United States Department of Agriculture

Ragged Ruby Project

Draft Environmental Impact Statement

Forest Service
Malheur National Forest – Blue Mountain Ranger District
Umatilla National Forest – North Fork John Day Ranger District November 2018

RAGGED RUBY PROJECT
Draft Environmental Impact Statement
Grant County, Oregon

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Abstract: A draft environmental impact statement has been prepared for the Ragged Ruby Project. Project activities are proposed on National Forest System lands on the Malheur National Forest, Blue Mountain Ranger District and Umatilla National Forest, North Fork John Day Ranger District in Grant County, Oregon. Two action alternatives have been developed based on public input and collaborative efforts. Alternative 1 is the no action alternative. Alternative 2, the proposed action, includes upland restoration activities; watershed, fisheries, and wildlife habitat restoration; prescribed burning and unplanned ignitions; road activities; and recreation system changes; alternative 2 is the preferred alternative. Alternative 3 is a modification of the proposed action, developed in response to comments generally requesting fewer activities. This alternative includes fewer acres of upland restoration activities, differences to the silvicultural prescriptions of the upland restoration activities, no helicopter logging, fewer acres of prescribed burning, fewer miles of temporary road construction and road maintenance, differences in approved recreational use types, and differences in three of the proposed forest plan amendments.

It is important that reviewers provide their comments at such times and in such a way that they are useful to the Agency's preparation of the environmental impact statement. Therefore, comments should be provided prior to the close of the comment period and should clearly articulate the reviewer's concerns and contentions. The submission of timely and specific comments can affect a reviewer's ability to participate in subsequent administrative review or judicial review. Comments received in response to this solicitation, including names and addresses of those who comment, will be part of the public record for this proposed action. Comments submitted anonymously will be accepted and considered; however, anonymous comments will not provide the respondent with standing to participate in subsequent administrative or judicial reviews.

Send Comments to: **Blue Mountain Ranger District**
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Summary

The Malheur and Umatilla national forests propose to authorize upland restoration activities; watershed, fisheries, and wildlife habitat restoration; prescribed burning and unplanned ignitions; road activities; and recreation system changes. The area affected by the proposal includes approximately 34,000 acres in the Granite Boulder Creek and Balance Creek subwatersheds that drain into the Middle Fork John Day River. Over the last century, tree species composition, tree density, landscape pattern, and the fire regime in the Ragged Ruby planning area has changed from historical conditions and is susceptible to insect and disease infestation and uncharacteristic wildfire. Overstocked stands are over-utilizing available water and creating non-typical stands (for example, juniper, grand fir, and Douglas-fir encroachment). Western white pine, whitebark pine, scabland flat bunchgrass areas, and dry meadows in inventoried roadless areas are departed from historical conditions. Degraded roads in or near riparian areas are causing aquatic resource damage due to sediment runoff. Existing trail systems are not meeting the needs of current Forest users and some are causing resource degradation. This action is needed to:

- Maintain and improve landscape resiliency and manage for diverse forest composition, stocking levels, and pattern to maintain healthy ecological function and process within a complex disturbance regime of wildfire, drought, insects, and diseases.
- Promote forest conditions that allow for the reintroduction of fire upon the landscape, thereby creating conditions that are conducive for firefighter safety, resource values, and private lands. These conditions would reduce wildland fire spread and intensity thereby improving public and firefighter safety. After treatments, fire should function as a stand maintenance process rather than a stand-replacing disturbance within treated areas. Wildland fire spread and intensity would be reduced. Safe public access would be improved and firefighters could more safely and readily manage wildfires.
- Improve aquatic resource conditions.
- Improve wildlife habitat.
- Improve one or more of the nine roadless area characteristics (as defined by the 2001 Roadless Area Conservation Rule) within the Dixie Butte and Greenhorn Mountain inventoried roadless areas and restore the characteristics of ecosystem composition and structure within the range of variability that would be expected to occur under natural disturbance regimes of the current climatic period.
- Contribute to the social and economic health of those enjoying multiple uses in the Ragged Ruby planning area.

The action alternatives were developed through a collaborative process involving the public, the Blue Mountains Forest Partners collaborative group, and Malheur and Umatilla national forest staff. Beginning in 2016, meetings and fieldtrips were held with the public and Blue Mountains Forest Partners collaborative group to discuss the existing and desired conditions of the Ragged Ruby planning area, and a potential suite of activities to achieve those desired conditions. The 30-day scoping period was open March 24 to April 24, 2017, and the 30-day scoping period extension was open December 7, 2017, to January 8, 2018. The major issues raised during scoping focused on the amount, location, and effects of upland restoration activities; effects to pine marten; and the cumulative effects of multiple projects in the Middle Fork John Day River drainage. These issues led the agency to develop one action alternatives to the proposed action, for a total of three alternatives:

- **Alternative 1 (no action)**: The ‘no action alternative’ is required by the National Environmental Policy Act. Under the no action alternative, no management activities proposed in any of the other alternatives would occur. Alternative 1 is designed to represent the existing condition and is analyzed for projected future conditions if no activities proposed in any of the alternatives are

authorized. It serves as the baseline to compare and describe the differences and effects between taking no action and implementing one of the other alternatives.

- **Alternative 2 (proposed action)**: Alternative 2 is the proposed action and preferred alternative, and would authorize upland restoration activities (9,200 acres); watershed, fisheries, and wildlife habitat restoration (10 acres aspen restoration and installation of 2 bat gates); prescribed burning and unplanned ignitions (34,000 acres); road activities (163 miles road maintenance, 12.4 miles temporary road construction, 2.9 miles road opening, 7.3 miles road closure, 1.7 miles road decommissioning, 1.2 miles conversion of road to trail, 9.9 miles seasonal wildlife road closures modified, and 25.3 miles confirmation of past administratively closed roads); and recreation system changes (2.8 miles new trail construction, 8.4 miles co-designation of roads as trails, 5.1 miles trail un-designation, 4 new trailheads, 3 new parking areas at trailheads, 4 trailheads un-designated, and 1 interpretive sign installed). This alternative also includes a forest plan amendment to change management area 13 (old growth) areas, remove trees greater than or equal to 21 inches diameter at breast height, harvest within and reduce late and old structure stands, and not maintain connectivity between all late and old structure and old growth stands. More detailed descriptions are found in chapter 2, Appendix A – Activity Tables, and Appendix B – Maps.
- **Alternative 3**: Alternative 3 was developed in response to significant issues raised during scoping to address comments generally requesting fewer activities. Alternative 3 would authorize upland restoration activities (8,210 acres); watershed, fisheries, and wildlife habitat restoration (10 acres aspen restoration and installation of 2 bat gates); prescribed burning and unplanned ignitions (31,500 acres); road activities (156 miles road maintenance, 11.6 miles temporary road construction, 2.9 miles road opening, 7.3 miles road closure, 1.7 miles road decommissioning, 1.2 miles conversion of road to trail, 9.9 miles seasonal wildlife road closures modified, and 25.3 miles confirmation of past administratively closed roads); and recreation system changes (2.8 miles new trail construction, 8.4 miles co-designation of roads as trails, 5.1 miles trail un-designation, 4 new trailheads, 3 new parking areas at trailheads, 4 trailheads un-designated, and 1 interpretive sign installed). This alternative also includes a forest plan amendment to change management area 13 (old growth) areas, remove trees greater than or equal to 21 inches diameter at breast height, harvest within and reduce late and old structure stands, and not maintain connectivity between all late and old structure and old growth stands. More detailed descriptions are found in chapter 2, Appendix A – Activity Tables, and Appendix B – Maps.

Major conclusions include:

- Silvicultural treatments would reduce stand density and the effects of that reduction would continue at least 40 years into the future. This would decrease the risk of a large, stand-replacement fire or an insect outbreak. Over time, the planning area would become deficient in young forest structure, but alternative 2 would increase the proportion of old forest single stratum when compared to alternative 1 (no action). Treatments would also decrease the proportion of late seral species while providing conditions conducive for natural regeneration and planting of early seral species. Alternative 3 would produce similar effects to alternative 2, but at a smaller scale as it treats 1,000 less acres.
- Alternative 2 would reduce potential crown fire activity (5,974 acres) and flame lengths (34,938 acres with 0 to 4-foot flame lengths) the most. Alternative 3 would reduce crown fire activity (6,040 acres) and flame lengths (30,113 acres with 0 to 4-foot flame lengths) slightly less than alternative 2.
- Composite watershed hazard would increase from the current low-to moderate plus to moderate plus plus (alternative 2) or moderate plus (alternative 3) during active implementation and gradually decline over several decades to low plus (alternatives 2 and 3).

- Middle Columbia River steelhead and Columbia River bull trout (both Endangered Species Act threatened species) and their designated critical habitat would have an Endangered Species Act determination of may affect, likely to adversely affect in the short term and a Beneficial Effect in the long term.
- Alternatives 2 and 3 would have 111.0 miles of open roads and 103.0 miles of closed roads.
- Alternative 2 trail and trailhead improvements would correct existing issues with the trail network by reestablishing trailheads in locations that are better suited to meet the needs and capacity of the trail system. There would be an overall increase of 6.1 miles of trail. Alternative 3 impacts would be the same as for alternative 2; however, without increased bicyclist opportunities in the northern trail system.
- Alternative 2 would produce about 13 million board feet of sawtimber and alternative 3 would produce 10 million board feet.
- Other undeveloped land would be slightly reduced under alternative 2 (by 0.4 percent) and alternative 3 (by 0.3 percent).

Based upon the effects of the alternatives, the responsible official will decide whether to:

- Select one of the action alternatives that has been considered in detail, or
- Modify the selected alternative, and
- Identify what mitigation measures would apply, or
- Select the no action alternative.

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Chapter 1 – Purpose of and Need for Action

Introduction

The Ragged Ruby Project is proposed to foster forest and aquatic ecosystems resilient to a changing environment; restore ecosystems that are naturally adapted to wildland fire; provide abundant clean water; social, economic, and environmental benefits from forest resources (including providing traditional foods); and create jobs and opportunities for local communities. This planning area is the second to last project proposed on the Malheur National Forest in the Middle Fork John Day River drainage, and the goal is to tie this project together with the restorative actions that are proposed and being implemented in the surrounding watersheds. The Ragged Ruby planning area is a diverse landscape with a variety of plant association groups. It also includes areas impacted by the 1994 Reed and 1996 Summit fires, part of the Vinegar Hill-Indian Rock Scenic Area, and a variety of existing recreation developments.

Public input received during project development was considered in developing the proposed action; some of the major comment themes so far are to: provide a road system that meets the needs of the local community while responding to resource concerns, include aquatic restoration projects addressing existing issues (for example, log weirs, culverts, and legacy berms that are barriers to fish passage), improve mule deer habitat, protect unique habitats where they exist, and minimize impacts of timber harvest and temporary road construction.

The Forest Service has prepared this environmental impact statement in compliance with the National Environmental Policy Act and other relevant Federal and State laws and regulations. This environmental impact statement discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives.

Additional documentation, including more detailed analyses of planning area resources, may be found in the project planning record located at the Blue Mountain Ranger District, John Day, Oregon. The draft environmental impact statement incorporates by reference all appendices and the project record.

Background

The proposed action was developed through a collaborative process involving the public, Blue Mountains Forest Partners, and Malheur National Forest staff. Beginning in the summer of 2016, fieldtrips and meetings were held to discuss the existing and desired conditions of the Ragged Ruby planning area and a potential activities to achieve those desired conditions.

Planning Area Location

The Ragged Ruby Project is located on the Malheur National Forest – Blue Mountain Ranger District and the Umatilla National Forest – North Fork John Day Ranger District in Grant County, approximately 9 miles north of Prairie City, Oregon. The Ragged Ruby planning area encompasses approximately 34,000 acres in the Granite Boulder Creek and Balance Creek subwatersheds that drain into the Middle Fork John Day River (see Appendix B – Maps, Map 13). The legal description for the planning area is (township, range, sections): Township 10 South, Range 33 East, sections 7-10, 13, and 15-36; Township 10 South, Range 34 East, sections

9-24 and 27-33; Township 11 South, Range 33 East, sections 1-5, 9-15, and 23-26; and Township 11 South, Range 34 East, sections 5-9, 16-21, and 28-30, Willamette Meridian.

Management Direction

This draft environmental impact statement tiers to the Malheur National Forest Land and Resource Management Plan (Malheur Forest Plan), Final Environmental Impact Statement, and Record of Decision; Umatilla National Forest Land and Resource Management Plan (Umatilla Forest Plan), Final Environmental Impact Statement, and Record of Decision; and incorporates by reference the accompanying land and resource management plans (Malheur and Umatilla Forest Plans), as amended (USDA Forest Service 1990a, 1990b, 1990c, 1990d, 1990e). Additional management direction is provided by forest plan amendments approved since 1990, some of which include:

- Columbia River Anadromous Fish Management Policy and Implementation Guide (USDA Forest Service 1994; Amendment 29). The amendment included changes to both management area 3A (inland fish habitat) and 3B (anadromous fish habitat).
- Interim Management Direction Establishing Riparian, Ecosystem and Wildlife Standards for Timber Sales (USDA Forest Service 1995a; Eastside Screens).
- Interim Strategies for Managing Anadromous Fish-Producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (USDA and USDI 1995a; PACFISH). This amendment provides goals, management objectives, and standards and guidelines that reduce the risk of loss of populations of anadromous fish and potential negative impacts to aquatic habitat.
- The Pacific Northwest Region Record of Decision for the Invasive Plant Program (USDA Forest Service 2005). This amendment added management direction relative to invasive plants.
- Record of Decision for the Malheur National Forest Site-Specific Invasive Plants Treatment Project (USDA Forest Service 2015a). This decision authorizes a range of treatment and restoration methods for an integrated weed management program.

Forest Plan Management Areas

Management direction is found within the resource prescriptions of the Malheur National Forest Land and Resource Management Plan and Umatilla National Forest Land and Resource Management Plan (USDA Forest Service 1990a, USDA Forest Service 1990d). See Table 1 and Appendix B – Maps, Map 2.

Table 1. Malheur and Umatilla Forest Plan management areas within the Ragged Ruby planning area

Management area	Acres[1]	Malheur and Umatilla Forest Plan goals
Malheur Forest Plan – General Forest (management area 1)	33,100 acres	Manage for timber production and other multiple uses on a sustained yield basis.
Malheur Forest Plan – Rangeland (management area 2)	Included in management area 1	Manage for livestock forage production and other multiple uses on a sustained yield basis.
Malheur Forest Plan – Riparian Areas (management area 3) / Riparian Habitat Conservation Areas	5,000 acres	Manage to protect or enhance riparian-dependent resources in watersheds supporting anadromous fish. Acres for this management area are measured using riparian habitat conservation area buffers.

Management area	Acres[1]	Malheur and Umatilla Forest Plan goals
Malheur Forest Plan – Big-Game Winter Range Maintenance (management area 4A)	16,200 acres	Maintain or enhance the quality of the winter range habitat for deer and elk through timber harvesting, prescribed burning, and other management practices. Manage for elk habitat by balancing cover quality, cover spacing, forage, and open road densities.
Malheur Forest Plan – Vinegar Hill – Indian Rock Scenic Area (management area 7)	3,500 acres	Manage this area to preserve and protect outstanding natural esthetics.
Umatilla National Forest – Vinegar Hill – Indian Rock Scenic Area (area 8)	700 acres	Protect or enhance the unique natural characteristics of description landscapes noted for their scenic beauty.
Malheur Forest Plan – Dixie Butte Proposed Research Natural Area (management area 9)	20 acres	Provide areas for non-manipulative research, observation, and study of undisturbed ecosystems. Maintenance of the natural processes within each area will be the prime consideration.
Malheur Forest Plan – Old Growth Habitat (management area 13)	1,800 acres	Provide “suitable” habitat for old growth dependent wildlife species, ecosystem diversity, and preservation of aesthetic qualities.
Malheur Forest Plan – Visual Corridors (management area 14F – foreground)	1,300 acres	Manage corridor viewsheds with primary consideration given to their scenic quality and the growth of large diameter trees. Visual quality objectives of retention, partial retention, and modification will be applied while providing for other uses and resources.
Malheur Forest Plan – Wildlife Emphasis Area (with Non-Scheduled Timber Harvest) (management area 21)	2,600 acres	Manage to provide high quality fish and wildlife habitat and water quality. Timber harvest will be on a non-scheduled basis and used only to meet fish or wildlife habitat objectives. Provide opportunities for high quality semi-primitive dispersed recreation.

[1] Some management areas overlap, so the total acreage is greater than the planning area.

Forest Plan Compliance

This project was initiated under the 1990 Malheur National Forest Land and Resource Management Plan (USDA Forest Service 1990a) which is currently being revised. The Forest Service released the revised management plan final environmental impact statement (USDA Forest Service 2018c) and draft record of decision (USDA Forest Service 2018b) on June 29, 2018, however, the implementation date of the new plan is uncertain. Therefore, the Forest Service will ensure this project decision complies with the management plan in effect at the time of the project decision. Until the implementation date of the revised forest plan, the Forest Service will develop projects consistent with the 1990 Malheur National Forest Land and Resource Management Plan.

Laws and Regulations

The management of resources on National Forest System lands is based on several federal laws and regulations, including the Multiple-use Sustained Yield Act of 1960; the Forest and Rangeland Renewable Resources Planning Act of 1974, as amended by the National Forest Management Act of 1976; the National Environmental Policy Act of 1969, including the Council on Environmental Quality regulations for implementing National Environmental Policy Act (40 CFR §§ 1500 1508, July 1, 1986); the Endangered Species Act 1973, as amended; Clean Water Act, as amended, 1977, 1982; Clean Air Act, as amended, 1990; National Historic Preservation

Act, 1966 as amended, 1976, 1980, 1992; Migratory Bird Treaty Act, 1918; and Executive Order 13186.

Purpose and Need for Action

The purpose and need for the Ragged Ruby Project was developed by comparing the management objectives and desired conditions in the Malheur and Umatilla Forest Plans to the existing conditions in the Ragged Ruby planning area related to forest resiliency and function. Where plan information was not explicit, best available science and local research were utilized.

Maintain and improve landscape resiliency and manage for diverse forest composition, stocking levels, and pattern to maintain healthy ecological function and process within a complex disturbance regime of wildfire, drought, insects, and diseases. More specifically:

- Trend the landscape pattern of stand structures towards a configuration that considers the historical range of variability.
- Increase stand diversity through shifting species composition towards the historical range of variability. This includes reducing late seral species and increasing hardwood and shrub species that were historically used for traditional foods (for example, huckleberries, mushrooms, and riparian hardwoods).
- Manage stand density to promote vigor and resiliency.
- Trend the landscape pattern of patch sizes, edge density, and associated core areas towards a configuration that decreases fragmentation across the landscape.
- Manage the Ragged Ruby planning area to complement the surrounding landscape (which includes previous planning areas), including providing logical wildlife corridors, reserves, and other large-scale objectives.

Promote forest conditions that allow for the reintroduction of fire upon the landscape, thereby creating conditions that are conducive for firefighter safety, resource values, and private lands. These conditions would reduce wildland fire spread and intensity thereby improving public and firefighter safety. After treatments, fire should function as a stand-maintenance process rather than a stand-replacing disturbance within treated areas. Wildland fire spread and intensity would be reduced. Safe public access would be improved and firefighters could more safely and readily to manage wildfires. More specifically, our fuel reduction objectives are to:

- Reduce the fuel loadings by reducing the density, and horizontal and vertical connectivity of standing vegetation, surface fuels, and ladder fuels.
- Reduce fuels along National Forest System roads 2050 and 45, and County Road 20 which is identified as escape corridors in the Grant County Community Fire Protection Plan (Grant County 2013).
- Reduce fuels along priority National Forest System roads 2000098, 2000909, 2045, 2045310, 2045888, 4550, and 4560.

Improve aquatic resource conditions:

- Enhance resiliency within the riparian areas.
- Improve structural, vertical, and horizontal complexity within riparian areas (enhance riparian hardwood and shrub communities).
- Improve aquatic habitat conditions and timing of water release from riparian areas and hillslopes.

Improve wildlife habitat:

- Designate or expand the dedicated old growth, replacement old growth, and pileated woodpecker feeding areas in the planning area to improve the agency's ability to manage for late and old structure dependent species.
- Identify and maintain functional wildlife connectivity corridors between late and old structure habitats to allow movement and landscape permeability of late and old structure wildlife species.
- Improve critical wildlife habitat types; specifically aspen, riparian, and productive upland shrub communities.
- Maintain or increase patches of security habitat for big game species.

Improve one or more of the nine roadless area characteristics (as defined by the 2001 Roadless Area Conservation Rule) within the Dixie Butte and Greenhorn Mountain inventoried roadless areas and restore the characteristics of ecosystem composition and structure within the range of variability that would be expected to occur under natural disturbance regimes of the current climatic period. Specifically, to:

- Improve the diversity of plant communities.
- Improve habitat for candidate species.

Contribute to the social and economic health of those enjoying multiple uses in the Ragged Ruby planning area:

- Provide a variety of wood products (including merchantable sawtimber, biomass, and post and poles).
- Maintain and improve conditions in grazing allotments (forage availability and cattle distribution).
- Provide a safe and sustainable road system that moves toward access and resource management objectives.
- Maintain and enhance recreational opportunities.
- Contribute towards forest management employment opportunities (for example, timber harvest and processing, prescribed burning, and aquatic and upland restoration work) to help maintain and improve community stability and infrastructure.

Existing and Desired Future Condition

Forest Composition, Stocking Levels, and Pattern

Due to fire suppression over the last century, the fire regime in the Middle Fork John Day River drainage has changed. Historically, fire was the dominant disturbance on the landscape due to Native American burning and lightning strikes during thunder storms. These fires were agents of stability, favoring fire resistant species (ponderosa pine, western larch, and to a lesser extent Douglas-fir) and the development of more open, park-like stands with little vertical structure. They also kept the ground vegetation dominated by fire-adapted grasses such as pine grass and elk sedge. Shade tolerant species (grand fir and Douglas-fir) were generally susceptible to these fires due to their thinner bark when young, and persistent, low-hanging crown characteristics.

Fire intensity also varied in response to vegetative conditions. Small areas of denser forest patches occurred in areas missed or more resistant to fire (draws, spring seep areas, and northerly aspects). Areas missed by frequent fires developed conditions where subsequent fires could potentially be of moderate to high intensity, resulting in stand replacement patches.

Recent studies on the Malheur National Forest have found that fire return intervals within mixed conifer forest types were only slightly longer than fire return intervals for Warm Dry ponderosa pine sites (fire return intervals between 1680 and 1900 ranged from 10.6 to 18.4 years within ponderosa pine sites and from 11.8 to 21.2 years within mixed conifer sites) (Johnston et al. 2017). Fire severity in these forest types was predominately low severity, although some mixed severity and relatively small (1 to 100 acres) stand-replacement patches did occur across the landscape through time. These small, stand-replacement events are evident across the planning area today because they are dense pole patches of lodgepole pine and western larch.

Warm Dry and Hot Dry forests are very different with respect to inherent productivity than Cool Moist and Cold Dry forests. Today they are also very different to historical norms in respect to structural and compositional attributes. Ponderosa pine forests are typically less dense, are dominated by ponderosa pine (or on the more productive sites, by ingrowth of grand fir) and tend to have a single canopy layer. Mixed conifer forests are much denser, are dominated by grand fir, and tend to have multiple canopy layers. However, because all sites historically experienced similar fire disturbance regimes, this tended to equalize stand biomass and species composition across the landscape. Historically, ponderosa pine and mixed conifer forests were very similar with respect to basal area and, to a lesser extent, species composition (Johnston et al. 2017).

The frequent, low-severity fires in this region have been extinguished with the policy of fire suppression. Early timber harvest and fire suppression cumulatively have changed stand conditions within the planning area, allowing for the build-up of surface fuels, increases in stand density, and ingrowth of late seral species that create ladder fuels. This has changed the fire regime in the dominant forest types to less frequent, mixed- and high-severity events with larger stand replacement patch sizes. Recent fires that have escaped initial attack within the planning area and near vicinity include the Buck Gulch fire of 1981 (460 acres), Jumpoff fire of 1986 (1,400 acres), Indian Rock (2,000 acres) and Reed (2,300 acres) fires of 1994, Summit fire of 1996 (38,000 acres), and Sharp’s Ridge fire of 2006 (1,500 acres). The Indian Rock and Summit fires burned with high severity and the Reed and Sharp’s Ridge fires burned with mixed severity.

The ingrowth of late seral species and increased stand densities have also helped to create conditions promoting insect outbreaks. A mountain pine beetle outbreak in the 1960s and 1970s killed many pine trees in the Middle Fork John Day River drainage. A spruce budworm outbreak in the mid-1980s and early 1990s has created dead and downed grand fir and Douglas-fir, and live grand fir and Douglas-fir with poor crowns, reduced growth, and dead or forked tops.

Dry Pine Stands

Dry pine stands fall within the Warm Dry and Hot Dry Upland Forest plant association groups. Warm Dry Upland Forest is the dominant plant association group within the planning area, comprising approximately 47 percent of the planning area. Hot Dry Upland Forest occupies approximately 3 percent of the planning area. Four of the seven structural stages (which provide for spatial heterogeneity in a stand) of both plant association groups are outside the historical range of variability. Over half of the areas within the Warm Dry and Hot Dry plant association groups have high stand densities that are susceptible to competition-induced tree mortality, insect and disease infestation, and high-severity wildfire.

The desired future condition in these stands is to reduce stand density, increase tree spatial heterogeneity, protect old trees, and shift species composition to a higher proportion of early seral species in stands with grand fir encroachment in the Warm Dry and Hot Dry plant association groups, while providing forest products (USDA Forest Service 1995a, Powell 1998, Powell 1999, Johnston et al. 2016, Johnston et al. 2018).

Mixed Conifer Stands

Mixed conifer stands fall within the Cool Moist and Cold Dry Upland Forest plant association groups. Cool Moist Upland Forest occupies approximately 21 percent of the planning area and Cold Dry Upland Forest occupies approximately 14 percent of the planning area. Approximately four of the seven structural stages (which provide for spatial heterogeneity in a stand) of both plant association groups are outside the historical range of variability. Approximately 40 to 60 percent of the area within the Cool Moist and Cold Dry plant association groups have high stand densities that are susceptible to competition-induced tree mortality, insect and disease infestation, and high-severity wildfire.

The desired future condition in these stands is to shift species composition to a greater proportion of early seral species (for example, western larch, ponderosa pine, and western white pine), reduce stand density, protect old trees (greater than 150 years old), and provide for multi-strata stands while providing forest products (USDA Forest Service 1995a, Powell 1998, Powell 1999, Johnston et al. 2016, Johnston et al. 2018). It is also to increase patch size across the landscape while blending sharp edges between plantations and the surrounding forest to improve landscape contagion and reduce conifer cover. This would release hardwoods and larger brush species (oceanspray and Rocky Mountain maple), increasing species diversity across the landscape.

Scabland Flats and Dry Meadows

Scabland flats and dry meadows are located throughout the planning area and provide unique habitat because they are characterized by shallow rocky soils as well as old growth ponderosa pine, mountain mahogany, and other forage and browse species that are important for big game habitat. They are currently encroached upon by juniper and ponderosa pine.

The desired future condition is to reduce juniper and ponderosa pine encroachment, increase mountain mahogany and other winter browse species, provide for erosion control, and restore or increase native bunchgrasses (USDA Forest Service 1995a, Powell 1998, Powell 1999, Johnston et al. 2016, Johnston et al. 2018).

Whitebark Pine and Western White Pine Stands

Whitebark pine and western white pine are found at higher elevations and cooler, moister areas in the Ragged Ruby planning area, including in the Dixie Butte and Greenhorn Mountain inventoried roadless areas. Both tree species have ecological and historical significance for the Forest.

Whitebark pine is a candidate for federal listing due to concerns regarding the species' decline caused by introduced white pine blister rust and native bark beetles. Climate change may also become a threat as the species occupies the highest elevation sites available and the trees cannot migrate higher to avoid warmer temperatures.

Genetic evidence suggests that western white pine and whitebark pine in the Malheur National Forest may have some resistance to white pine blister rust. However, the combination of increased competition, drought stress, blister rust infection, and mountain pine beetle has caused significant tree mortality of mature trees over the last several decades. This combination of threats seriously affects both species throughout their range on the Malheur National Forest.

The desired future condition is to increase the health and vigor of whitebark pine and western white pine in the planning area (Erickson et al. 2007) and reintroduce fire into the landscape.

Fuel Conditions

The historical fire regime in the Ragged Ruby planning area was characterized by frequent mixed-severity fires known as fire regime III (see chapter 3, Fire and Fuels section for description). Fire return intervals in the Blue Mountains of Oregon in mixed conifer forests ranged from 7 to 24 years in drier sites and about 47 years for moister sites. The fires burned in a mixed-severity regime with the higher severities in the moister sites, which also had the longer fire return intervals (Agee 1996). Within the planning area, fire return intervals ranged between 11 to 18 years in dry pine sites and 12 to 21 years in mixed conifer sites (Johnston et al. 2017). Past forest practices, including active fire suppression, grazing, and timber harvest have changed the composition and structure of vegetation in the planning area. Current conditions include increases in tree density, encroachment of shade-tolerant tree species, or high loss of shade-intolerant tree species. This creates fuel conditions above historical fire behavior and effects. Current fire behavior conditions under 90th percentile weather conditions are expected to have flame lengths of 4 to 8 feet with some areas exceeding 11 feet. Tree mortality would vary by species and wild fire intensity, but on average it is expected that 76 percent of the greater than 21 inches diameter at breast height trees (averaged across all species) would die.

The desired condition is an ecosystem that would thrive with the recurring disturbance of wildfire within the planning area, and a decreased probability of uncharacteristic catastrophic wildland fire occurring. Specifically, this means a reduction in surface fuels, duff/litter depth, ladder fuels, and crown bulk density; an increase in canopy base heights; and the stimulation of the growth of aspen and other fire-adapted vegetation. The desired condition from a fire behavior standpoint would be a surface fire with average flame lengths less than 4 feet, and minimal passive crown fire averaging less than 20 percent at the stand level. There would be a safe environment for firefighters, forest visitors, and the public; strategic fuel zones along designated roadways; and fire reestablished to its natural role in the ecosystem. Less biomass would be available to burn under a wildfire thereby reducing potential health hazards from smoke emissions. Less greenhouse gasses would be released in the planning area during a wildfire event, and those emissions would not significantly contribute to climate change (Grant County 2013, USDA Forest Service 1990a, USDA Forest Service 2015g).

Aquatic Resource Conditions

The planning area includes federally listed Middle Columbia River steelhead, Columbia River bull trout, and their designated critical habitat under the Endangered Species Act. Other aquatic species within the planning area listed as either Malheur Forest Plan Management Indicator Species or Region 6 Sensitive Species include Interior redband trout, Pacific lamprey, Columbia spotted frog, western ridged mussel, and California floater (a freshwater mussel). Habitat is present for one or more of these species in Sunshine, Ragged, Ruby, Butte, Sulphur, Bennett, Coyote, Dry, Beaver, Granite Boulder, and Lemon creeks, and in the Middle Fork John Day River.

Overstocked stands are over-utilizing available water and creating non-typical stands (for example, juniper, grand fir, and Douglas-fir encroachment). Degraded roads in or around riparian areas are causing aquatic resource damage due to sediment runoff. Some roads are also restricting aquatic organism passage at stream crossings.

Desired conditions include:

- A properly functioning watershed, with restored natural processes and functions that allow the watershed to maintain diversity and complexity.
- The ability of the landscape to capture, store, and safely release water.
- High water quality and species diversity as a result of stable soils and thriving life stages of aquatic organisms.
- A planning area where all life stages of aquatic organisms have access to potential habitats unimpaired by human-caused barriers.
- Vegetative conditions which allow resiliency to changing environmental factors (USDA Forest Service 1990a, USDA Forest Service 1994, USDA and USDI 1995a).

Aspen Stands

Aspen provides unique habitat for many wildlife species within coniferous forests, and it is currently much reduced from its historical extent. Aspen is currently found at approximately 28 locations in the planning area. It appears that a combination of fire suppression, heavy grazing by both domestic and wild ungulates, conifer encroachment, and lowering of the water table has reduced the survival of aspen. Many of the aspen stands within the Ragged Ruby planning area have either been treated through past projects, burned in the Summit Fire, or both. Many of these stands are young and have fences that need to be extended and repaired to allow for suckering to expand. Some of the stands within the planning area are being shaded out by conifer encroachment.

The desired future condition is to protect declining aspen stands and improve aspen regeneration and vigor; reduce flame length, fireline intensities, and maintain fire as a surface fire; and reintroduce fire to stimulate sprouting (Swanson et al. 2010).

Wildlife Habitat

The Ragged Ruby planning area provides habitat for a wide variety of species including American peregrine falcon (Region 6 sensitive), bald eagle (Region 6 sensitive), black-backed woodpecker (Malheur Forest Plan management indicator species), blue (dusky) grouse (Malheur Forest Plan featured species), downy woodpecker (Malheur Forest Plan management indicator species), fringed myotis (Region 6 sensitive), gray wolf (Region 6 sensitive), hairy woodpecker (Malheur Forest Plan management indicator species), Johnson's hairstreak (Region 6 sensitive), Lewis' woodpecker (Region 6 sensitive, Malheur Forest Plan management indicator species), northern flicker (Malheur Forest Plan management indicator species), northern goshawk (featured species), osprey (featured species), Pacific (pine) marten (Malheur Forest Plan management indicator species), pallid bat (Region 6 sensitive), pileated woodpecker (Malheur Forest Plan management indicator species), red-naped sapsucker (Malheur Forest Plan management indicator species), Rocky Mountain elk (Malheur Forest Plan management indicator species), silver-bordered fritillary (Region 6 sensitive), three-toed woodpecker (Malheur Forest Plan management indicator species), Townsend's big-eared bat (Region 6 sensitive), western bumblebee (Region 6 sensitive), white-headed woodpecker (Region 6 sensitive, Malheur Forest Plan management indicator species), and Williamson's sapsucker (Malheur Forest Plan management indicator species). These and other wildlife species present in the planning area require a wide variety of habitat types (for example, rock crevices, snags, meadows, open late-seral ponderosa pine forest, riparian habitat with aspen, and closed canopy late seral subalpine and montane forests). See chapter 3, Wildlife sections for more information.

The desired condition is to provide a diversity of habitat sufficient to maintain viable populations of all species (USDA Forest Service 1990a, Forest-wide goal 19, page IV-2). Forage production would be increased, aspen stand would be improved in health and vigor, open road density would be reduced, snags would be well distributed, and green trees would be available to provide snag replacements through time (USDA Forest Service 1990a, pages IV-6 and IV-9).

Wildlife Connectivity Corridors

The Eastside Screens provides direction that old growth (management area 13) and late and old structure stands be connected with each other in a contiguous network pattern by at least two different directions, stand widths should be at least 400 feet wide, and that the length of connectivity corridors be as short as possible (USDA Forest Service 1995a). Wildlife connectivity corridors have been designated in the recent adjacent projects: Balance, Big Mosquito, Camp Lick, Galena, Reed, and Summit (see Appendix B – Maps, Maps 10 and 11). Part of the desired future condition is to designate wildlife connectivity corridors that connect to what has been designated in adjacent projects, and to improve the resilience of these corridors.

Mining Adits

There are currently several un-gated mining adits[1] in the planning area. The desired future condition is to increase public safety at these sites, while also protecting cultural resources and bat roost sites (USDA Forest Service 1990a).

Roadless Area Characteristics

The Dixie Butte and Greenhorn Mountain inventoried roadless areas make up approximately 23 percent of the Ragged Ruby planning area (approximately 7,700 acres of the 34,000-acre planning area). Western white pine and whitebark pine in the inventoried roadless areas are currently in decline due to white pine blister rust, mountain pine beetles, and encroachment by subalpine fir and grand fir (due to fire suppression). Dry meadows and scabland flats in the Dixie Butte Inventoried Roadless Area have been encroached upon by juniper, ponderosa pine, Douglas-fir, and non-native invasive plants, which are shading out and competing with the native bunchgrass and shrub communities that provide important wildlife habitat utilized by many species.

The desired future condition is to enhance two of the nine roadless characteristics (features that are often present in and characterize inventoried roadless areas) as identified in the 2001 Roadless Area Conservation Rule (36 Code of Federal Regulations 294.11). Specifically, to enhance:

(3) Diversity of plant communities (whitebark pine, western white pine, scabland flat bunchgrass areas, and dry meadows).
(4) Habitat for candidate species (whitebark pine).

The desired future condition is also to reduce the encroachment of western juniper and conifers into areas where they did not historically occur to increase water availability and reduce shading for native vegetation and encourage natural recovery of unique vegetation communities (whitebark pine, western white pine, scabland flat bunchgrass areas, and dry meadows) (USDA Forest Service 1995a, Powell 1998, Powell 1999, Erickson et al. 2007, Johnston et al. 2016, Johnston et al. 2018).

[1] Entrance to an underground mine.

Social and Economic Health

The Malheur National Forest is managed according to multiple use objectives. The Forest recognizes that there are many social and economic values that are important to the public, including the availability of wood products, employment opportunities created via forest management, availability of a safe and economical road system, protection of historic properties, availability of recreational opportunities, and quality rangeland management. Therefore, there is a need for the Ragged Ruby Project to contribute to the social and economic health of those enjoying multiple uses in the Ragged Ruby planning area.

Wood Products

Wood products play an important role in the local economy by providing employment and revenue. Timber harvest has decreased since the 1990s and there is currently only one operating saw mill in Grant and Harney counties.

The desired condition is to provide wood products to help maintain the existing lumber and forest products infrastructure and support local employment, providing for community stability. The Malheur Forest Plan includes direction to provide a sustainable flow of timber and associated wood products at a level that would contribute to economic stability and provide an economic return to the public (USDA Forest Service 1990a, Forest goals 24-26, page IV-2).

Rangeland

Livestock grazing has been permitted in the planning area since the early 1900s. In the past 30 years, intensive grazing management strategies have been developed and are continually adapted to maintain or improve riparian habitat. Data from annual riparian monitoring indicates that livestock use of riparian areas has been within allowable levels for several years and these areas are in recovery.

The desired condition is for resilient upland and riparian conditions, a diverse species mix within the upland and riparian areas, and a fire return interval returned to historical frequencies which provide ample forage, in accordance with Forest goal 20, Forest-wide standard 78, and MA3A/3B standards 19-21 (USDA Forest Service 1990a, pages IV-2, IV-34, and IV-58).

Road System

There are approximately 216.5 miles of road in the Ragged Ruby planning area, 115.7 miles of which are objective maintenance level 2 and 3 (open) roads. The existing total road density is 4.1 miles per square mile for open and closed roads. The existing open road density is 2.2 miles per square mile.

Forest roads are linear features that can impact hydrologic and geomorphic processes and functions that can affect biotic species (macroinvertebrates, fish, etc.). Roads have the tendency to capture water from the hillslope and concentrate it to one location, thereby increasing the probability of landslides, gully formation, and changes to sediment transport. Beyond rerouting water, roads also directly contribute sediments eroded from their surface to water bodies.

Road density (miles of road within an area) is an important indicator for watershed condition, but in isolation does not demonstrate fine sediment being delivered directly to waterbodies. The proximity of roads within 300 feet of a stream is a better indicator for road-stream connectivity; roads in close proximity have a higher likelihood of accelerated water and sediment runoff to streams. Further, time since last road maintenance also indicates the degree to which road drainage features (ditch relief culverts, stream crossing culverts, etc.) may be filled with material and not functioning, thereby increasing the risk for gully formation or changes to sediment and water transport. These indicators often cumulatively contribute to each other. Roads within close proximity to streams that have not had road maintenance, likely have water concentrated on the surface with gullies or rills developed, and deliver directly to perennial waterbodies. Rills and gullies are terms for defining very small channels that slowly develop into streams; they are erosion source areas and conduits for water to be accelerated. Native surface roads have the highest likelihood of being eroded to a waterbody.

Approximately 38 percent (13,000 acres) of the Ragged Ruby planning area is located in the big-game winter range (management area 4A) land allocation. The goals for big-game winter range are to:

> Maintain or enhance the quality of the winter range habitat for deer and elk through timber harvesting, prescribed burning, and other management practices. Manage for elk habitat by balancing cover quality, cover spacing, forage, and open road densities. (USDA Forest Service 1990a, page IV-69)

One of the standards of this land allocation is:

> To limit disturbance to wintering big game, the open road density will be no greater than 2.2 mi/mi^2 by 1999. Where existing conditions do not meet this goal, project transportation system designs will be developed in order to move toward this goal in the shortest time frame possible. Densities will be monitored on a watershed basis, see Appendix I (USDA Forest Service 1990a, page IV-72).

In big-game winter range, the open road density in the Ragged Ruby planning area is approximately 2.67 miles per square mile in the Balance Creek subwatershed and 2.93 miles per square mile in the Granite Boulder Creek subwatershed (which exceeds the Malheur Forest Plan management area 4A road density standard of 2.2 miles per square mile). Extensive research and published literature (for example, Rowland et al. 2004 and Rumble et al. 2005) shows the relationship of elk behavior, distribution, and habitat use in relation to roads on the landscape.

In addition, some roads in the planning area are currently under a seasonal wildlife closure from October 1 to April 4. There is currently an ineffective pole gate at the south entrance of National Forest System Road 3670368 with a seasonal closure sign of October through May. This includes approximately 9.9 miles of road. These seasonal closures were authorized by the 1995 Ann Timber Sale Decision Notice for the purpose of increasing big game security.

Surveys of roads in the planning area identified some roads that are in deferred maintenance (for example, have trees growing in them, are grassed or brushed in, and are effectively closed on the ground).

The desired condition is to plan, design, operate, and maintain a safe and economical transportation system that provides efficient access for the movement of people and materials involved in the use and protection of the National Forest lands at the minimum level necessary to meet resource objectives (for example, timber harvest and removal, big-game habitat security needs, and recreational opportunities) (USDA Forest Service 1990a, Forest goals 35 and 36, page IV-3 and management area 4A standard 24, page IV-72).

Recreational Opportunities

Recreational use in the planning area includes driving for pleasure, dispersed camping (mostly during seasonal hunting), and access to the Vinegar Hill-Indian Rock Scenic Area. There are currently 8 miles of trail and 2 trailheads in the Ragged Ruby planning area. There are currently resource concerns associated with these trails, confusion on the location of these trails and trailheads, and user conflicts. Specifically:

- **Blackeye Trail #243 and Trailhead** – The trailhead is located in an open meadow area, 0.4 miles from the nearest maintenance level 2 access road (National Forest System Road 2010).
- **Tempest Mine Trail #256 and Trailhead** – The trail is currently designated as a foot/horse-riding trail, but the trailhead does not have adequate parking and turnaround options for large vehicles or horse trailers.
- **Princess Trail #251** – The existing trailhead at Dupratt Springs has not been accessible by vehicles since the 1990 Forest Plan went into effect, which provided direction to close existing roads in the Vinegar Hill-Indian Rock Scenic Area to public use (USDA Forest Service 1990a, management area 7 standard 16, page IV-92). The trailhead was moved, but not officially designated to the junction of National Forest System roads 2010 and 2010148. National Forest System Road 2010148 was then changed to a maintenance level 1 (closed) road and used as part of the Princess Trail.
- **Sunrise Butte Trail #255 and Trailhead** – The existing Sunrise Butte Trailhead was established in an area with no maintenance level 2 (open) road access, and consequently does not reflect usage on the ground.
- **Davis Creek Trail #244 and Trailhead** – The trail and its use are currently having impacts to Middle Columbia River steelhead, bull trout, Middle Columbia River steelhead and bull trout critical habitat, and other aquatic species.

The desired condition is to provide a range of recreational opportunities and settings, provide for a distribution and variety of recreation facilities that are consistent with public demand and are compatible with a forest environment, assure accessible facilities to as many people as possible, provide a diverse system of trails, and improve the safety of recreationists (USDA Forest Service 1990a, Forest goals 1-5, page IV-1; USDA Forest Service 1990d, page 4-1).

Forest Management Employment Opportunities

The rural communities adjacent to the Malheur National Forest have relied upon natural resources to support timber harvest, agriculture, and ranching since their founding. Declining forest products have greatly reduced employment and economic vitality in this region’s small communities. Since the mid-1990s, Grant and Harney counties are consistently listed among the top three counties for unemployment in the State of Oregon. Currently (as of December 2017), Grant County is at 6.4 percent unemployment (seasonally adjusted) compared to Oregon state average 4.1 percent and the National average of 4.1 percent (Oregon Employment Department 2017).

The desired condition is to contribute to the social and economic health of communities which are significantly affected by National Forest management (USDA Forest Service 1990a, Forest goal 42, page IV-3; USDA Forest Service 1990d, page 4-2).

Need for Amending the Malheur Forest Plan

The Malheur Forest Plan provides a long range strategy for managing the Malheur National Forest. Forest-wide standard #3 states that “If it is determined during project analysis that the best way to meet the management area goals of the Forest Plan conflicts with a Forest Plan standard, the Forest Supervisor may approve a nonsignificant amendment to that standard for that project…” (USDA Forest Service 1990a, page IV-25). Therefore, changes to the original Malheur Forest Plan were anticipated based on site-specific resource conditions.

The Forest Service has enacted new rules to guide changes to forest plans, including amendments. Although the Malheur National Forest is currently revising its forest plan using the 1982 Planning Rule, the 2012 Planning Rule (36 Code of Federal Regulations 219) requires the Forest Service to use the new planning rule for amendments of plans created under a prior rule. The regulation at 36 Code of Federal Regulations 219 is different than the regulations under which the 1990 Malheur Forest Plan was developed, and reflects the complex nature of modern forest planning and management. It is not expected that the 1990 Malheur Forest Plan be consistent with all of the components of 36 Code of Federal Regulations 219, although the requirements of the new planning rule may be met with thoughtful amendments of the older forest plan.

Based on the guidance described above, site-specific conditions in the Ragged Ruby planning area, and relevant Malheur National Forest-specific information and data, the Forest Service has determined that there is a need to amend the existing Malheur Forest Plan. Within the Ragged Ruby Project Draft Environmental Impact Statement, the following sections address proposed forest plan amendments:

- Chapter 1 – Need for Amending the Malheur Forest Plan – This section identifies the need to amend the Malheur Forest Plan, what specific amendments are proposed, and the rationale for each amendment.
- Chapter 2 – Amendments to the Malheur Forest Plan – This section identifies the amendments included in each action alternative, what specific part of the Malheur Forest Plan is proposed for amendment, and what that plan component is being replaced with (if applicable).
- Chapter 3 – The effects of forest plan amendments are discussed in:
    - Requirements of 36 Code of Federal Regulations 219.8 through 219.11 – This section provides an explanation of how the plan components meet the sustainability requirements of 219.8, the diversity requirements of 219.9, the multiple use requirements of 219.10, and the timber requirements of 219.11, as applicable.
    - Amendment Direct, Indirect, and Cumulative Effects – This section discusses the direct and indirect effects of the proposed forest plan amendments, as well as the effects of past, ongoing, and foreseeable future forest plan amendments that overlap in time and space.
- Appendix F – This appendix contains the 36 Code of Federal Regulations 219 applicability table for the project. The table shows which components of 36 Code of Federal Regulations 219.8 through 219.11 directly apply to the proposed forest plan amendments.

To address the purpose and need, the Ragged Ruby Project's action alternatives would require the following amendments to the Malheur Forest Plan, as amended.

Change Management Area 13 (Old Growth) Areas

The Malheur Forest Plan standards for old growth habitats are identified for management area 13 (Malheur Forest Plan, pages IV-105 and 106; Appendix G; and the Malheur Forest Plan Final Environmental Impact Statement), directing that old growth (management area 13) areas be distributed across the Malheur National Forest to provide for wildlife species dependent on this forest type. There are two areas related to old growth forest habitat for which Malheur Forest Plan standards were set: dedicated old growth habitats and replacement old growth habitats. The

Forest Plan states that dedicated old growth will be 300 acres and replacement old growth will be 150 acres for every 12,000 acres.

The Malheur Forest Plan describes management area 13 as being "composed of mature/overmature sawtimber (150 years old or older) which provides habitat for wildlife species dependent on mature/overmature forest conditions, provides for ecosystem diversity, and provides for the preservation of aesthetic qualities…These acres are evenly distributed across the Forest…These acres reflect both designated old growth and old growth replacement…" (USDA Forest Service 1990a, page IV-105).

A forest plan amendment is proposed to address management area 13 standards 4 through 8, to inventory and validate all old growth areas and correct previous designations. This direction provides for an iterative process where dedicated and replacement old growth can be changed over time in response to changing conditions on the ground (USDA Forest Service 1990a, pages IV-105 to IV-106). Old growth areas have been inventoried and evaluated at the project planning level for the past 28 years; this allows for site-specific analysis and response to changing conditions (for example, wildfire and stand deterioration) to designate management area 13 where it is currently existing for dedicated old growth, and where it is on the path to developing into replacement old growth (dedicated and replacement old growth may be shifted multiple times throughout the life of the 1990 Malheur Forest Plan in response to changing conditions on the ground).

Based on interdisciplinary review of the management area 13 areas in the Ragged Ruby planning area, the following changes were identified to meet Malheur Forest Plan standards:

- Dedicated old growth 3122 (pileated woodpecker) – approximately 32 acres would be added to the existing dedicated old growth area.
- Dedicated old growth 3128 (pileated woodpecker) – approximately 122 acres would be added to the existing dedicated old growth area.
- Replacement old growth 3245 (pine marten) – this replacement old growth area (approximately 170 acres) would be designated.
- Dedicated old growth 3252 (pine marten) – approximately 20 acres would be added to the existing dedicated old growth area.
- Replacement old growth 3252 (pine marten) – this replacement old growth area (approximately 94 acres) would be designated.
- Dedicated old growth 3332 (pileated woodpecker and pine marten) – approximately 82 acres would be added to the existing dedicated old growth area.
- Replacement old growth 3332 (pileated woodpecker and pine marten) – this replacement old growth area (approximately 317 acres) would be designated.

Table 2. Comparison of existing management area 13 (old growth) with proposed changes to meet Malheur Forest Plan standards

Old growth management areas[1]	Management area 13 minimum acre requirements	Existing acres in the planning area	Adjusted (proposed) acres
Dedicated old growth 3122 PW (pileated woodpecker)	300	303	335
Replacement old growth 3122 PWRF (pileated woodpecker)	150	189	189
Dedicated old growth 3128 PW (pileated woodpecker)	300	271	393

Old growth management areas[1]	Management area 13 minimum acre requirements	Existing acres in the planning area	Adjusted (proposed) acres
Replacement old growth 3128 PWRO (pileated woodpecker)	150	183	183
Dedicated old growth 3244 MM (pine marten)[2]	160	148	148[3]
Replacement old growth 3244 MMRO (pine marten)[2]	80	243	243
Dedicated old growth 3245 MM (pine marten)	300	302	302
Replacement old growth 3245 MMRO (pine marten)	150	0	170
Dedicated old growth 3252 MM (pine marten)	160	153	173
Replacement old growth 3252 MMRO (pine marten)	80	0	94
Dedicated old growth 3332 PP (pileated woodpecker and pine marten)	300	235	317
Replacement old growth 3332 PPRF (pileated woodpecker and pine marten)	150	0	317
Total		2,027	2,864

[1] Pileated woodpecker (PW), pileated woodpecker replacement area combined with a pileated woodpecker feeding area (PWRF), pileated woodpecker feeding area replacement (PWRO), American pine marten (MM), American pine marten replacement area (MMRO), combined pileated woodpecker and American pine marten (PP), and combined pileated woodpecker and American pine marten replacement area combined with a pileated woodpecker feeding area (PPRF).

[2] Management area 13 area is only partially located in the Ragged Ruby planning area.

[3] This dedicated old growth unit was burned in the 1994 Reed and 1996 Summit fires, and there is no sufficient area within the Ragged Ruby planning area boundary to re-designate the dedicated old growth unit.

See Appendix B – Maps, Map 2 for a map of the current location of dedicated old growth (management area 13) and Maps 10 and 11 for the proposed locations of dedicated and replacement old growth.

The designation or expansion of suitable management area 13 areas across the planning area would improve the agency's ability to manage for pileated woodpecker, American pine marten, and other late and old structure dependent species. It is anticipated that habitat viability for these species would be maintained or increased via the proposed management area 13 network expansion.

Remove Trees Greater Than or Equal to 21 Inches Diameter at Breast Height

Alternatives 2 and 3 would require a forest plan amendment to Eastside Screens, standard 6(d)(2)(a): "Maintain all remnant late and old seral and/or structural live trees greater than or equal to 21 inches DBH that currently exist within stands proposed for harvest activities."

This amendment is being proposed to allow removal of young (less than 150 years old), relatively large (greater than or equal to 21 inches diameter at breast height) grand fir and Douglas-fir trees in the Hot Dry and Warm Dry plant association group stands in commercial thinning units. These trees are competing with older ponderosa pine and western larch, causing competition stress and increasing the risk that the older trees may die as a result of insects, diseases, drought, and wildfire. By reducing tree densities, the older trees would have greater access to water, nutrients, and sunlight resulting in their continued existence, and allowing for increased growth, health, and vigor (McDowell et al. 2003). To compensate for this amendment, all trees greater than 150 years old would be retained.

This amendment was discussed extensively during collaboration and is based on restoration strategies by Dr. Norman Johnson and Dr. Jerry Franklin (Franklin and Johnson 2009).

- Trees in dry forests begin to exhibit some characteristics of old growth at 150 years.
- Use of diameter limits (such as 21 inches diameter at breast height) fails to protect many older trees.
- Diameter limits can deter the harvest of young, relatively large trees that crowd older trees, greatly increasing the risk that the old trees would die as a result of either wildfire or insect attack.

Harvest within and Reduce Late and Old Structure Stands[2]

Alternatives 2 and 3 would require a forest plan amendment to the Eastside Screens, standard 6(d), scenario A: "Do not allow timber sale harvest activities to occur within LOS stages that are below HRV." The Eastside Screens also states that "Some timber sale activities can occur within LOS stages that are within or above HRV in a manner to maintain or enhance LOS within the biophysical environment. It is allowable to manipulate one type of LOS to move stands into the LOS stage that is deficit if this meets historical conditions."

Grand fir and Douglas-fir trees have become a major species component within stands across the planning area. Historically, these species were not a major component within the dry forest types, but were present on the landscape. Past management practices, including fire suppression, have allowed the ingrowth of these species which has increased the risk of tree mortality to old ponderosa pine and western larch from competition-induced stress, wildfire, and insect attacks.

Within the Warm Dry and Hot Dry plant association groups (biophysical environments) in the Ragged Ruby planning area, old forest single stratum is below the historical range of variability and old forest multi-strata is above the historical range of variability. This amendment is being proposed to allow upland restoration treatments within late and old structure stands in these plant association groups to move stands from old forest multi-strata to old forest single stratum and to protect old ponderosa pine and western larch trees. This action would meet Eastside Screens, standard 6(d)(2)(b) to "Manipulate vegetative structure that does not meet late and old structural (LOS) conditions (as described in Table 1 of the Ecosystem Standard), in a manner that moves it towards these conditions as appropriate to meet HRV."

Not Maintain Connectivity between all Late and Old Structure and Old Growth Stands

Alternatives 2 and 3 would require a forest plan amendment to the Eastside Screens, standard 6(d)(3)(a), which provides direction to maintain or enhance the current level of connectivity between late and old structure and management area 13 stands by maintaining connections between them as described below:

- Late and old structure stands and management area 13 need to be connected with each other inside the watershed as well as to like stands in adjacent watersheds in a contiguous network pattern by at least two different directions).

[2] Late and old structure is a term defined in the Eastside Screens ecosystem standard as structural stages where large trees are common. The Malheur National Forest has consistently defined late and old structure in Warm Dry forest types as stands having 10 trees per acre greater than or equal to 21 inches diameter at breast height.

- Stands in which medium diameter or larger trees are common, and canopy closures are within the top one-third of site potential. Stand widths should be at least 400 feet wide at their narrowest point.
- The length of connectivity corridors between late and old structure and management area 13 stands should be as short as possible.

Wildlife corridors would be provided between all management area 13 stands, some late and old structure stands, and to adjacent watersheds; however, not all late and old structure stands would be connected.

Much of the Ragged Ruby planning area is outside the historical range of variability due to over 100 years of fire suppression and other past management actions. This has led to a shift in species composition (more late seral species) and increased stand densities, which have also created conditions promoting insect and disease outbreaks. Currently, approximately one third of the planning area south of the Middle Fork John Day River is late and old structure. While this is above the historical range of variability for late and old structure, a majority of the area is old forest multi-strata, and historically it would have been old forest single stratum.

This amendment is being proposed to allow upland restoration activities that would reduce stand density, increase tree spatial heterogeneity, protect old trees, and shift species composition to a higher proportion of early seral species (for example, western white pine, western larch, and ponderosa pine), limiting the ability to connect all late and old structure and management area 13 stands as directed in the Eastside Screens.

Proposed Action

The Forest Service is proposing a suite of activities to meet the purpose and need for action: upland restoration activities; watershed, fisheries, and wildlife restoration; prescribed burning; road activities; and recreation system changes (see chapter 2 for more detail).

Decision Framework

The Forest Supervisor of the Malheur National Forest is the responsible official who will review the project to make a decision. The decision should contain activities that best meet the purpose and need and desired future condition, and provide consistency with Malheur and Umatilla Forest Plans' standards and guidelines. The decision will include project design criteria necessary to provide resource protection. The Forest Supervisor will decide whether to:

- Select one of the action alternatives that has been considered in detail, or
- Modify the selected alternative, and
- Identify what mitigation measures would apply, or
- Select the no action alternative.

If only a portion of activities from one of the action alternatives is selected, or a combination of activities from multiple action alternatives is selected, then the Forest Supervisor will decide whether to amend the Malheur Forest Plan.

Public Involvement

The Ragged Ruby Project was first listed in the Malheur National Forest Schedule of Proposed Actions beginning in July 2016, and has been listed in subsequent quarterly schedule of proposed actions.

The notice of intent was published in the Federal Register on March 24, 2017. The notice of intent asked for public comment on the proposal from March 24 to April 24, 2017. In addition, as part of the public involvement process, the Forest issued a news release on March 24, 2017, published a legal notice in the Blue Mountain Eagle on March 29, 2017, made a presentation to Grant County Court on April 12, 2017, and held a public open house on April 12, 2017 (which 11 people attended). An amended notice of intent was published in the Federal Register on December 7, 2017. The amended notice of intent asked for public comment from December 7, 2017 to January 8, 2018, on two forest plan amendments for connectivity and harvest in late and old structure stands, including identification of the applicable substantive provisions of 36 Code of Federal Regulations 219.8 through 219.11. This opportunity for comment applied only to these two amendments. In addition, as part of the public involvement process, the Forest published a legal notice in the Blue Mountain Eagle on December 13, 2017. The Forest Service response to the comment letters received during both the scoping period and scoping period extension can be found in Appendix D – Scoping Report, and public meeting notes can be found in the project record.

Using comments from the public, other agencies, and tribes (see chapter 1, Issues section), the interdisciplinary team developed a list of issues to address.

Issues

The Forest Service separated the issues into two groups: significant and analysis issues.

Significant Issues

Significant issues were defined as those directly or indirectly caused by implementing the proposed action and that represent a point of debate or concern that cannot be resolved without consideration of the trade-offs involved. These issues spur the design of alternatives to the proposed action that provide a different path to achieve project objectives. Trade-offs can be more clearly understood by developing alternatives and displaying the relative impacts of these alternatives weighed against the proposed action. The following significant issues have been identified for the Ragged Ruby Project:

- Level and effects of upland restoration activities (see chapter 3, Forest Vegetation, Socioeconomics, and Evaluation of Forest Plan Amendments sections)
- Effects to pine marten (see chapter 3, Wildlife – Management Indicator Species section)

Analysis Issues

Analysis issues are environmental components that are considered in the chapter 3 analysis. These issues are used as a way to compare the alternatives. These issues: (1) are generally less focused on the elements of purpose and need than the significant issues; (2) reflect the discussions of the effects of the proposed activities to those resources; and (3) are important for providing the responsible official and public with complete information about the effects of the project. The following analysis issues have been identified for the Ragged Ruby Project:

- Soils (see chapter 3, Soils section)
- Watershed (see chapter 3, Watershed section)
- Plants (see chapter 3, Botanical Resources and Invasive Plants sections)
- Wildlife (see chapter 3, Wildlife – Proposed, Endangered, Threatened, and Sensitive Species; Wildlife – Management Indicator Species, Wildlife – Featured Species, Wildlife – Migratory and Resident Birds, and Evaluation of Forest Plan Amendments sections)

- Aquatic species (see chapter 3, Watershed, Aquatic Species – Primary Habitat Elements, and Aquatic Species – Threatened, Endangered, Sensitive, and Management Indicator Species sections)
- Fire and fuels (see chapter 3, Fire and Fuels section)
- Air quality (see chapter 3, Air Quality section)
- Climate change (see chapter 3, Climate Change section)
- Transportation system (see chapter 3, Transportation System section)
- Heritage resources (see chapter 3, Heritage Resources section)
- Rangeland resources (see chapter 3, Rangeland Resources section)
- Recreation resources (see chapter 3, Recreation Resources section)
- Visual resources (see chapter 3, Visual Resources section)
- Special areas (see chapter 3, Special Areas section)

Chapter 2 – Alternatives

Introduction

This chapter describes and compares the alternatives considered for the Ragged Ruby Project. It includes a description and map of each alternative considered. This section also presents the alternatives in comparative form, defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public.

Alternatives Considered in Detail

Alternative 1 – No Action

Under the no action alternative, current management plans would continue to guide management of the planning area. No upland restoration activities; watershed, fisheries, and wildlife habitat restoration; prescribed burning and unplanned ignitions; road activities; recreation system changes; or forest plan amendments would be implemented to accomplish project goals.

Alternative 2 – Proposed Action

Modifications to the Proposed Action

The modifications to the proposed action that was scoped to the public are:

- Dropped approximately 30 acres of dry pine restoration.
- Dropped approximately 50 acres of mixed conifer restoration.
- Added approximately 110 acres of whitebark pine restoration.
- Added helicopter units and landings.
- Ecological riparian and large wood treatments were dropped from the Ragged Ruby Project proposals because they are already authorized under the Aquatic Restoration Decision. See chapter 2, Alternatives and Elements Considered but Eliminated from Detailed Study section for more information about this change.
- Road *operational* maintenance levels were used during scoping to display the existing road system on project maps. *Operational* maintenance level is supposed to reflect the condition of the road on the ground, but this information is not always accurate (as it is updated infrequently). Following scoping, road *objective* maintenance levels in the Forest's corporate roads database were updated with past National Environmental Policy Act decisions. Road *objective* maintenance levels are now being used as the baseline for the existing road system on project maps, as this more accurately shows the existing road system. This change led to some of the following road changes.
- Added approximately 2.4 miles of temporary road construction.
- Added approximately 0.1 miles of road opening.
- Added approximately 0.9 miles of road closures.
- Dropped the road relocation because these activities are already authorized under the Aquatic Restoration Decision.
- Dropped the proposed addition of 2.5 miles of existing roadbed onto the road system as maintenance level 1 road.
- Reduced the decommissioning of maintenance level 2 (open) roads by 1.6 miles.
- Added 1.4 miles of decommissioning of maintenance level 1 (closed) roads.

- Clarified that approximately 1.2 mile of maintenance level 1 (closed) roads would be converted to trails.
- Added 1.7 miles to the modification of seasonal wildlife road closures due to a mapping error during scoping.
- Dropped 1.4 miles of confirmation of past administratively closed roads due to information being updated in the Forest's corporate roads database with past National Environmental Policy Act decisions.
- Dropped proposal for the new segment of the Tempest Mine trail on National Forest System Road 4559283 and construction of a Tempest Mine West trailhead at the junction of National Forest System roads 4559283 and 4559284. As a result of this change, also renamed and combined the Granite Boulder trail and trailhead scoping proposal with the remainder of the Tempest Mine trail scoping proposal to minimize confusion in the trail system. As a result, also changed the proposal for National Forest System Road 4559283 (0.7 miles) from road decommissioning to road closure.
- Added the installation of 1 interpretive sign.

Upland Restoration Activities

Individual upland restoration units are described in Appendix A – Activity Tables and displayed in Appendix B – Maps, Map 3.

Dry Pine Restoration

Trees would be either be removed, masticated, or felled and burned from stands that have high tree densities and/or high proportions of late seral species. In stands where these trees are young and relatively large (approximately 9 to 28 inches diameter at breast height) they would either be removed through commercial thinning or through tree tipping for large wood placement in riparian restoration projects. Commercial thinning incorporates single trees, clumps, and openings based on historical tree spatial patterns with a target of 40 to 60 basal area left based on elevational gradients, aspect, and soil composition. In stands where most of these trees are relatively small (approximately 1 to 9 inches diameter at breast height) and where an abundance of regeneration provides ladder fuels, the trees would either be masticated, non-commercially thinned, or removed for biomass[3] material. Fuels treatments may include piling of activity and natural fuels, burning of piled material, and underburning. Mechanical treatments would be followed by prescribed burning to reduce surface and ladder fuels and to help restore fire back to the landscape.

Non-commercial thinning would be limited to 9 inches diameter at breast height in inventoried roadless areas and riparian habitat conservation areas, and 11 inches diameter at breast height in all other areas. Portions of any commercial thinning units overlapping riparian habitat

[3] Biomass can be defined as pieces that are not large enough to have commercial sawlog value. Biomass removal from any specific unit would follow the guidelines of the designated prescription. This material may be used for pulp chips, co-generation of electricity, commercial fuel pellets, post and poles, and other non-traditional uses. This material may be removed during logging operations, by hand, or with small equipment such as all-terrain/utility-terrain vehicles, or small excavators or forwarders. For the most part, existing woody material on the ground is not suitable for biomass utilization and would be left on site for nutrient input to the soil, or would be piled and burned if in excessive amounts. Efforts would be made to stimulate local markets by utilizing woody biomass generated by this project rather than disposing of it by burning. Utilization is limited by the marginal economics of the products to areas accessible by ground-based skidding.

conservation areas on project maps would be identified as skips, gaps, or non-commercial thinning as specified above.

Areas treated: Approximately 1,040 acres of commercial thinning[4], 2,210 acres of commercial and non-commercial thinning, and 640 acres of non-commercial thinning.

Mixed Conifer Restoration

Trees would either be removed, masticated, or felled and burned from stands that have high tree densities and/or high proportions of late seral species. In stands where these trees are young and relatively large (approximately 9 to 28 inches diameter at breast height) they would either be removed through commercial thinning or through tree tipping for large wood placement in riparian restoration projects. In stands where most of these trees are relatively small (approximately 1 to 9 inches diameter at breast height), and where an abundance of regeneration provides ladder fuels, the trees would either be masticated, non-commercially thinned, or removed for biomass material. Commercial and non-commercial thinning would be based on leave tree requirements. Fuels treatments may include piling of activity and natural fuels, burning of piled material, and underburning. Mechanical treatments would be followed by prescribed fire to reduce surface and ladder fuels and help restore fire back to the landscape.

Non-commercial thinning would be limited to 9 inches diameter at breast height in inventoried roadless areas and riparian habitat conservation areas, and 11 inches diameter at breast height in all other areas. Portions of any commercial thinning units overlapping riparian habitat conservation areas on project maps would be identified as skips, gaps, or non-commercial thinning as specified above.

Areas treated: Approximately 2,800 acres of commercial and non-commercial thinning and 640 acres of non-commercial thinning.

Dry Meadow and Scabland Flat Bunchgrass Restoration

There would be mostly hand felling with some mastication and potential for commercial harvest where road access exists and soil conditions allow. Juniper and ponderosa pine that exhibit old tree characteristics would be retained. Some trees would be felled and left on site for erosion control and to protect native shrubs and other species. Native species would be seeded (for example, with native bunchgrasses) and non-native invasive species would be treated in strategic areas in order to recolonize these areas with native species. No active ignitions would occur in these areas; however, fire would be allowed to move into these areas knowing that the sparseness of fuels and poor continuity of surface fuels would limit fire spread.

These scablands range from low to high elevations in the planning area; treatments would be adjusted to the site. A combination of active and passive restoration would be used.

A botanist would visit the proposed sites before activities begin to inspect the condition of ground dwelling cryptogams[5]. Ground disturbance to areas of well-developed biotic soil crusts

[4] Commercial and non-commercial thinning treatments are being proposed in this project to meet the restorative objectives of the upland restoration treatments. These treatments are intended to reflect the multiple-use objectives of the Forest, by providing both restorative benefits to the watershed as well as economic benefits to local communities.
[5] Cryptograms (biotic soil crusts) are communities of living organisms on the soil surface in arid and semi-arid ecosystems. They perform important ecological roles including carbon and nitrogen fixation and soil stabilization, and they affect germination and nutrient levels in vascular plants.

(specifically, cyanobacteria, lichens, and mosses) would be minimized during hand felling activities to maintain the integrity of the crust layer.

Non-commercial thinning would be limited to 9 inches diameter at breast height in inventoried roadless areas and riparian habitat conservation areas, and 11 inches diameter at breast height in all other areas. Portions of any commercial thinning units overlapping riparian habitat conservation areas on project maps would be identified as skips, gaps, or non-commercial thinning as specified above.

Areas treated: Approximately 80 acres of non-commercial thinning (with commercial removal where road access and soil conditions allow) and 920 acres of non-commercial thinning.

Whitebark Pine and Western White Pine Restoration

Trees would be broadcast thinned throughout designated whitebark pine and western white pine stands to promote the health and vigor of these trees. Treatments would be non-commercial. Fuels treatments would include prescribed fire, underburning, jackpot burning, and/or natural ignition.

Thinning would generally be limited to 9 inches diameter at breast height in inventoried roadless areas, except young trees may be cut up to 21 inches diameter at breast height when they are directly adjacent to and competing with whitebark pine and western white pine. Thinning would also be limited to 9 inches diameter at breast height within riparian habitat conservation areas, and 11 inches diameter at breast height in all other areas.

Areas treated: Approximately 410 acres of whitebark pine restoration and 460 acres of western white pine restoration.

Other Upland Restoration Information

Unique Habitat Protection: Certain unique habitats or microsites would be left untreated where they occur in all upland restoration types described above. Larger areas of unique habitat have also been identified for protection through project planning. These include areas of old growth grand fir, seepy areas with lots of hardwoods, and unique wildlife habitat. This design element follows the Malheur Forest Plan standard to "Maintain the integrity of unique habitats including meadows, rimrock, talus slopes, cliffs, animal dens, wallows, bogs, and seeps and springs by incorporating cover buffers of approximately 100 feet in width. Utilize additional mitigation/enhancement measures identified through project level analysis" (USDA Forest Service 1990a, Forest-wide standard 56, page IV-31).

Harvest Systems: Where trees targeted for removal have commercial value, various types of equipment would be used based on terrain and access constraints. Cut trees would be transported to landing zones via tractor, skyline, or helicopter systems depending on topography and road access. Skyline yarding would be used on steep terrain. Tractor yarding would be used on flat, gentle, stable slopes. A combination of skyline and tractor yarding would be used where slopes vary.

Skid trails, skyline corridors, and landing locations would be determined before logging and are subject to approval by the sale administrator. Nine helicopter landing zones are identified in Appendix B – Maps, Map 3. In landing zones, the vegetation would be cleared for equipment to prepare, deck, and load trees for hauling. No new landing zones would be located within riparian habitat conservation areas. The areas proposed for commercial harvest (approximately 6,130 acres) would be harvested via tractor, skyline, and/or helicopter systems as follows:

- Tractor – 91 units, 4,160 acres
- Skyline – 41 units, 1,170 acres
- Combination of tractor and skyline – 13 units, 450 acres
- Helicopter – 5 units, 320 acres
- Combination of helicopter and tractor – 1 unit, 30 acres

Units that are commercially treated would have the option to be either whole tree yarded, cut to length, grapple piled, and/or hand piled, and pile burned (see Appendix A – Activity Tables for unit-specific information). In order to move toward performance-based contracting, the contractor, with Forest Service oversight, would be allowed to determine the most appropriate logging method and activity fuels treatment to meet contract specifications (for example, design criteria such as soil compaction or tons per acre of fuel left).

Watershed, Fisheries, and Wildlife Habitat Restoration

Aspen Restoration

Many of the aspen stands within the Ragged Ruby planning area have been treated through past projects. Many of those stands would need fence repair and expansion. However, for the remaining aspen stands, conifer trees that have grown into the stands may be tipped, felled, or girdled within 150 feet from the existing stand's perimeter to reduce competition for light and water and allow for stand expansion where appropriate. Western larch would generally be retained because of the lower amount of shade produced by these trees. Ponderosa pine with high ground-to-crown height may also be retained because the shade produced by these conifers does not typically fall within the aspen stand. Conifers felled or tipped within these stands may be used for stream/floodplain restoration purposes. Treatment would not remove old trees as defined in the silvicultural prescription.

Fencing, jackstrawing, or hinging of conifers may be used to reduce grazing pressures from livestock and wildlife. Fuels treatments may include piling of activity and natural fuels, burning of piled material, and underburning.

Areas treated: Approximately 10 acres (18 aspen stands).

Individual aspen restoration units are described in Appendix A – Activity Tables and displayed in Appendix B – Maps, Map 5.

Bat Gate Installation

Installation of bat gates would be at two mine adits using an existing road or pack stock (see Appendix B – Maps, Map 5). Bat gates are "bat friendly" metal structures often installed over the entrances of caves, mine shafts, and adits where bats are known to roost. Bat gates are designed and constructed so that even large bat species can pass through the gate and can continue using the cave or mine.

Other Aquatic Restoration Treatment Information

Aquatic restoration activities would occur throughout the planning area. Some aquatic restoration activities are associated with road and trail actions proposed elsewhere in this document. Please see the existing trail and trailhead change activities (described in Recreation

System Changes section below). Restoration activities may include fish passage restoration, large wood and boulder placement, legacy structure removal, channel reconstruction or relocation, off- and side channel habitat restoration, setback or removal of existing berms, road and trail erosion control, riparian vegetation planting, and beaver habitat restoration. For more information of these activities, please see the Relationship to the Aquatic Restoration Decision section below.

Prescribed Burning and Unplanned Ignitions

Both mechanically treated and untreated stands would be exposed to prescribed burning as fire is re-introduced into the planning area. Treated stands would see a combination of burning piled material and underburning. Those stands not being mechanically treated would be managed primarily with the use of prescribed burning. Prescribed burning would also be used to stimulate the growth of aspen and other fire-adapted vegetation.

As conditions and stand characteristics allow, unplanned ignitions within the planning area would be used to meet the objectives of prescribed burning. Unplanned ignitions are unexpected fires started by either natural (for example, lightning), or human causes (for example, unattended campfire or deliberate incendiary device). Human caused accidental or arson fire are not managed on the landscape and require suppression tactics as long as firefighter and public safety can be maintained. Natural fires would be used if certain prescription parameters are being met. It is also important to recognize values at risk for an area where the fire may start, and the risk it may impose on a firefighter. Unplanned ignitions should have prescription parameters that can be obtained to meet other resource objectives designed in the draft environmental impact statement. This could be accomplished with certain information on current weather, fuel characteristics, long-term weather forecasts, time of year (season), and availability of resources to manage a fire.

Prescribed fire would occur on approximately 34,000 acres. Burn blocks vary in size from 2,700 to 5,500 acres with boundaries identified along manmade and natural fuel breaks, such as existing roads and ridgetops (see Appendix A – Activity Tables and Appendix B – Maps, Map 6). The size, in acres, of a particular burn block does not represent how much of the landscape would be burned or blackened. Within each identified burn block there would be a number of unburned acres. Examples include open scabby areas, wet riparian areas, and north-facing slopes in general. Additionally, much of the area where prescribed fire would carry is expected to burn in a mosaic pattern for a number of reasons. Fuel moisture, shading, grazing, and lack of continuous fuelbeds can lead to the mosaic burn pattern often created during prescribed fire operations. Another factor limiting actual burned acres is project design criteria limiting where active ignitions can occur within a particular burn block. Depending on weather conditions, fuel characteristics, and design criteria, the number of acres burned could vary from 50 to 80 percent of the proposed burn block size.

Road Activities

Road Use, Road Maintenance, and Temporary Road Construction

The following road activities would occur in support of implementing upland restoration and other project activities.

Road maintenance and reconstruction (approximately 163 miles) for haul would occur on open and closed roads to provide safe access and adequate drainage. Some county roads would also need to be used for haul. Haul routes are identified by road segment in Appendix A –

Activity Tables and displayed in Appendix B – Maps, Map 3. Below is a list describing the level of maintenance and reconstruction work that would occur:

- **Low**: Work may consist of but is not limited to: brushing roadside vegetation, felling danger trees, blading roadbeds, cleaning ditches and culvert inlets and outlets, removing slough and slide materials, and placing aggregate and/or asphalt surfacing. In addition, culverts in dry, intermittent channels and ditch relief pipes would be replaced as needed. These standard maintenance activities would occur on all roads where commercial activity occurs or on a rotating basis determined by use and need.
- **Moderate**: Includes the work mentioned above with the addition of replacing culverts in non-fish bearing perennial and intermittent streams. The need to place a high number of culverts in close proximity to fish bearing streams could result in placing a road segment in this classification. This also includes building rip rap embankments and retaining walls less than 5 feet tall, fill repairs, and heavy re-grading of roads to accommodate drainage, with ditch lines being filled to provide adequate roadway widths.
- **High**: Includes the work mentioned above with the addition of replacing culverts, other instream work in fish bearing perennial streams, repairing major road failures in riparian areas, and road realignments.

Closed roads to be utilized for haul: These roads would be utilized for log haul. The closure would remain consistent with the intent of the original closure. Basic custodial maintenance would be performed to allow for future access and to prevent damage by maintaining adequate drainage. Roads would be re-closed by the following levels as described below:

- **Low level closure**: Close with a physical barrier and water bar as needed. Water bars would not be drivable.
- **Moderate level closure**: Close with a physical barrier and water bar as needed. Water bars would not be drivable. Include following work items listed below as needed.
    - Remove culverts from stream channels with fills of shallow to moderate depth.
    - Reduce fill depth for culverts in deep fill locations.
    - Pull back side-cast material.

Proposed haul roads are subject to change through implementation. Any roads that are added to haul during implementation would only have work done as listed in the road maintenance or reconstruction description. Any work needed that is not listed in the description would be consulted on with Forest Service resource specialists. Roads not listed that are used would follow all project design criteria outlined in the decision document.

- **High level closure**: Close with a physical barrier and water bar as needed. Water bars would not be drivable. Include work items described at the moderate level and items listed below as needed.
    - Remove culverts from stream channels in deep fills.

Temporary road construction (approximately 12.3 miles) would be necessary to access some timber harvest units. Temporary roads would be rehabilitated after use. Rehabilitation would eliminate future use of the road with the objective of restoring hydrological function. Temporary roads would be restored by some combination of the following to ensure that the road has adequate drainage and ground cover to prevent erosion, soil productivity is restored, the road is no longer drivable, and the road is not highly visible after approximately 5 years:

- Waterbarring as needed to restore natural drainage patterns.

- Re-contouring slopes (removing cut and fill slopes) and pulling berms from the edge of the road back onto the road.
- Subsoiling (loosening) compact soils in a "J" pattern to a depth of approximately 16 inches (unless prevented by bedrock or rock content of soils).
- Planting or seeding disturbed areas with native species that naturally occur in the planning area to achieve a minimum of 35 percent ground cover.
- Placing slash, boulders, and logs on the roadbed (where available).
- Disguising the visible entrance with pieces of cull logs, tops of cut trees, and/or rocks, etc. to prevent vehicle use.

There would be no temporary road construction outside the planning area. Temporary roads are identified by segment in Appendix A – Activity Tables and displayed in Appendix B – Maps, Map 3.

Use of private roads to access upland restoration treatment units: There are several roads where easements exist or may be needed through private land to implement this project. The project's transportation planner has put in a request through the zone realty specialist to obtain permanent and/or temporary right-of-way access through private property. The realty specialist has contacted the landowner and opened up the conversation about access.

Rock pit use: Approximately 15 existing rock sources in and near the planning area would potentially be utilized. Materials suitable for road surfacing, riprap, and other road improvements would be excavated from these pits which may necessitate their expansion and improvement. Non-native invasive plant species that occur in the rock pits proposed for use would be treated prior to use, or flagged off for avoidance so as not to spread invasive species. See Appendix B – Maps, Map 8.

Disposal sites: Approximately 8 disposal sites would be used for excess fill material from road work that might contain non-native invasive plant species, and would be disposed of in an approved location by a botanist. See Appendix B – Maps, Map 8.

Water sources: Approximately 17 sites would be used as water sources for road maintenance. See Ragged Ruby Roads Report for more detailed information.

Road System Changes

The following road system changes would occur to update the road system in the Ragged Ruby planning area (see Appendix A – Activity Tables and Appendix B – Maps, Map 8).

Change the designation of roads from maintenance level[6] 1[7] to 2[8] (approximately 2.9 miles): Roads are proposed for a maintenance level change from 1 to 2 (road opening) where there is an

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[6] Maintenance level is a term used by the Forest Service to differentiate the level of service and maintenance needed for NFS roads. Through road management objectives, each road is assigned to one of five different operational (and objective) maintenance levels. The operational maintenance level determines what type and frequency of maintenance work is planned to maintain the road to the desired standard and preserve the investments in the road. It does not necessarily reflect the drivability of a road on the ground. Some maintenance level 1 (closed) roads are effectively open and drivable on the ground and some maintenance level 2 (open) roads have not been used by the public or for management in many years and have effectively grown in with trees and other vegetation blocking the roadway.

[7] Maintenance level 1 is assigned to intermittent service roads during the time they are closed to vehicular traffic. Basic custodial maintenance is performed to keep damage to adjacent resources to an acceptable level and to perpetuate the road to facilitate future management activities.

[8] Maintenance level 2 is assigned to roads open for use by high-clearance vehicles. Passenger car traffic is not a consideration. Traffic is normally minor, consisting of administrative, permitted, dispersed recreation, or other specialized uses.

opportunity to provide recreational access in areas where roads are already open on the ground and are not causing resource damage.

Change the designation of roads from maintenance level 2 to 1 (approximately 7.3 miles): Roads are proposed for a maintenance level change from 2 to 1 (road closure) when the road: (1) is causing resource damage and might be needed for short-term management access, (2) is effectively closed on the ground (for example, grown in by trees) and might be used for haul under this project, or (3) would reduce the road density for wildlife habitat, public safety, water quality, or range management. Road use would be limited to infrequent management and other permitted activities. Closure may be by a physical barrier or gate, and by regulation. Basic custodial maintenance would be performed for future management.

Decommission maintenance level 2 (open) road (approximately 0.3 miles): One currently maintenance level 2 (open) road would be decommissioned by this project because it is causing resource damage and is not needed for management access. Decommissioned roads are roads permanently removed from the Forest transportation system by official actions and no longer displayed on the transportation map. The goal is to establish a condition that would not require custodial maintenance in the future, through stabilization and restoration to a more natural state. Road decommissioning treatments would be designed to improve hydrologic and ecologic function. Decommissioning does not necessarily mean returning a road to its original ground contours. Some roads are naturally re-vegetating and would need no treatment.

Actively decommissioned roads would typically be decommissioned by some combination of the following: recontouring slopes (removing cut and fill slopes); subsoiling (loosening) compacted soils in a “J” pattern to a depth of 16 inches (unless prevented by bedrock or rock content of soils); pulling berm; pulling slash (where available); planting or seeding disturbed areas with native species that naturally occur in the planning area to achieve a minimum of 35 percent ground cover; restoring natural drainage patterns and waterbarring as needed; and/or disguising the first hundred yards of travel way with large pieces of organic material such as cull logs and tops of trees. Methods will be determined in consultation with a hydrologist, fisheries biologist, or soil scientist.

Decommission maintenance level 1 (closed) roads (approximately 1.4 miles). National Forest System roads 2050791, 2610502, 2610793, and 2610827 show no sign of a designed road and are located in the Dixie Butte Inventoried Roadless Area; these roads are not needed for future timber harvest because they are located within inventoried roadless areas. Approximately 0.2 miles of National Forest System Road 2010219 would be decommissioned that is causing local passage problems, erosion, and deep, muddy conditions; it also diverts overland flow to National Forest System Road 2010, causing similar problems on that road.

Convert maintenance level 1 (closed) roads to trails (approximately 1.2 miles). Approximately 1.0 miles of National Forest System Road 4555 would be converted from a road to the Sunrise Butte trail in the Greenhorn Mountain Inventoried Roadless Area; approximately 0.2 miles of National Forest System Road 2010219 would be converted from a road to the Blackeye trail.

Modification of seasonal wildlife road closures (approximately 9.9 miles): Modify the closure timing of an existing seasonal wildlife closure to start 3 days following archery season (late September) until May 1 (weather permitting) so that the proposed date does not fall during an open deer or elk season. For example, in 2017, the opening day of rifle buck season is September 30. Currently, the gate would be closed and locked on the second day of season (October 1), potentially creating conflicts and safety concerns with hunters and dispersed campers. A new gate would be installed on National Forest System Road 3670197 before the junction with National Forest System Road 3670368.

Confirmation of past administratively closed roads: Within the Ragged Ruby planning area, there are road segments identified in the road system database as closed by previous administrative actions. These road segments, identified as maintenance level 1, are included in this project so they can be documented as closed through this National Environmental Policy Act process. The existing conditions of these road segments range from overgrown with natural vegetation, physically blocked with a gate or earthen berm, or the road prism is no longer visible. Approximately 7 percent of the road mileage is closed on the ground with no physical closure barrier present. These roads were previously closed for wildlife habitat security, reduction in road density for wildlife habitat, hydrological impacts, water quality impacts, or to otherwise reduce resource damage. The Ragged Ruby interdisciplinary team analyzed each road segment to determine its current use and future access need for the public and administration. Through this analysis, approximately 25.3 miles of road are proposed for official closure and long-term storage for future use and are listed in Appendix A – Activity Tables.

Recreation System Changes

Changes to Existing Trails and Trailheads

Recreation system changes by trail and trailhead are described in Appendix A – Activity Tables and displayed in Appendix B – Maps, Map 9.

Blackeye Trail #243 and Trailhead

Convert part of National Forest System Road 2010219 to a trail, construct a new segment of trail, and relocate the trailhead to a new location. Specific actions include:

- Un-designate[9] the existing Blackeye East trailhead and remove existing sign.
- Extend the east end of Blackeye Trail for 0.2 miles along National Forest System Road 2010219 (proposed for decommissioning in the Road Activities, Road System Changes section); this section of National Forest System Road 2010219 would be converted to a trail.
- Continue the Blackeye Trail extension with new construction of 0.5 miles of new horse-riding/foot/bicycle trail to connect to National Forest System Road 2010 (at an existing turnaround).
- There could be a realignment of up to 20 feet from the center point of the current trail to improve trail location and design, and any sections of the current trail location not being used would be rehabilitated.
- This existing turnaround is currently being used as a dispersed campsite and turnaround area. This site would be designated as the new Blackeye East trailhead. The site would be expanded to approximately 1 acre to accommodate 3 to 4 vehicles with horse trailers,

[9] Un-designating a trail involves changing the trail from open to closed in the Forest Service's corporate database, the Natural Resource Manager. This will allow for the removal of the trail from the geographic information system data. Work on the ground could include, but is not limited to: disguising the entrance to the former route with logs and boulders, rehabilitating areas that are adversely affecting hydrological function, scarification of the trail tread to promote vegetation growth, reseeding (if needed), and removing all signs for the trail (including trailhead and directional signs). Monitoring of the rehabilitated area will occur for up to 5 years to ensure vegetation growth and re-evaluation of treatments (if needed).

requiring site leveling and gravel placement. A trailhead kiosk would be installed. This site would continue to be available as a dispersed campsite.

- Un-designate the existing Blackeye West trailhead, which is located behind an earthen berm and gate on National Forest System Road 4559; the proposed Tempest Mine trailhead would provide access to the western end of the Blackeye Trail (and a Blackeye West trailhead would no longer be needed).

The proposed new Blackeye East trailhead and 0.5 miles of new trail construction are located outside of, but adjacent to the Ragged Ruby planning area, in the Vinegar Creek-Middle Fork John Day River subwatershed (see Appendix B – Maps, Maps 9 and 13). This proposal is being included in the Ragged Ruby Project because the Blackeye Trail crosses subwatershed (and planning area) boundaries, and the proposal is a connected action to other trail system improvements proposed on the Tempest Mine and Princess trails.

Tempest Mine Trail #256 and Trailhead

This trail would be designated as a foot/bicycle trail and improved as a family friendly and Americans with Disabilities Act accessible trail to the Blackeye Trail junction, where the remaining trail would be designated for foot/bicycle/horse-riding use. Specific actions include:

- Move the existing earthen berm approximately 20 feet north on National Forest System Road 4559[10] to allow two vehicles (without horse trailers) to park, and designate as the Tempest Mine trailhead. Extra parking would be available southeast on National Forest System Road 4559283, just past the culvert on the southwest side of the road. Horse trailer parking would not be available at this trailhead; however, horse-riding access to this area would be provided from the proposed Blackeye trailhead.
- Co-designate the new portion of the Tempest Mine trail on 2.1 miles of National Forest System Road 4559 up to where it joins the existing Tempest Mine Trail. This section of the trail would be designated as a family friendly trail, and would be developed to Americans with Disabilities Act accessibility standards.
    - Construct a turnout on the Tempest Mine Trail just north of the Lemon Creek crossing with benches and interpretive signs that describe pine marten habitat, stream ecology, historical information, or other natural resource topics.
    - A hardened crossing or bridge would be constructed to cross Granite Boulder Creek.
- Un-designate the upper 0.5 miles of the Tempest Mine Trail that hooks back to the east.
- Extend the upper end of Tempest Mine Trail with 1.1 miles of new trail construction. This would connect to the Princess Trail (just south of where the Princess Trail enters private property).
- Co-designate Tempest Mine Trail for bicycle use to provide western access to the Princess Trail.

There could be a realignment of up to 20 feet from the center point of the current trail to improve trail location and design, and any sections of the current trail location not being used would be rehabilitated.

[10] This road would remain maintenance level 1 (closed) because the road accesses a Superfund site (an abandoned mine that has been evaluated under the Comprehensive Environmental Response, Compensation, and Liability Act) that would need the road access to rehabilitate if funding becomes available in the future.

Princess Trail #251

The Princess Trail would be re-routed to connect to the Tempest Mine Trail, Sunrise Butte Trail, and a trail system on the Umatilla National Forest in the North Fork John Day Wilderness (South Fork Desolation Trail #3001, Blue Mountain Trail #6141, and Lost Creek Trail #3002). Specific actions include:

- Un-designate the eastern 2.1 miles of the Princess Trail connecting to National Forest System Road 2010148.[11] Access to the eastern end of the Princess Trail would be from the Tempest Mine, Blackeye, and Sunrise Butte trails.
- Re-designate the middle 0.6 miles of the Princess Trail as the Dupratt Trail.
- There could be a realignment of up to 20 feet from the center point of the current trail to improve trail location and design, and any sections of the current trail location not being used would be rehabilitated.
- Un-designate the existing Princess East trailhead.
- Extend the eastern end of Princess Trail 0.7 miles from the junction with the Tempest Mine extension and Dupratt trails to the North Fork John Day Wilderness trail system. The new trail segment would connect to the existing wilderness trail system at the junction of South Fork Desolation Trail #3001, Blue Mountain Trail #6141, and Lost Creek Trail #3002.
    - Signs would be placed along this segment of new trail to discourage bicyclists from going into the North Fork John Day Wilderness.[12] If bicycle use is observed in the North Fork John Day Wilderness, bicycle use would be prohibited on the Tempest Mine, Blackeye, Sunrise Butte, and Princess trails.

The proposed construction of 0.7 miles of new trail is located outside of, but adjacent to the Ragged Ruby planning area, in the Headwaters Desolation Creek subwatershed (see Appendix B – Maps, Maps 9 and 13). This proposal is being included in the Ragged Ruby Project because the Princess Trail crosses subwatershed (and planning area) boundaries, and the proposal is a connected action to other trail system improvements proposed on the Princess Trail.

Sunrise Butte Trail #255 and Trailhead

This proposal would update the trail system on Forest Service maps and provide appropriate trailhead signage. Specific actions include:

- Designate Shoberg landing as the Sunrise Butte trailhead, where a large parking area already exists, and install a trailhead kiosk.
- Change 0.93 miles of National Forest System Road 4555 from ML1 (closed) to ML2 (open) to access Shoberg landing (see Road Activities, Road System Changes section).
- Extend the Sunrise Butte trail 1.3 miles by co-designating the trail on National Forest System Road 4555 from Shoberg landing to the southern end of the current Sunrise Butte trail.
- There could be a realignment of up to 20 feet from the center point of the current trail to improve trail location and design, and any sections of the current trail location not being used would be rehabilitated.

The proposed conversion of 0.9 miles of road to trail is located outside of, but adjacent to the Ragged Ruby planning area, in the Big Boulder Creek subwatershed (see Appendix B – Maps,

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[11] This road would remain maintenance level 1 (closed) because it provides access to private property.

[12] Mechanized use (for example, bicycles, off-highway vehicles) is prohibited in wilderness areas under the 1964 Wilderness Act.

Maps 9 and 13). This proposal is being included in the Ragged Ruby Project because the Sunrise Butte Trail crosses subwatershed (and planning area) boundaries, and the proposal is a connected action to other trail system improvements proposed on the Sunrise Butte Trail.

Davis Creek Trail #244 and Trailhead

This proposal includes the following specific actions:

- Undesignate existing Davis Creek west trailhead along National Forest System Road 2050. Designate new Davis Creek west trailhead off of National Forest System Road 2050302. An approximately 1 to 2-acre parking area would be developed to accommodate off-highway vehicles and horse trailers; a toilet may be installed if public use increases at this site. Dispersed camping would continue to be available at the site. A new section of trail would be built to connect to where the Davis Creek Trail is co-designated on National Forest System Road 2050302.
- Co-designate 0.6 miles of National Forest System Road 2050302 as the Davis Creek Trail. Construct 0.1 miles of new trail to connect National Forest System roads 2050302 and 2050282. Co-designate 0.1 miles of National Forest System Road 2050282 as trail. Construct 0.1 miles of new trail to connect National Forest System roads 2050282 and 2050201. Co-designate 0.4 miles of National Forest System Road 2050201 as trail. Construct 0.3 miles of new trail to connect National Forest System roads 2050201 and 2050301. Co-designate 0.7 miles of National Forest System Road 2050301 as trail. Construct berms (or other barriers) and install trail markers to clearly identify trail route. Slash would be placed near switchbacks to minimize erosion and discourage user-created shortcuts.
- Co-designate 1.3 miles of National Forest System Road 2050035, 1.6 miles of National Forest System Road 2050032, and 0.1 miles of National Forest System Road 2050666 as the Davis Creek Trail.
- For the approximately 6 miles of the Davis Creek Trail between National Forest System roads 2050666 and 2614229, actions to minimize aquatic impacts may include: hardening stream crossings, minor trail realignment, constructing bridges, erosion control (for example, large wood placement), re-contouring, trail drainage, and water barring. Trail markers would be added to help identify trail location and entrances to undesignated routes would be camouflaged to reduce confusion on the trail's route. Sustainable trail design techniques would be utilized.
- Undesignate 2.5 miles of the current Davis Creek Trail between National Forest System roads 2050072 and 2050666 to allow aquatic restoration of Butte Creek.
- This trail would not be designated for horse-riding use; however, use by horse-riders would not be prohibited.

The Davis Creek Trail proposals would be designed to accommodate off-highway vehicles and utility terrain vehicles less than or equal to 50 inches wide. Access points will be constructed or improved in a way that restricts motorized access to less than or equal to 50 inches wide.

The proposed trail work on approximately 5.8 miles of trail is located outside of, but adjacent to the Ragged Ruby planning area, in the Little Boulder Creek-Middle Fork John Day River and Vinegar Creek-Middle Fork John Day River subwatersheds (see Appendix B – Maps, Maps 9 and 13). This proposal is being included in the Ragged Ruby Project because the Davis Creek Trail crosses subwatershed (and planning area) boundaries, and the proposal is a connected action to other trail system improvements proposed on the Davis Creek Trail.

Interpretive Sign Installation

An interpretive sign may be placed along National Forest System Road 2050 to highlight natural resources management occurring in the planning area.

Wildlife Connectivity Corridors

Approximately 2,200 acres of wildlife connectivity corridors would be designated to connect management area 13 and late and old structure stands both within and adjacent to the Ragged Ruby planning area.

Required Project Timing

The relocation of National Forest System roads 2050 and 2050072 (authorized under the Aquatic Restoration Decision) shall occur prior to haul on those roads to minimize effects to aquatic resources.

Forest Plan Amendments

Change Management Area 13 (Old Growth) Areas

Alternative 2 would increase management area 13 boundaries by approximately 837 acres to bring the total acres up to Malheur Forest Plan standards. See Appendix B – Maps, Map 10 for the proposed dedicated and replacement old growth locations and Table 2.

It is important to note that management areas (including management area 13) overlap, and when a specific segment of land falls under the goals of several management areas, the acres are assigned to the higher priority management area (the more restrictive standards and guidelines) (USDA Forest Service 1990a, page IV-46). In other words, the changes to management area 13 either overlay other management areas when the management area 13 designation is expanded, and "uncover" other management areas when the management area 13 designation is removed.

Remove Trees Greater Than or Equal to 21 Inches Diameter at Breast Height

Alternative 2 would amend the Eastside Screens, standard 6(d)(2)(a) to allow removal of young (less than 150 years old), relatively large (greater than or equal to 21 inches diameter at breast height) grand fir and Douglas-fir trees in the Warm Dry and Hot Dry plant association group stands in the commercial thinning units (approximately 3,400 acres). The Warm Dry and Hot Dry plant association groups are the only biophysical environments (plant association groups) that have a late and old structural stage within Eastside Screens, standard 6(d), scenario A. Trees greater than 150 years old would be determined by applying the guidelines presented in Identifying Old Trees and Forest (Van Pelt 2008) for Douglas-fir and Johnston et al. (2018) for grand fir. This amendment would apply only for the duration of, and for those actions proposed in, the site-specific Ragged Ruby Project.

Harvest within Late and Old Structure Stands

Alternative 2 would amend the Eastside Screens, standard 6(d), scenario A to allow approximately 50 acres of commercial thinning within old forest multi-strata stands in the Hot Dry plant association group (which is currently above the historical range of variability), to move these stands to old forest single stratum. It would also amend the Eastside Screens to allow approximately 1,160 acres of upland restoration treatments (approximately 1,010 acres of commercial thinning and 150 acres of non-commercial thinning) within late and old structure stands in the Warm Dry plant association group. Almost all of the approximately 1,160 acres proposed for upland restoration treatments in the Warm Dry plant association group are within the old forest multi-strata structure class (which is above the historical range of variability) (only 5 acres are within the old forest single stratum structure class). Of these acres approximately 120 acres would be removed from late and old structure, approximately 440 acres would transition from old forest multi-strata to old forest single stratum, and approximately 590 acres would remain old forest multi-strata. With mechanical treatment old forest single stratum would move closer to the historical range of variability, from 3 to 5 percent of the Warm Dry plant association group (the historical range of variability is 15 to 55 percent), while old forest multi-strata would remain above the historical range of variability at 21 percent (the historical range of variability is 5 to 20 percent). Modeling also indicates that through continual growth of trees, despite some stands being removed from late and old structure, there would still be no net loss of late and old structure after treatment. This amendment includes removal of both trees less than 21 inches diameter at breast height and young (less than 150 years old), relatively large (greater than or equal to 21 inches diameter at breast height) grand fir and Douglas-fir trees. This amendment would apply only for the duration of, and for those actions proposed in, the site-specific Ragged Ruby Project.

Not Maintain Connectivity between all Late and Old Structure and Old Growth Stands

Alternative 2 would amend the Eastside Screens, standard 6(d)(3)(a) to not maintain or enhance the current level of connectivity between all late and old structure and old growth (management area 13) stands. Wildlife corridors would be provided between all management area 13 stands, some late and old structure stands, and to wildlife connectivity corridors in adjacent watersheds; however, not all late and old structure stands would be connected. Approximately 2,200 acres of wildlife connectivity corridors would be designated as part of the Ragged Ruby Project.

Alternative 3

Alternative 3 was developed to meet the purpose and need for the Ragged Ruby Project, while addressing the issues identified in chapter 1 and responding to comments requesting less activities. This alternative was developed in response to specific comments received requesting:

- Less upland restoration activities (changed activities in pine marten habitat and other undeveloped lands from commercial to non-commercial thinning or no treatment, and no commercial removal from dry meadow and scabland flat bunchgrass restoration units).
- Reduced burn blocks by approximately 2,500 acres to minimize impacts to pine marten habitat.
- Exclusion of bicycle use from several trails to minimize the potential for bicycles to enter the nearby North Fork John Day Wilderness.
- Changes to the removal of trees greater than or equal to 21 inches diameter at breast height, harvest within late and old structure stands, and not maintaining connectivity between all late and old structure and old growth stands forest plan amendments.

Upland Restoration Activities

Individual upland restoration units are described in Appendix A – Activity Tables and displayed in Appendix B – Maps, Map 4.

Dry Pine Restoration

Dry pine restoration would be the same as described under alternative 2, with 450 acres less commercial and non-commercial thinning, and 40 acres more non-commercial thinning.

Areas treated: Approximately 1,040 acres of commercial thinning, 1,760 acres of commercial and non-commercial thinning, and 680 acres of non-commercial thinning.

Mixed Conifer Restoration

Mixed conifer restoration would be the same as described under alternative 2, with 880 acres less commercial and non-commercial thinning and 270 acres more non-commercial thinning.

Areas treated: Approximately 1,920 acres of commercial and non-commercial thinning and 910 acres of non-commercial thinning.

Dry Meadow and Scabland Flat Bunchgrass Restoration

Dry meadow and scabland flat bunchgrass restoration would be the same as described under alternative 2, without the 80 acres of commercial and non-commercial thinning and 110 acres more non-commercial thinning. Commercial removal along the edges of the scabland flats (proposed in alternative 2) was changed to non-commercial thinning only.

Areas treated: Approximately 1,000 acres of non-commercial thinning.

Whitebark Pine and Western White Pine Restoration

Trees would be hand felled directly around whitebark pine and western white pine trees to promote the health and vigor of these trees. Treatments would be non-commercial. Fuels treatments would include prescribed fire, underburning, jackpot burning, and/or natural ignition.

Thinning would be limited to 9 inches diameter at breast height in inventoried roadless areas and riparian habitat conservation areas and 11 inches diameter at breast height in all other areas.

Areas treated: Approximately 410 acres of whitebark pine restoration and 460 acres of western white pine restoration.

Other Upland Restoration Information

Other upland restoration information would be the same as described under alternative 2, with 1,410 acres less commercial harvest and no helicopter harvest.

Harvest Systems: The areas proposed for commercial harvest (approximately 4,720 acres) would be harvested via tractor and/or skyline systems as follows:

- Tractor – 74 units, 3,310 acres
- Skyline – 32 units, 900 acres
- Combination of tractor and skyline – 14 units, 510 acres

See Appendix A – Activity Tables for unit-specific information.

Watershed, Fisheries, and Wildlife Habitat Restoration

Aspen Restoration

Aspen restoration would be the same as described under alternative 2.

Bat Gate Installation

Bat gate installation would be the same as described under alternative 2.

Other Aquatic Restoration Treatment Information

Other aquatic restoration treatment information would be the same as described under alternative 2.

Prescribed Burning and Unplanned Ignitions

Prescribed burning and unplanned ignitions would be the same as described under alternative 2, except for impacting approximately 2,500 fewer acres.

Road Activities

Road Use, Road Maintenance, and Temporary Road Construction

The following road activities would occur in support of implementing upland restoration and other project activities. See Appendix B – Maps, Maps 4 and 8.

Road maintenance and reconstruction (approximately 156 miles) would be the same as described under alternative 2, with 7 miles less roads used. Haul routes are identified by road segment in Appendix A – Activity Tables.

Closed roads to be utilized for haul: Closed roads utilized for haul would be the same as described under alternative 2.

Temporary road construction (approximately 11.7 miles) would be as described under alternative 2, with 0.8 miles less construction. Temporary roads are identified by segment in Appendix A – Activity Tables.

Use of private roads to access upland restoration treatment units: Use of private roads to access upland restoration treatment units would be the same as described under alternative 2.

Rock pit use: Rock pit use would be the same as described under alternative 2.

Disposal sites: Disposal site use would be the same as described under alternative 2.

Water sources: Water source use would be the same as described under alternative 2.

Road System Changes

Road system changes would be the same as described under alternative 2.

Recreation System Changes

Changes to Existing Trails and Trailheads

Recreation system changes would be the same as described under alternative 2, with the exception that the designated recreational use type on the Blackeye, Dupratt, Princess, Sunrise Butte, and Tempest Mine trails would not include bicycle use or trail realignment.

Interpretive Sign Installation

Interpretive sign installation would be the same as described under alternative 2.

Wildlife Connectivity Corridors

Approximately 3,260 acres of wildlife connectivity corridors would be designated to connect management area 13 and late and old stands both within and adjacent to the Ragged Ruby planning area.

Required Project Timing

Timing requirements would be the same as described under alternative 2.

Forest Plan Amendments

Change Management Area 13 (Old Growth) Areas

Management area 13 (old growth) changes would be the same as described under alternative 2.

Remove Trees Greater Than or Equal to 21 Inches Diameter at Breast Height

Alternative 3 would amend the Eastside Screens, standard 6(d)(2)(a) to allow removal of young (less than 150 years old), relatively large (greater than or equal to 21 inches DBH) grand fir and Douglas-fir trees in the Warm Dry and Hot Dry plant association group stands in the commercial thinning units (approximately 3,000 acres). The Warm Dry and Hot Dry plant association groups are the only biophysical environments (plant association groups) that have a late and old structural stage within the Eastside Screens, standard 6(d), scenario A. Trees greater than 150 years old would be determined by applying the guidelines presented in Identifying Old Trees and Forest (Van Pelt 2008) for Douglas-fir and Johnston et al. (2018) for grand fir. This amendment would apply only for the duration of, and for those actions proposed in, the site-specific Ragged Ruby Project.

Harvest within Late and Old Structure Stands

Alternative 3 would amend the Eastside Screens, standard 6(d), scenario A to allow approximately 50 acres of commercial thinning within old forest multi-strata stands in the Hot Dry plant association group (which is currently above the historical range of variability), to move these stands to old forest single stratum. It would also amend the Eastside Screens to allow approximately 970 acres of upland restoration treatments (approximately 820 acres of commercial thinning and 150 acres of non-commercial thinning) within late and old structure stands in the Warm Dry plant association group. All of the approximately 970 acres proposed for upland restoration treatments in the Warm Dry plant association group are within the old forest multi-strata structure class (which is above the historical range of variability). Of these acres approximately 120 acres would be removed from late and old structure, approximately 350 acres would transition from old forest multi-strata to old forest single stratum, and approximately 510 acres would remain old forest multi-strata. With mechanical treatment old forest single stratum would move closer to the historical range of variability, from 3 to 5 percent of the Warm Dry plant association group (the historical range of variability is 15 to 55 percent), while old forest multi-strata would remain above the historical range of variability at 21 percent (the historical range of variability is 5 to 20 percent). Modeling also indicates that through continual growth of trees, despite some stands being removed from late and old structure, there is still no net loss of late and old structure after treatment. This amendment includes removal of both trees less than 21 inches diameter at breast height and young (less than 150 years old), relatively large (greater than or equal to 21 inches diameter at breast height) grand fir and Douglas-fir trees. This amendment would apply only for the duration of, and for those actions proposed in, the site-specific Ragged Ruby Project.

Not Maintain Connectivity between all Late and Old Structure and Old Growth Stands

Alternative 3 would amend the Eastside Screens, standard 6(d)(3)(a) to not maintain or enhance the current level of connectivity between all late and old structure and old growth (management area 13) stands. Wildlife corridors would be provided between all management area 13 stands, some late and old structure stands, and to wildlife connectivity corridors in adjacent watersheds; however, not all late and old structure stands would be connected. Approximately 3,260 acres of wildlife connectivity corridors would be designated as part of the Ragged Ruby Project.

Project Design Criteria and Mitigation Measures

The Forest Service also developed project design criteria and mitigation measures for the project (see Appendix C – Project Design Criteria).

Monitoring

Fire and Fuels

Monitoring would be completed by Blue Mountain Range District fire personnel. Monitoring of work conducted under thinning, grapple, and hand piling contracts would consist of periodic inspections while work is in progress and after completion to determine compliance with contract standards. Monitoring of prescribed burning includes weather, flame length, surface fuel reduction, and smoke dispersal to ensure burning is conducted within the parameters stated in the burn plan. Prescribed burning would also be visually monitored to ensure that widespread tree mortality levels do not exceed mortality limits as described in the silviculture prescription directly after burning. Mortality would also be assessed several years after burning to determine trends in tree mortality and the apparent causes of those trends.

Non-native Invasive Plants

Invasive plant occurrences, treatments, and the areas that would be potentially disturbed as a result of the proposed actions would be monitored before, during, and after the implementation of the project. Monitoring protocol would follow the Forest Service’s national invasive plant monitoring requirements and protocols, and the Malheur National Forest’s existing Collaborative Forest Landscape Restoration Project Monitoring Plan for invasive species.

Recreation

The Malheur National Forest would monitor trails that lead into or are near the North Fork John Day Wilderness area (Princess, Blackeye, and Sunrise Butte trails) for mechanized and motorized use into the wilderness area. Monitoring would include, but would not be limited to: Forest employees (typically recreation program staff) field checks, trail counters, trail cameras, and/or sign-in sheets at trailheads and/or wilderness access points. Monitoring will be up to once a week, weather permitting, but no less than twice during summer season of use, for the first 3 years. After which, time monitoring data will be evaluated and adjusted for frequency as needed. If monitored use shows that the wilderness trails are being access by mechanized or motorized users, designated use on the trail(s) as a whole would be limited to hiking and equestrian use.

The Davis Creek Trailhead area would also be monitored for increased use that might indicate a need to develop a toilet at the trailhead location. Monitoring would include, but would not be limited to: Forest employees (typically recreation program staff) field checks, trail counters, trail cameras, and/or sign-in sheets at trailheads. Monitoring will be up to once a week, weather permitting, but no less than twice during summer season of use, for the first 3 years. After which time monitoring data will be evaluated and adjusted for frequency as needed. Monitoring of the Davis Creel Trail can include, but would not be limited to: resource degradation, soil erosion, user created trails, and trash and human waste left at site.

Watershed

Project activities would be included in the suite of activities from which random and non-random samples are pulled for monitoring by the Malheur National Forest under the Forest Service's National Best Management Practices Program.

Alternatives and Elements Considered but Eliminated from Detailed Study

Federal agencies are required by the National Environmental Policy Act to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 Code of Federal Regulations 1502.14). Public comments received in response to the proposed action provided suggestions for alternative methods for achieving the purpose and need. Some of these alternatives may have been outside the scope of the purpose and need for action, duplicative of the alternatives considered in detail, or determined to be components that would cause unnecessary environmental harm. Therefore, a number of alternatives were considered, but dismissed from detailed consideration for reasons summarized below.

No Upland Restoration or Prescribed Burning in the Inventoried Roadless Areas

Several commenters requested that no upland restoration activities or prescribed burning be considered in the Dixie Butte and Greenhorn Mountain inventoried roadless areas. To clarify, proposed upland restoration activities and prescribed burning the inventoried roadless areas would not include commercial harvest or the use of heavy equipment. The alternative of no treatment whatsoever was considered, but eliminated from detailed study because it would not meet the purpose and need to maintain and improve landscape resiliency and manage for diverse forest composition, stocking levels, and pattern to maintain healthy ecological function and process within a complex disturbance regime of wildfire, drought, insects, and diseases. Mechanical treatments within the Dixie Butte and Greenhorn Mountain inventoried roadless areas include thinning around whitebark pine, western white pine, and within higher elevation dry meadows and scablands.

There is a need to thin around whitebark pine to improve the resiliency of that species within the planning area. Whitebark pine is a candidate for federal listing due to concerns regarding the species' decline caused by introduced white pine blister rust, native bark beetles, and uncharacteristically high-severity fire on the landscape. Within the inventoried roadless areas, whitebark pine are located in a narrow band at tree line at the highest elevations. These trees are currently infected with low levels of white pine blister rust. Due to fire suppression, they are also encroached upon by subalpine fir, which has greatly increased tree density and competition for resources. Decreased whitebark pine vigor due to blister rust and increased competition make it susceptible to tree mortality from mountain pine beetle. Most of the recent whitebark pine mortality in the inventoried roadless areas is attributed to mountain pine beetle, which is slowly killing the larger trees.

Western white pine are found in cooler, moister areas of the Middle Fork John Day River drainage and within the Dixie Butte Inventoried Roadless Area. It is a tree species with special significance for the Malheur National Forest because it only grows on moist, productive environments and the population on the Malheur National Forest has proven to be fairly blister rust resistant. Similar to whitebark pine, western white pine is currently infected with low levels of white pine blister rust, has experienced increased competition due to fire suppression, and is being killed by mountain pine beetle. Mountain pine beetle activity in the Dixie Butte Inventoried Roadless Area over the last 10 years has killed groups and small pockets of western white pine each year, resulting in a significant level of tree mortality in the larger and older trees. Although western white pine is also actively regenerating in small openings, many of these current openings are not large enough for the trees to grow vigorously. Thinning around these trees is also needed to improve the resiliency of this species within the planning area.

Higher elevation dry meadows and scablands within the Dixie Butte Inventoried Roadless Area are characterized by shallow, rocky soils. The vegetation structure within these scablands includes native bunchgrasses, mountain mahogany and other large shrubs, old growth pine trees, and in some cases old, wolfy Douglas-fir trees. Due to historical grazing and other management activities, these scabland soils are often eroded and experience accelerated surface water runoff. Due to fire suppression practices they have also been encroached upon by western juniper, many small ponderosa pine and Douglas-fir trees, and non-native invasive plants. Excess juniper and small conifers within these water-limited sites shade out and compete with native bunchgrass and shrub communities that provide for unique vegetation communities and wildlife habitat within a matrix of dense mixed-conifer forest. Tree felling within these meadows and scablands is needed to maintain diversity in forest composition and to maintain these areas at the appropriate stocking levels.

Fire suppression on the Malheur National Forest has allowed for large increases in tree density in higher elevation and moist forest types. Although high elevation and moist forest types are cooler and moister than low elevation ponderosa pine stands, they still experience summer drought conditions. Research on the Malheur National Forest and within the Ragged Ruby planning area (Johnston et al. 2017) found that mean fire return intervals were only slightly longer in cool moist and Cold Dry forests than in Warm Dry forests. This indicates that higher elevation and moist forest types have missed several fire cycles over the past century. Prescribed burning is needed to reduce fuel levels and to maintain the ecological process of fire in these areas.

Allow Salvage Logging of Trees Killed by Prescribed Burning

One member of the public requested that the project include a proposal to salvage log trees killed by prescribed burning. This was considered, but eliminated from detailed study because this would require attempting to analyze an unknown future existing condition. Prescribed burning is proposed across a majority of the Ragged Ruby planning area, and trees would be killed across this area. So, it is unknown where the units would be, what the harvest system would be, where road maintenance for haul would be needed, if and where temporary road construction would be needed, etc. In addition, this proposal would mean multiple entries with heavy equipment in some areas that could exceed Malheur Forest Plan standards for soil disturbance. Basically, this would require re-analyzing the planning area (following prescribed burning) to determine where the potential exists for salvage logging.

In addition, snags provide important wildlife habitat for many species. Some project activities remove snags from the planning area (for example, roadside danger tree removal during timber harvest operations). Prescribed burning both consumes existing snags and recruits new snags through fire-caused tree mortality. This mortality is planned for in a project's prescribed burning silviculture prescription and it is the intent to have tree mortality from prescribed burning stay within certain mortality levels.

Ecological Riparian and Large Wood Treatments

The project's scoping package included a proposal for ecological riparian and large wood treatments, including thinning, tree tipping and felling, and large wood placement, along approximately 35 to 56 miles of stream within riparian habitat conservation areas. This proposal also included the potential for commercial byproduct removal from the outer portion of riparian habitat conservation areas. This initial proposal was based upon preliminary interpretation of survey data, with refinement of the proposal planned for the 2017 field season.

Upon this further review, the interdisciplinary team found there is not potential for commercial byproduct removal based on the site-specific conditions in the Ragged Ruby planning area. Some of the reasons include minimal, existing road access to areas with restoration potential, steep slopes within riparian habitat conservation areas which limit logging feasibility, and other operational or topographic constraints that limit the ability to place wood in streams in advance of harvest, as required by Forest Plan standards.

Non-commercial thinning, tree tipping and felling, and large wood placement are still activities needed to meet the desired future condition of streams in the planning area. However, these activities are already authorized under the Aquatic Restoration Decision. Consequently the ecological riparian and large wood treatments were dropped from the Ragged Ruby Project, but will occur under the Aquatic Restoration Decision (see Appendix E – Past, Ongoing, and Reasonably Foreseeable Actions) and will be analyzed in the cumulative effects sections in chapter 3.

Do Not Utilize For Haul Maintenance Level 1 Roads that Are Overgrown or Construct any Temporary Roads

Several commenters requested that overgrown closed roads not be utilized for haul and that no temporary roads be constructed. This was considered, but eliminated from detailed study because it would not meet the purpose and needs to:

- Maintain and improve landscape resiliency and manage for diverse forest composition, stocking levels, and pattern to maintain healthy ecological function and process within a complex disturbance regime of wildfire, drought, insects, and diseases.
- Promote forest conditions that allow for the reintroduction of fire upon the landscape, thereby creating conditions that are conducive to firefighter safety, resource values, and private lands.
- Contribute to the social and economic health of those enjoying multiple uses in the Ragged Ruby planning area, including providing a variety of wood products and contributing towards forest management employment opportunities to help maintain and improve community stability and infrastructure.

Access to priority treatment areas needed to achieve the purpose and need would not be available. As described above and in chapter 3, Forest Vegetation section and the Ragged Ruby Silviculture Report, much of the Ragged Ruby planning area is stocked above the management zone[13] and many structural stages are outside the historical range of variability. Leaving these stands untreated would not shift them toward more historical species composition, structural stages that are within or moving toward the historical range of variability, or reduce density and fuel loading to effectively improve fire risk and safety conditions. It is necessary to provide access for the removal of merchantable material, in its different forms, to meet these objectives.

The action alternatives were developed using a landscape and interdisciplinary approach. Upland stands were identified for treatment by the project silviculturist if there was a silvicultural need to shift species composition, reduce density, or change structure to increase resiliency. After stands were identified, the Forest Service interdisciplinary team worked together to determine which of those stands identified as needing treatment would become a part of the proposed action or other action alternative to provide for the greatest benefit for wildlife habitat, fuels reduction that would decrease fire behavior, public access and recreation, grazing allotments, community stability, and overall landscape resiliency. A significant reduction in the area treated would not meet the purpose and need of this project.

Implement Upland Restoration Activities within Wildlife Connectivity Corridors

A commenter requested that upland restoration activities be implemented in wildlife connectivity corridors. This was considered, but eliminated from detailed study. The majority of these stands are on steep ground requiring logging via skyline systems, and to thin them using skyline equipment there would need to be approximately 5,000 board feet to the acre available for removal. This level of removal would not maintain these stands within the upper two-thirds of site potential that is required by the Malheur Forest Plan, as amended by the Eastside Screens.

Provide Parking and Horse Riding Access at the Tempest Mine Trailhead

When starting to develop the recreation proposed actions, the interdisciplinary team identified a need to discontinue designating horse-riding access at the proposed Tempest Mine trailhead due inadequate parking (a horse trailer parking at the trailhead would block the road and there are no nearby turnarounds). The interdisciplinary team took a fieldtrip and looked at several alternative trailhead locations that would provide horse trailer parking:

- Expand existing trailhead parking site – Alternative was proposed to cut into the bank near existing earthen berm to expand the parking area. However, this was eliminated because digging in deep enough to provide adequate parking would create a steep bank and induce possible rockslides, erosion, and sediment movement into nearby Granite Boulder Creek, which is Middle Columbia River steelhead and bull trout critical habitat.
- Develop parking in dispersed campsite across Granite Boulder Creek – This was eliminated due to it being within the floodplain and prone to being underwater with annual high water line. Development would also create ground disturbance right

[13] Stand density index (SDI) is a tool used by silviculturists to assess stand viability and is a common measure of density that allows comparisons across units independent of individual tree age or size (Powell 1999). For any given average tree size for each species there is a limit to the number of trees per acre that may coexist in a stand, known as the maximum SDI (Max SDI). The percent of Max SDI is an index of intra-tree competition for site resources and is an indication of overall stand health; tree growth and mortality, susceptibility to tree mortality from insect and disease, and fire hazard. The management zone is 40 to 60 percent SDI, which is where site resources are generally being captured into tree growth and there is high stand growth (see Ragged Ruby Silviculture Report for more detail).

alongside Granite Boulder Creek, displacing sediment and lowering water quality in Middle Columbia River steelhead and bull trout critical habitat.

- Relocate trailhead to rock pit along National Forest System Road 4559 – This option was eliminated because the side of the rock pit is steep (dug in too deeply) and would incur additional engineering costs to reinforce against potential rockslides. It is also over 1 mile from the existing trailhead location, which would require new trail construction to extend trail to this location along Middle Columbia River steelhead and bull trout critical habitat, or co-designating the trail extension on the road.
- Relocate trailhead to junction of National Forest System roads 4559283 and 4559284 – This option was scoped to the public and included co-designating 0.7 miles of National Forest System Road 4559283 as trail, and construction approximately 0.5 miles of new trail to connect into the existing Tempest Mine trail. This option was dropped from the proposal due to feedback that creating a horse-riding trailhead about 3 miles further from the existing trailhead on a rough road with several hairpin turns was undesirable for vehicles pulling horse trailers.

Horse-riding access to trails in this areas would be provided under alternatives 2 and 3 from the proposed Blackeye trailhead, which would be improved for horse trailer parking.

Eliminate Motorized Use of the Davis Creek Trail or Eliminate the Trail Entirely

Several commenters requested that an alternative be considered that would eliminate motorized use of the Davis Creek Trail, or eliminate the trail entirely. This would not meet the purpose and need to contribute to the social and economic health of those enjoying multiple uses in the Ragged Ruby planning area, including maintaining and enhancing recreational opportunities. In addition, the 1990 Malheur Forest Plan identifies the Davis Creek Trail as a motorized trail (USDA Forest Service 1990a, pages A-4 to A-5). The trail is also one of only seven trails currently designated for motorized use on the Malheur National Forest.

There are aquatic resource concerns associated with the Davis Creek Trail crossing Davis Creek, Deerhorn Creek, and Little Butte Creek which are or flow into designated critical habitat for Middle Columbia River steelhead and bull trout. However, alternatives 2 and 3 would address these concerns with the proposed hardening of stream crossings, minor trail realignment, bridge construction, erosion control (for example, large wood placement), re-contouring, trail drainage, and water barring.

Increase Motorized Trails Connecting to the Davis Creek Trail

The interdisciplinary team considered expanding off-highway vehicle use in the area by co-designating closed National Forest System roads in the vicinity of National Forest System Road 2050 as off-highway vehicle trails. This option was considered, but eliminated from detailed study due to these roads: (1) crossing numerous riparian habitat conservation area category 1 streams and Middle Columbia River steelhead and bull trout critical habitat; (2) crossing into and providing additional motorized access to the Dixie Butte Inventoried Roadless Area; and (3) crossing important big game habitat where motorized use is undesirable.

Increase Recreational Development of Balance Lake

Several commenters requested that a trail be constructed around Balance Lake and that the lake be dredged and stocked to restore fishing opportunities. This alternative was considered but eliminated from detailed study because Balance Lake appears to have been formed by a natural landslide decades to centuries ago; its position and formation relative to the ancient landslide appear to be similar to transitory sag ponds (most commonly associated with glaciers) which are common temporary features. Balance Lake is filling as a result of natural processes. The natural dam, created during the landslide, has not been assessed; it was improved at an unknown time by a user-created road which was later decommissioned. Keeping the lake dredged enough to allow for fishing would incur extensive maintenance costs, disrupt natural processes, and cause great harm to the aquatic communities currently present. The Balance Lake area is not currently included in the list of Malheur National Forest recreational sites. Developing adequate information about the hydrology and geology of the area either to inform the feasibility of trail construction or for interpretation was beyond the scope of this project.

No Removal of Trees Greater Than or Equal to 21 Inches Diameter at Breast Height Amendment

Comments received during the scoping period ranged from requesting that an amendment to the Eastside Screens, standard 6(d)(2)(a) “21 inch rule” be utilized, to requesting that no 21 inch amendments be utilized. An alternative to not propose a 21 inch amendment was considered, but eliminated from detailed study due to the limits it would place on meeting the purpose and need for the Ragged Ruby Project.

The purpose and need of the Ragged Ruby Project includes maintaining and improving landscape resiliency and managing for diverse forest composition, stocking levels, and pattern to maintain healthy ecological function and process within a complex disturbance regime of wildfire, drought, insects, and diseases. The option to remove grand fir and Douglas-fir trees greater than or equal to 21 inches diameter at breast height, while retaining old trees according to the Van Pelt guidelines (Van Pelt 2008) and Johnston et al. (2018), would meet the intent of the Eastside Screens by allowing for the conservation of actual late and old structure habitat, while also shifting the landscape to better represent the historical range of variability and reverse conifer encroachment due to fire suppression across the landscape. Not implementing a 21 inch amendment would reduce future heterogeneity and resiliency on the landscape.

Restoring species composition towards historical levels can often mean removing large but younger (less than 150 years) grand fir and Douglas-fir to favor pines and western larch. Hard diameter limits, such as a 21 inch diameter at breast height limit, can make it difficult or impossible to achieve desired [species] composition in many mixed-conifer forests, which would compromise their future resilience (Franklin et al. 2013). By leaving all grand fir and Douglas-fir greater than or equal to 21 inches diameter at breast height, the percentage of early seral tree species would be lower and in the future there would be a greater seed source for the more shade tolerant, late seral fir trees. Large but young grand fir and Douglas-fir have a greater leaf area than large ponderosa pine and western larch trees, which increases shade within forested stands, requires the use of more of the water resource, and provides ladder fuels into the canopy. This creates growing conditions more ideal for more fir and less ideal for ponderosa pine and western larch. This would reduce the future resilience of these stands and not meet the purpose and need by further decreasing desired species composition and densities. For more information see Chapter 3 Evaluation of Proposed Forest Plan Amendments, Removal of Trees Greater Than or Equal to 21 Inches Diameter at Breast Height and Harvest within and Reduce Late and Old Structure Stands.

No Harvest within Late and Old Structure Amendment

Several commenters requested that the Malheur Forest Plan, as amended by the Eastside Screens, not be amended to allow harvest within late and old structure stands. This alternative was considered, but eliminated from detailed study because it would not meet the purpose and need to maintain and improve landscape resiliency and manage for diverse forest composition, stocking levels, and pattern to maintain healthy ecological function and process within a complex disturbance regime of wildfire, drought, insects, and diseases.

This alternative would drop all commercial treatments within stands determined to meet the requirements of late and old structure. Fire was historically the dominant disturbance factor in the Ragged Ruby planning area. Due to this, late and old structure was dominated by early seral ponderosa pine, western white pine, and western larch, with a varying component of Douglas-fir, lodgepole pine, grand fir, and Engelmann spruce in the wettest locations. These stands still have large, “old” early seral trees but also have very dense ingrowth of predominantly grand fir that creates ladder fuels, greatly increases density, and reduces the resiliency and vigor of the large, “old” early seral trees. This alternative was considered but dropped from detailed analysis because it does not address increasing “old” tree vigor and resiliency to disturbance for a large portion of the “old” early seral trees within the planning area. This would not be consistent with the purpose and need of the Ragged Ruby Project to restore forest structure, composition, and density toward more resistant and resilient vegetative conditions given the historical fire regime. Late and old structure stands represent approximately 37 percent of the Ragged Ruby planning area. These stands would continue to be late and old structure after they are treated and into the future because all trees exhibiting “old” tree characteristics, despite species or diameter, would be left. In general, Warm Dry ponderosa pine stands would transition from old forest multi-strata to old forest single stratum because they would be thinned from below. This would decrease the amount of old forest multi-strata (which is above the historical range of variability for the Warm Dry plant association group) and increase the amount of old forest single stratum (which is currently below the historical range of variability). In general, Warm Dry and Cool Moist mixed conifer stands would remain old forest multi-strata because they would be thinned throughout the diameter range, still leaving all trees that exhibit “old” tree characteristics, but also leaving some small and young early seral trees for recruitment. Currently, the Cool Moist plant association group is within the historical range of variability for old forest single stratum and above the historical range of variability for old forest multi-strata. Thinning the late and old structure stands throughout the diameter range would increase the abundance of old forest single stratum and decrease the abundance of old forest multi-strata within the Cool Moist plant association group to the point that both structure classes would be above the historical range of variability after treatment. If these stands were not treated, they would continue to be overstocked with high proportions of late seral species. They would also continue to be at high risk to a stand replacement wildfire, which would decimate much of the old forest structure in the Ragged Ruby planning area. For more information see Chapter 3 Evaluation of Proposed Forest Plan Amendments, Removal of Trees Greater Than or Equal to 21 Inches Diameter at Breast Height and Harvest within and Reduce Late and Old Structure Stands.

Maintaining Connectivity Between all Late and Old Structure and Old Growth Stands

Several commenters requested that the Malheur Forest Plan, as amended by the Eastside Screens, not be amended to not maintain connectivity between all late and old structure and old growth stands. This alternatives was considered, but eliminated from detailed study because it would not meet the purpose and need to maintain and improve landscape resiliency and manage for diverse forest composition, stocking levels, and pattern to maintain healthy ecological function and process within a complex disturbance regime of wildfire, drought, insects, and diseases. This amendment would reduce stand density, increase tree spatial heterogeneity, protect old trees, and shift species composition to a higher proportion of early seral species. For more information see Chapter 3 Evaluation of Proposed Forest Plan Amendments, Not Maintaining Connectivity Between all Late and Old Structure and Old Growth Stands.

Using Seasonal Road Closures Rather than Closing or Decommissioning Roads

Several commenters requested seasonal closures or other measures be used to manage roads as opposed to closing them (year-round) or decommissioning them. This option was considered but eliminated from detailed study because in the Ragged Ruby Project, road decommissioning is proposed where there is aquatic resources damage, there is no sign of a road, and/or the road is not needed for current or future management.

For proposed road closures where big game habitat security is a concern, it was noted that traffic substantially increases during the spring when turkey hunters and shed antler hunters are afield, and again during the fall hunting seasons, indicating a need to provide for big game security from early fall (September) throughout the winter, and through critical calving and fawning seasons (June). Furthermore, seasonal road closures require an effective barrier, such as a gate, to ensure adequate security is provided. Without such barriers, many closures are often unnoticed or ignored and do not provide any increased or enhanced security for big game species. Historically, seasonally gate-closed roads across the Blue Mountain Ranger District have not been effective because of repeated vandalism of the gates, increasing the maintenance costs or practicality of maintenance.

The expected timeframe of reduced traffic needed, the number of roads proposed for closure on short road segments, limited budgets, associated time constraints to open and close barriers on or before any established seasonal dates, and maintenance of barriers, means managing big game security with seasonal closures in this areas would not be feasible.

Comparison of Alternatives

Table 3 provides a comparison of project activities, and Table 4 provides a summary highlighting the difference in effects of implementing each alternative. Readers should review chapter 3 in its entirety for the full effects analysis.

Table 3. Comparison of activities between alternatives

Project activity	Alternative 1	Alternative 2	Alternative 3
Dry pine restoration	--	1,040 acres commercial thinning 2,210 acres commercial and non-commercial thinning 640 acres non-commercial thinning	1,040 acres commercial thinning 1,760 acres commercial and non-commercial thinning 680 acres non-commercial thinning
Mixed conifer restoration	--	2,800 acres of commercial and non-commercial thinning 640 acres of non-commercial thinning	1,920 acres commercial and non-commercial thinning 910 acres non-commercial thinning

Project activity	Alternative 1	Alternative 2	Alternative 3
Dry meadow and scabland flat bunchgrass restoration	--	80 acres commercial thinning (with commercial removal along the edges of the scabland flats and dry meadows) 920 acres non-commercial thinning	1,030 acres non-commercial thinning (with no commercial removal along the edges of the scabland flats and dry meadows)
Whitebark pine restoration	--	410 acres non-commercial thinning (by broadcast thinning a larger area around the whitebark pine)	410 acres non-commercial thinning (with trees hand felled directly around the whitebark pine)
Western white pine restoration	--	460 acres non-commercial thinning (by broadcast thinning a larger area around the western white pine)	460 acres non-commercial thinning (with trees hand felled directly around the western white pine)
Helicopter landings	--	9 landings (30 acres)	--
Aspen restoration	--	10 acres	10 acres
Bat gate installation	--	2 bat gates	2 bat gates
Prescribed burning	--	34,000 acres	31,500 acres
Road maintenance for haul	--	151 miles	143 miles
Alternate haul routes	--	12 miles	13 miles
Temporary road construction	--	12.4 miles (42 temporary road segments)	11.7 miles (39 temporary road segments)
Potential rock pit use	--	15 pits	15 pits
Potential disposal site use	--	8 sites	8 sites
Potential water sources	--	17 sites	17 sites
Change the designation of roads from closed to open (maintenance level 1 to 2)	--	2.9 miles (5 road segments)	2.9 miles (5 road segments)
Change the designation of roads from open to closed (maintenance level 2 to 1)	--	7.3 miles (20 road segments)	7.3 miles (20 road segments)
Decommission open (maintenance level 2) road	--	0.3 miles (1 road segment)	0.3 miles (1 road segment)
Decommission closed (maintenance level 1) roads	--	1.4 miles (5 road segments)	1.4 miles (5 road segments)
Convert a closed (maintenance level 1) road to a trail	--	1.2 miles (2 road segments)	1.2 miles (2 road segments)
Modify seasonal wildlife road closures	9.9 miles from October 1 to April 4	9.9 miles from 3 days following archery season (late September) to May 1	9.9 miles from 3 days following archery season (late September) to May 1
Confirm past administratively closed roads	--	25.3 miles (37 road segments)	25.3 miles (37 road segments)

Project activity	Alternative 1	Alternative 2	Alternative 3
Trail users groups on the Blackeye, Dupratt, Princess, Sunrise Butte, and Tempest Mine trails	--	Bicycle, horse-riding, foot, and Americans with Disabilities Act (on part of the Tempest Mine Trail)	Horse-riding, foot, and Americans with Disabilities Act (on part of the Tempest Mine Trail)
New trail construction	--	2.8 miles (5 trail segments)	2.8 miles (5 trail segments)
Co-designate road as trail	--	8.4 miles (5 trail segments)	8.4 miles (5 trail segments)
Un-designate trail	--	5.1 miles (3 trail segments)	5.1 miles (3 trail segments)
Establish new trailheads and erect signage	--	4 sites	4 sites
Develop parking areas at new trailheads	--	3 sites	3 sites
Un-designate existing trailheads	--	4 sites	4 sites
Interpretive sign installation	--	1 sign	1 sign
Wildlife connectivity corridors	--	2,200 acres	3,260 acres
Forest plan amendments	--	Dedicated old growth unit changes, removal of trees greater than or equal to 21 inches diameter at breast height, harvest within late and old structure stands, not maintain connectivity between all late and old structure and old growth stands	Dedicated old growth unit changes, removal of trees greater than or equal to 21 inches diameter at breast height, harvest within late and old structure stands, not maintain connectivity between all late and old structure and old growth stands

Table 4. Comparison of effects between alternatives

Comparison element	Alternative 1	Alternative 2	Alternative 3
Soils	No soil compaction would occur. The risk of a high-severity wildfire would continue to increase, increasing the hazard of soil erosion. There would be no changes in the trends for forest floors and nutrients.	Soil compaction would be kept to a minimum and within Malheur Forest Plan standards. Soil erosion would be negligible. Some nutrients would be removed by project activities; however, most would remain in the soil, forest floor, and remaining trees.	Alternative 3 impacts would be the same as for alternative 2.
Watershed condition	The watershed hazard would remain the same as the existing condition (low-to-moderate plus) in the short term. The presence of riparian roads would continue to limit stream channel recovery. Over the long term, watershed hazard would generally decrease as recovery from past activities continues, although localized areas of active erosion would continue as chronic, localized hazards.	Composite watershed hazard is expected to increase to moderate plus plus during the period of active implementation, and to decline to moderate plus in the year(s) following road maintenance, best management practices use during harvest of units, implementation of proposed road decommissioning, and closing/stormproofing of the roads post-haul. Composite watershed hazard would continue to decline, approaching low plus over three to five decades.	The effects on composite watershed hazard in alternative 3 are similar to those described for alternative 2 except less ground would be disturbed by harvest activities. Although less ground disturbance would likely result in development of about 15 percent fewer opportunities for connections that would concentrate overland flow or mobilize sediment, much of this reduction is on the north aspects where, overall, there are fewer legacy impacts with which to connect. Watershed hazard is expected to increase to moderate-plus during the period of active implementation and gradually decline over several decades, as described for alternative 2.
Forest vegetation	Stands would continue to grow on their current trajectory. Forested stands would continue to be overstocked with high proportions of late seral species. Stand structure would shift from predominantly young forest structure to predominantly old forest structure, doubling the amount of late and old structure in 40 years. The proportion of the planning area above the management zone would increase.	Silvicultural treatments would reduce stand density and the effects of that reduction would continue at least 40 years into the future. This would decrease the risk of a large, stand-replacement fire or an insect outbreak. Over time, the planning area would become deficient in young forest structure, but alternative 2 would increase the proportion of old forest single stratum when compared to alternative 1 (no action). Treatments would also decrease the proportion of late seral species while providing conditions conducive for natural regeneration and planting of early seral species.	Alternative 3 would produce similar effects to alternative 2, but at a smaller scale as it treats 1,000 less acres.

Comparison element	Alternative 1	Alternative 2	Alternative 3
Botanical resources	Aspen habitats would likely continue to decline.	There would be minimal impacts to botanical resources from project activities. Sensitive plant species in aspen stands should be beneficially impacted in the long-term.	Alternative 3 impacts would be the same as for alternative 2.
Invasive plants	Some existing invasive plant populations may naturally increase in size.	Alternative 2 may increase invasive plants; however, this would be minimized by project design criteria.	Alternative 3 impacts would be the same as for alternative 2.
Wildlife	Early-seral stands would continue to decrease in the planning area, which would adversely affect early-seral dependent bird species, many of which are migratory. Western larch and large overstory ponderosa pine (which are important to the majority of the Region 6 sensitive species in the planning area) would weaken due to moisture stress from competition in overstocked stands. Large snags would likely increase, benefiting snag-dependent species in areas not accessible by roads.	Wildlife species may exhibit a variety of responses to the proposed management activities. Managing vegetation in the planning area towards the historical range of variability would benefit species that prefer conditions within the historical range of variability, and could adversely affect some that prefer the current departed conditions. However, by managing habitat within the historical range of variability it is assumed that adequate habitat would be provided to ensure population viability for those species that would have occurred in this area historically. Emphasis would be placed on retaining quality wildlife habitat, while also progressing towards more resilient conditions.	Alternative 3 impacts would be slightly less than alternative 2.
Aquatic species – primary habitat elements	Hazard of severe crown fire would be higher, which could result in the loss of shading along stream channels, instream wood, and streamside vegetation. Recreational opportunities related to hiking, biking, and off-highway vehicle use within the analysis area would remain the same and public use of the existing facilities would likely increase in. The increase in recreational use without the recreation system changes identified in alternatives 2 and 3 may contribute to degradation of aquatic habitat. Road and crossing improvements related to haul would not occur, which would allow several miles of roads to continue acting as potential sediment sources, impeding and intercepting overland water flow, transporting sediment, and causing ground water seepage.	Recreation system changes would have a negative and meaningfully measurable effect on the primary habitat element of embeddedness and fine sediment in the short term and a positive and meaningfully measureable effect in the long term. The effects of the remaining five project elements (timber felling, prescribed burning and unplanned ignitions, temporary roads and landings, road decommissioning, and road maintenance and use) on the remaining five primary habitat elements (pool frequency, water temperature and stream shading, large woody debris, width-to-depth ratio, and bank stability) would be either negative and not meaningfully measurable or neutral in the short term.	Alternative 3 impacts would be the same as for alternative 2.

Comparison element	Alternative 1	Alternative 2	Alternative 3
Aquatic species – threatened, endangered, sensitive, and management indicator species	Effects determinations are not made for alternative 1 (no action).	Middle Columbia River steelhead and Columbia River bull trout and their designated critical habitat: Endangered Species Act determination (threatened) of May affect, likely to adversely affect in the short term; Beneficial Effect in the long term. Management indicator species determination of continued viability at the Forest scale. Redband trout: Sensitive species determination of may impact individuals or habitat, but would not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species in the short term; beneficial impact in the long term. Management indicator species determination of continued viability at the Forest scale. Pacific lamprey, Columbia spotted frog, Western ridged mussel, and California floater: Sensitive species determination of may impact individuals or habitat, but would not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species in the short term; beneficial impact in the long term.	Alternative 3 impacts would be the same as for alternative 2.
Fire and fuels	The planning area would remain at risk of an uncharacteristically severe fire. Crown fire activity potential on 24,759 acres and 18,321 acres with 0 to 4-foot flame lengths.	Alternative 2 would reduce potential crown fire activity (5,974 acres) and flame lengths (34,938 acres with 0 to 4-foot flame lengths) the most.	Alternative 3 would reduce crown fire activity (6,040 acres) and flame lengths (30,113 acres with 0 to 4-foot flame lengths) slightly less than alternative 2.
Air quality	Alternative 1 would produce the most greenhouse gas emissions (4,447,931 tons) during a wildfire.	Alternative 2 would produce the second most greenhouse gas emissions (2,344,710 tons), including the 1,818,119 tons that would be produced during prescribed burning and potential 526,592 tons produced during a wildfire event (post-treatment).	Alternative 3 would produce the least greenhouse gas emissions (1,811,508 tons), including 964,174 tons that would be produced during prescribed burning and potential 842,600 tons produced during a wildfire event (post-treatment).
Climate change	Alternative 1 would have no direct, indirect, or cumulative effects to climate change.	Alternative 2 would improve forest conditions and capacity to grow trees, which are positive factors in carbon sequestration.	Alternative 3 impacts would be the same as for alternative 2.

Comparison element	Alternative 1	Alternative 2	Alternative 3
Transportation system	Alternative 1 would have 115.7 miles of open (maintenance level 2 and 3) roads and 100.8 miles of closed (maintenance level 1) roads.	Alternative 2 would have 111.0 miles of open (maintenance level 2 and 3) roads and 103.0 miles of closed (maintenance level 1) roads.	Alternative 3 impacts would be the same as for alternative 2.
Heritage resources	The continued threat of uncharacteristically severe wildfire would risk the long-term stability of cultural resources.	Alternative 2 would have minimal effects to cultural resources from project activities due to project design criteria.	Alternative 3 impacts would be the same as for alternative 2.
Rangeland resources	Forage would likely continue to decrease.	Alternative 2 would increase available forage and ease of access to water developments.	Alternative 3 impacts would be slightly less than alternative 2.
Recreation resources	Trail systems would be left in conditions that do not meet the needs of Forest users, or that perpetuate resource degradation including: erosion, use beyond the designated uses, and adverse effects to water quality and fish.	Alternative 2 trail and trailhead improvements would correct existing issues with the trail network by reestablishing trailheads in locations that are better suited to meet the needs and capacity of the trail system. There would be an overall increase of 6.1 miles of trail.	Alternative 3 impacts would be the same as for alternative 2; however, without increased bicyclist opportunities in the northern trail system.
Visual resources	Scenic vegetation diversity would be impaired, too dense, and lacking extent of historical large trees. There would be no positive wildfire influences on vegetation structure and species. Scenic stability would be low and most vegetation scenery attributes would be impaired, and some absent or not likely to be sustained due to ecosystem stress (wildfire imbalance; excess grand fir).	Treatments would improve long-term scenic integrity, by opening the stands up for increased visibility and visual diversity. Prescribed fire would improve conditions for fire resistant species, which would indirectly improve landscape character attributes of large trees and open stands that can withstand low intensity fires. Scenic stability would be moderate and shift towards historical conditions of fire adapted scenery attributes. Would reduce risk of scenery impairment from ecosystem disturbance events.	Scenic integrity and scenic stability would not measurable vary from alternative 2.
Economics	Alternative 1 would not produce any sawtimber or employment opportunities.	Alternative 2 would produce 24,720 CCF (13 million board feet) of sawtimber, timber harvest and required design criteria present net value of -$27,092, and all restoration activities present net value of -$7,449,186, and timber harvest-related employment of 94 jobs.	Alternative 3 would produce 19,080 CCF (10 million board feet) of sawtimber, timber harvest and required design criteria present net value of -$28,865, and all restoration activities present net value of -$6,825,062, timber harvest-related employment of 73 jobs.

Comparison element	Alternative 1	Alternative 2	Alternative 3
Special management areas	Alternative 1 would have no effects to wilderness areas, inventoried roadless areas, potential wilderness areas, and other undeveloped lands. The existing condition would remain unchanged, except by natural processes and ongoing management activities. The landscape would likely continue developing complex fuel loads. A wildfire may burn more extensively and kill more trees, which would result in larger acreages of blackened landscapes compared to prescribed fires.	Alternative 2 would have indirect effects to wilderness and potential wilderness areas from prescribed burning causing short-term views of smoke in these areas. Activities in the inventoried roadless areas would have some effects to soils, water, air quality, plants, wildlife, aquatic species, dispersed recreation, scenic quality, reference landscapes, and other locally identified unique characteristics. Alternative 2 would slightly reduce (by 0.4 percent) the amount of other undeveloped lands in the planning area.	Alternative 3 would have similar impacts to wilderness areas, inventoried roadless areas, and potential wilderness areas. However, at a slightly smaller scale to fewer acres treated. Alternative 3 would slightly reduce (by 0.3 percent) the amount of other undeveloped lands in the planning area.
Forest plan amendments	No forest plan amendments are part of alternative 1.	Management area 13 (old growth) would increase by approximately 837 acres. Young (less than 150 years old), relatively large (greater than or equal to 21 inches diameter at breast height) grand fir and Douglas-fir trees in the Warm Dry and Hot Dry plant association group stands in the commercial thinning units (approximately 3,400 acres) would be removed. Approximately 1,210 acres of thinning would occur within late and old structure stands. Connectivity would not be maintained between all late and old structure and old growth stands; however, approximately 2,200 acres of wildlife connectivity corridors would be designated.	Management area 13 (old growth) would increase by approximately 837 acres. Young (less than 150 years old), relatively large (greater than or equal to 21 inches diameter at breast height) grand fir and Douglas-fir trees in the Warm Dry and Hot Dry plant association group stands in the commercial thinning units (approximately 3,000 acres) would be removed. Approximately 1,020 acres of thinning would occur within late and old structure stands. Connectivity would not be maintained between all late and old structure and old growth stands; however, approximately 3,260 acres of wildlife connectivity corridors would be designated.

Chapter 3 – Affected Environment and Environmental Consequences

Introduction

Chapter 3 summarizes the physical, biological, social, and economic environments of the Ragged Ruby planning area, the effects of implementing each alternative on these environments, and the scientific and analytical basis for the comparison of effects by alternative. In the development of the environmental analyses that follow, best available science was considered and is documented in the project record for each resource area. An environmental effect, impact, or consequence is defined as a modification of or change in the existing environment brought about by the action taken.

The Silviculture; Fire, Fuels, and Air Quality; Soils; Watershed; Aquatic Resources; Wildlife; Botanical Resources; Range; Non-native Invasive Plants; Heritage; Recreation; Visuals; Economics; Roads; and Special Areas reports are incorporated by reference into this draft environmental impact statement. The Ragged Ruby Project Draft Environmental Impact Statement contains summaries of the individual specialist reports; the full analysis is contained in the individual reports, which are available on the Forest's website at: https://www.fs.usda.gov/project/?project=49392.

Soils

Regulatory Framework

Forest Service Manual Pacific Northwest Region (Region 6) supplement number 2500.98-1 (USDA Forest Service 1998) says objectives of soil management are "To meet direction in the National Forest Management Act of 1976 and other legal mandates. To manage National Forest System lands ... without permanent impairment of land productivity and to maintain ... soil ... quality.... Soil quality is maintained when soil compaction, displacement, puddling, burning, erosion, loss of organic matter ... are maintained within defined standards and guidelines" (USDA Forest Service 1998). The Malheur Forest Plan implements this policy, so if an action maintains detrimental conditions within the standards of the Malheur Forest Plan, legal and regulatory requirements for soil protection would be met. Malheur Forest Plan Forest-wide standards 101, 103, 104, and 125-129 pertain to soil (USDA Forest Service 1990a). More detailed direction is in Forest Service Manual Pacific Northwest Region (Region 6) supplement number 2500.98-1 (USDA Forest Service 1998).

Forest-wide standard 126 stipulates that detrimental conditions, including roads, shall not exceed 20 percent (USDA Forest Service 1990a). Since an average of 3 percent of the total area of proposed units is in roads, the limit for detrimental conditions, excluding roads, is 17 percent.

Organic Act of 1897

Compliance requires that favorable conditions of water flow be secured, and a continuous supply of timber be furnished.

Multiple-Use Sustained-Yield Act of 1960

Compliance requires that management not impair productivity of the land.

National Forest Management Act of 1976

Compliance requires that soil be protected and timber harvests occur only on lands where soil or other watershed conditions will not be irreversibly damaged. (Portions of the National Forest Management Act relevant to the soil resource are amendments to the Forest and Rangeland Renewable Resources Planning Act of 1974.)

Resource Indicators

Issue Statements

- Malheur Forest Plan standard 126 requires total acreage of detrimental impacts to remain under 20 percent (17 percent, excluding roads) within a given activity area. Previous management activities have occurred within the units, and it is possible that total detrimental impacts from this entry plus previous entries would exceed 17 percent (soil quality).
- Forest management activities can cause soil disturbance leading to an increased risk of erosion. It is possible that sediment from erosion could decrease water quality. In addition, if erosion occurs on sensitive scab soils, it is possible that the productivity of these areas could be permanently impaired (erosion).
- Forest management activities can alter the quantity of organic matter and nutrients on site, possibly degrading productivity to an unacceptable level (organic matter and nutrients).

Resource elements, indicators, and measures for assessing the effects to soils are presented in Table 5.

Table 5. Resource elements, indicators, and measures for assessing effects to soils

Resource element	Resource indicator	Measure	Source
Soil quality	Detrimental impacts (compaction, displacement, detrimental burning, puddling)	Number of units that do not meet the standard	Malheur Forest Plan Forest-wide standard 126 (USDA Forest Service 1990a)
Soil erosion – sediment export	Sediment exported from units	Amount of sediment that reaches streams, from soil in units	National best management practices for water quality management on National Forest System lands, volume 1, page 131 (USDA Forest Service 2012)
Soil erosion – land productivity	Permanent impairment of land productivity	Erosion resulting from activities on highly erodible soil	Forest Service Manual Region 6 Supplement Number 2500.98-1. (USDA Forest Service 1998) Malheur Forest Plan Forest-wide standards 103 and 127 (USDA Forest Service 1990a)
Organic matter and nutrients	Amount (pounds per acre) of organic matter and nutrients	Amount of organic matter and nutrients, compared to natural amounts	Public interest

Soil Quality

Affected Environment

Methodology

Soil Types

The best available source of information about the location of soil types within the planning area is the terrestrial ecological unit inventory. The terrestrial ecological unit inventory is a digital map layer and associated database.

Detrimental Soil Conditions

Technicians trained by a soil scientist did soil assessments in all stands that met the following criteria: (1) mostly less than 45 percent slope; (2) outside riparian habitat conservation areas, old growth areas, and roadless areas; (3) larger than 20 acres; and (4) appeared in satellite photos to have timber densities sufficient for commercial logging. Assessments were done in the summer of 2015, during which technicians collected semi-quantitative information about impacts from past and ongoing activities and inspected the stands to determine if special project design criteria would be required to protect soil. Soil assessments reveal all impacts from past and ongoing activities listed in Appendix E – Past, Ongoing, and Reasonably Foreseeable Actions, including timber harvest, roads, fuel treatments, fire suppression, livestock grazing, off-highway vehicle use, firewood cutting, and other past and ongoing activities. Seventy-nine percent of the proposed ground-based commercial harvest acres are in units in which had soil assessments. Of the units that lacked soil assessments, 81 percent of the acres have not been logged in the past few decades, and thus are likely to have mostly recovered from previous logging.

Units 68, 196, and 338 are unusually heterogeneous, in terms of existing detrimental impacts. In these units, certain stands have very different existing detrimental impacts from one another. For instance, in unit 338, one stand has detrimental conditions of 2 percent whereas the other stand has detrimental conditions of 9 percent. Since these units were formed by joining disparate vegetation stands together, it would be misleading to treat all parts of these units as if existing detrimental impacts are uniform over the whole unit. So units 68, 196, and 338 were divided into subunits for purposes of soil analysis and soil design criteria. Locations of the subunits are available in the project record.

Existing Condition

Soil Types

Soils vary in their response to logging, based on such factors as the presence of a volcanic ash cap, rockiness, geology, texture, and soil depth. Maps of ash cap soils, scab soils, clayey soils, mollic soils, geology derived from the terrestrial ecological unit inventory, and slope steepness are in the appendix to the Ragged Ruby Soils Report.

The presence of a volcanic ash cap causes important differences in soils. Most soils in the Blue Mountains are influenced by ash, but soils with a distinct cap of ash differ from soils where ash has been partially eroded away or mixed with the residual soil (called here "mixed ash"), because typically ash cap soils have more total ash than mixed ash soils. Ash cap soil tends to be more easily displaced and compacted than mixed ash soil, in part because rock provides some protection. Unlike mixed ash soils, ash cap soils are susceptible to "aerial displacement" when the soil is very dry and machines raise a dust cloud. Ash cap soils cover about 54 percent of the planning area. Ash cap soils tend to occur on north- and east-facing slopes, so they are abundant south of the Middle Fork John Day River, except at the west end of the planning area. North of the river, ash cap soils are common at mid-elevations between about 5,000 and 6,500 feet. A map of ash cap soils is available in the appendix to the Ragged Ruby Soils Report.

Some variation in soils is caused by varying rock types. Table 6 shows rock types in the planning area.

Table 6. Major rock types in the Ragged Ruby planning area

Rock type	Percent of planning area	Typical textures	Approximate general location[1]
Clay forming rocks of Clarno formation	39	Clay and clay loam	Mostly within 2 miles of Middle Fork John Day River.
Metasediments and Metavolcanics	29	Loam and silt loam	A band starting about 2 miles northwest from the Middle Fork John Day River extending 2 to 3 miles uphill; and upper Butte and Ruby creeks.
Andesite and basalt	18	Loam and clay loam	Coyote, upper Sunshine, and upper Butte creeks.
Granite	6	Sand and sandy loam	Sunrise Butte; and between upper Ragged and upper Ruby creeks.

1. A geology map derived from the terrestrial ecological unit inventory is available in the appendix to the Ragged Ruby Soils Report.

The Clarno formation includes conglomerates of cobbles and boulders in a tuffaceous matrix[14], volcanic mudflow breccias, tuff, andesite, and basalt. Tuffs and breccias weather to clays. Soils high in clay tend to retain water instead of letting it percolate through, resulting in long-lasting saturation. Saturated soil is inappropriate for machine traffic, because it is susceptible to compaction and puddling. A map of clay soils is available in the appendix to the Ragged Ruby Soils Report.

Grassland soils occur in the planning area. Grassland soils are called Mollisols. Mollisols have thick, dark topsoil, resulting from the fact that many grasses and forbs put more organic matter below ground than trees do. In the planning area, Mollisols generally formed in non-forest areas, or in open park-like stands, with abundant grasses and forbs between widely-spaced conifers. Mollisols are concentrated in the lower third of the planning area. A map of mollic soils is available in the appendix to the Ragged Ruby Soils Report. Although fire suppression and other activities have led to denser forest canopies and less abundant grasses and forb, the Mollisols persist and can indicate pre-management vegetation. Consequently, areas dominated by Mollisols are good targets to restore to these open, park-like conditions.

Steep soils tend to be more easily displaced and compacted than less steep soils. However, flatter areas sometimes are more compacted and displaced because on flatter areas skidders have greater freedom of movement and thus strayed from skid trails more, impacting a greater area. In general, slopes are lower in the middle of the planning area and increase with distance from the Middle Fork John Day River. Slopes steeper than 40 percent are common more than 2 miles from the Middle Fork John Day River. A slope steepness map is available in the appendix to the Ragged Ruby Soils Report.

[14] Tuffaceous matrix is the sedimentary rock derived from tuff in which the cobbles and boulders are embedded.

Detrimental Soil Conditions

Table 7 shows existing detrimental conditions on all units in which existing detrimental conditions exceed 6 percent. These units are a relatively small proportion of the total number of units where commercial logging is proposed. Existing detrimental conditions range from 0 to 12 percent. Most detrimental impacts are from compaction and associated puddling, and also some displacement. In a few units, detrimentally burned soil occupies up to 2 percent of the area. Many units have recovered from previous logging, because decades have passed since these units were last logged. Some units were never heavily impacted because they happened to be logged under winter or dry conditions. Units with less than 6 percent existing detrimental conditions are not included in Table 7, because the general project design criteria ensure those units would have less than 17 percent cumulative detrimental conditions.

Table 7. Existing condition, cumulative effects, and special project design criteria for all units with 7 percent or more existing detrimental conditions (percentages shown do not include roads)

Unit[1]	Existing detrimental conditions, percent of unit	Post project cumulative detrimental conditions, percent of unit	Special project design criteria[2]
30	6	15	-
36 T	7	16	b
64	12	17	b, d
66	11	17	b
68.1	8	16	-
68.2	12	17	b, d
70	8	16	-
72	8	17	-
74, 76, 78, 80	8	17	-
82 T	6	16	-
172	9	17	b, s
194	10	17	b, s
196.1	8	17	b
304	6	17	-
306	6	16	-
338.2	9	17	b, s
342	8	17	b
370	7	16	-
400	6	16	-

1. Units numbers followed by a “T” indicate the tractor part of a unit, which also includes skyline parts. Decimal unit numbers, such as 68.1, denote subunits. See explanation in Methodology section.
2. For a complete description, see Appendix C – Project Design Criteria.
   b = no biomass harvest except at the time of logging, or a more protective measure
   d = dry soil, or a more protective measure
   s = subsoiling of landings, or a more protective measure

Environmental Consequences

Methodology

The project soils specialist has formed professional judgments on probable effects. Professional judgments are based on monitoring, personal observation (including observation in similar areas), scientific literature, and professional contacts. These professional judgments are summarized in the Quantitative Logging Effects on Detrimental Soil Conditions document in the project record. Briefly, effects are calculated based on existing condition, volume to be removed, biomass removal, the amount of draws, the amount of slopes steeper than 35 percent, the presence of a volcanic ash cap and coarse fragments, the amount of uphill skidding, and the presence of short skid trails. However, quantitative effects can be predicted only roughly. Soil science is not advanced enough to make precise predictions. In addition, effects of management depend on unknowns, such as weather, details of implementation, and whether a wildfire would occur.

Spatial and Temporal Context for Effects Analysis

The spatial context for effects analysis is each proposed unit. Unless otherwise noted, the temporal context is after operations cease.

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

Past and present activities relevant to soil cumulative effects analysis listed in Appendix E – Past, Ongoing, and Reasonably Foreseeable Actions include timber harvest, roads, and fuel treatments. Soil assessments indicate that fire suppression, wildfires, prescribed fire, livestock grazing, off-highway vehicle use, firewood cutting, historical mining, riparian restoration, plantation maintenance, invasive plant treatments, and other past and ongoing activities have negligible effects on soil in proposed harvest units.

None of the foreseeable actions, including the Malheur Travel Management Plan or activities authorized under the Aquatic Restoration Decision (USDA Forest Service 2014b), are likely to meaningfully impact soil.

Alternative 1 – No Action

Direct and Indirect Effects

Alternative 1 would cause no detrimental soil quality effects. Existing detrimental effects would slowly decrease over decades due to growing roots, burrowing animals (including arthropods), and freezing water.

Cumulative Effects

Because there would be no direct or indirect effects, there would be no cumulative effects.

Alternatives 2 and 3

Direct and Indirect Effects

Temporary Roads

Temporary road construction and use would displace and compact some soil. Detrimental impacts due to temporary roads would be small because temporary roads occupy only small areas in the units. This small effect was calculated in the effects shown in Table 7. Rehabilitation of temporary roads may include subsoiling. On subsoiled temporary road segments, perhaps 60 percent the area of the roads would be in a restored condition. On unsubsoiled roads, soil productivity would be restored over the course of a few decades.

Skidder Logging

Steep slopes are more susceptible than less steep slopes to displacement and erosion from ground-based machinery. Waterbar construction often causes displacement, and more waterbars are needed on steep slopes. Also, wheels on heavy equipment going up steep slopes are more liable to slip and dig into the soil. This effect is especially likely when the extra weight of logs is added to the equipment weight (uphill skidding). In addition, due to the tilt of the machinery on steep slopes, more weight is put on downhill wheels, which can cause more compaction.

Skidding bares soil, decreases infiltration, and channels overland flow, which accelerates erosion particularly on steep slopes. However, skidding would cause negligible sediment export from the units, despite sediment movement within units. Sediment is normally deposited less than 15 feet downslope from skid trails, as the water is slowed by ground cover and percolates into the soil. This is true even on slopes up to 45 percent. Usually erosion of skid trails decreases through 1 to 3 years, until it stops.

The experience of the project soil specialist indicates that damage by logging on steep slopes, using the design criteria, is acceptable because only moderate amounts of displacement occur, and because of the small size of the area affected. Displacement and erosion from steep slope skidding would be limited, because slopes steeper than 35 percent occupy a relatively small proportion of most units. Design criteria, such as directional felling and winching would also help limit displacement and erosion. Decreased productivity due to severe displacement and erosion can last for hundreds of years. Design criteria that effectively control displacement and erosion include a prohibition on skidding on highly erodible soil, a prohibition on skidding on steep slopes (greater than 44 percent downhill, greater than 35 percent uphill), limitations on skidding in draws, and waterbar requirements.

Much of the skid trail area would be compacted, and some of the soil tracked only once or twice would be compacted. Compaction usually lasts more than 20 years; some compaction lasts more than 50 years. Design criteria effective at limiting compaction include requiring skid trails to be widely spaced, reusing existing skid trails where appropriate, prohibiting skidding under wet conditions, and allowing only low ground pressure machinery off of skid trails. The design criteria would keep compaction to a practical minimum and Malheur Forest Plan standards likely would be met in all units.

Landings are severely impacted. The design criterion that encourages re-use of appropriately located landings would keep these impacts to a minimum.

Some harvest would occur in areas with moister soil, such as aspen stands and other moist areas in uplands. Moister soils are more susceptible to compaction and puddling. However, the design criterion that bans ruts deeper than 6 inches, would limit operations on wet soil.

For nine units, the increase in detrimental impacts would be partially offset by special design criteria (Table 7). These special design criteria are needed to keep the detrimental impacts at or below 17 percent.

Forwarder Logging and Biomass Harvest

Forwarder with harvester (cut-to-length) logging causes less impacts than skidder logging, due to the lower ground pressure of forwarders. Forwarders also tend to travel over slash, spreading the weight over a larger area. Forwarder with harvester logging systems increase detrimental impacts by only about 5 percent, and forwarder logging usually does not require landings, so impacts are less than from skidder logging.

Biomass harvest includes harvest of smaller material than normal logging (which is typically the harvest of logs larger than 7 to 9 inches diameter). The effect of biomass harvest in units without normal logging only adds about 4 percent to existing detrimental impacts, because it is usually done with forwarders, and the forwarders are not as heavily loaded as they would be with logs.

Effects of biomass harvest after logging depend on whether the logging systems for the normal logging and for the biomass harvest are the same. If they are the same, (and biomass harvest is done soon enough after the normal logging that skid trails can still be seen) biomass harvest would add about 1 percent more detrimental impacts. If logging systems for the normal logging and for the biomass harvest are not the same, biomass harvest would add about 3 percent more detrimental impacts. The difference between 3 percent and 1 percent is due to the fact that with different logging systems, the biomass harvest would make new forwarder or skid trails, whereas with the same logging systems the biomass harvest would use the same forwarder or skid trails.

Subsoiling or Winter Logging

Subsoiling may be used on units 64, 68.2, 172, 194, and 338.2 as described in project design criteria. Subsoiling would decrease detrimental impacts by about 60 percent, for the skid trails and landings that are subsoiled.

On units where winter logging is used, the increase in detrimental impacts would be only 30 percent of the increase expected under early summer conditions.

Skyline and Helicopter Logging

Skyline logging causes much less displacement, erosion, and compaction than tractor logging, detrimentally affecting about 1 to 2 percent of the area.

Helicopter logging causes almost no detrimental impacts within units, although helicopter landings tend to be large.

Yarding with Tops Attached and Prescribed Burning

These activities are not expected to change detrimental impacts from those expected otherwise. Yarding with tops attached would likely affect about the same amount of area as grapple piling. Prescribed burning would not detrimentally burn, compact, or displace soil.

Grapple Piling, Pile Burning, and Mastication

A project design criterion requires grapple piling and mastication machinery to have a low ground pressure, to operate on dry soil, and to operate on skid trails where feasible. With this design criterion, the project soils specialist expects grapple piling or mastication would compact about 1 percent of each unit where it is used. Feller bunchers of similar ground pressure operating off skid trails compacted about 1.5 percent of a unit in a monitoring study (McNeil 1996).

Soil beneath grapple piles would be detrimentally burned, taking many years to recover. However, the project soil specialist has rarely observed detrimentally burned soil that occupied more than 2 percent of a unit.

Tree Tipping In Upland Units

Tree tipping involves using heavy machinery to push over trees (leaving root wads attached), and then removing the tipped trees. If tipping and removal of trees for placement in riparian areas is used instead of logging in some units, the effects are expected to be less than those from logging because less wood volume would be removed, and because the same project design criteria would apply as for logging.

Summary of Logging and Mechanical Fuel Control on Soil Quality

As shown by the difference between "existing detrimental" and "cumulative detrimental" columns in Table 7, increases in detrimental impacts would be between 8 and 11 percent on units without special project design criteria. On units with special project design criteria, increases would range from 5 to 9 percent. If the unit happens to be harvested over deep snow or on deeply frozen soil, increase in compaction would be only about 30 percent of the predicted amount.

Detrimental impacts due to displacement, burning, and untreated compaction would recover over the course of several decades due to natural processes.

Other Proposed Activities

Table 8. Effect of proposed activities, other than logging and mechanical fuel control, on soil quality

Proposed activity	Increased detrimental impacts	Explanation
Prescribed burning and unplanned ignitions	negligible	Prescribed fire rarely burns hot enough and long enough to detrimentally burn soil.
Dry meadow and scabland flat bunchgrass restoration	small	Protection afforded by project design criterion Soil- RR PDC-18.
Aspen restoration	relatively small	Relatively low volume would be removed.
Bat gate installation	none	Use of existing road or pack stock.
Road maintenance, reconstruction, opening, or closure	none	Soil is already detrimentally impacted.
Rock pit use, disposal sites, decommissioning of open roads, and recreation system changes	negligible	Negligible acreage.
Non-commercial thinning including whitebark pine and western white pine restoration	negligible	Non-commercial so no heavy equipment.

Cumulative Effects

The spatial scale for effects analysis is each proposed unit. Unless otherwise noted, the temporal scale is after operations cease. Detrimental impacts from the proposed operations (logging including temporary roads and biomass harvest, subsoiling, and fuels control) add to impacts of past and ongoing actions. Table 7 "existing detrimental" column reveals all impacts on proposed units from past and ongoing activities, including timber harvest, fuel treatments, fire suppression, livestock grazing, firewood cutting, and off-highway vehicle use. The past and ongoing impacts from roads are accounted for by the decrease of the maximum allowable detrimental impacts from 20 percent to 17 percent. Table 7 "cumulative detrimental" column shows what the expected condition would be for units that have 7 percent or more existing impacts. Maximum cumulative detrimental impacts would be 17 percent. Thus the Malheur Forest Plan standard of 17 percent would be met in all units in all alternatives.

Livestock grazing and firewood cutting would continue to impact a negligible amount of soil in harvest units, as recovery from past use balances impacts from future use. The negligible detrimental impacts from off-highway vehicle use would decrease even more with implementation of the Malheur Travel Management Plan. Stream and riparian restoration under the Aquatic Restoration Decision (USDA Forest Service 2014b) probably would not affect much (if any) soil in proposed harvest units, but if so, the soil project design criteria in the Aquatic Restoration Environmental Assessment (USDA Forest Service 2014a), combined with those in Appendix C – Project Design Criteria, would provide sufficient soil protection to meet Malheur Forest Plan standards.

Other activities listed in Appendix E – Past, Ongoing, and Reasonably Foreseeable Actions, such as mining and recreation, would have negligible effect on soil quality in the units.

Soil Erosion

Affected Environment

Methodology

The best source of information about the location of soil types is the terrestrial ecological unit inventory. However, some spots of highly erodible soils are too small to be mapped in the terrestrial ecological unit inventory. Soil assessor technicians looked for spots of highly erodible soil in the forested stands they visited.

The following description of erosion is based on informal observations by the project soil scientist with 27 years of experience on the Malheur National Forest.

Existing Condition

Forested soils have abundant ground cover, so the potential for erosion normally exists only where ground cover has been removed or is naturally low.

Sensitive soil types include shallow, rocky soils supporting low amounts of ground cover, mainly in juniper woodlands or non-forested areas (scab soils). Scab soils cannot absorb much water, and thus produce overland flow. These soils tend to be erodible, and generally are not found in logging units, but can be adjacent to units and exist as inclusions within units. Scabs tend to be concentrated in the center of the planning area on either side of the Middle Fork John Day River, as well as the high elevations in the northeastern corner of the planning area. A map of scab soils is available in the appendix to the Ragged Ruby Soils Report.

Sheet and rill erosion appears to be a problem in the high elevation scab soils in the northeastern corner of the planning area in the vicinity of Sunrise Butte and Vinegar Hill; intense grazing around the turn of the 20th century initiated accelerated erosion in this area. After erosion is initiated, it can be self-maintaining, because erosion decreases plant productivity and ground cover, and decreased ground cover maintains erosion. The high elevation of these soils exacerbates the problem, because the cold climate decreases plant productivity, and the heavier rainfall is more erosive.

Serpentinite is a metavolcanic rock type that often forms scab soils. This is because serpentinite tends to form infertile soil, which decreases ground cover and increases erosion. A few hundred acres of serpentinite exists in the metavolcanic rocks near the head of Ruby Creek (Brooks et al. 1984). However, this serpentinite in the planning area did not form much scab soil, probably because the volcanic ash buried and ameliorated[15] the infertile serpentinite soil.

Erosion depends in part upon precipitation. Elevations range from about 3,600 feet near the confluence of Sunshine Creek with the Middle Fork John Day River to about 7,500 feet at the summit of Dixie Butte and about 8,100 feet at the summit of Vinegar Hill. Precipitation ranges from about 16 to 40 inches per year, depending on elevation.

See the Soil Quality section above for a description of some other important soil types.

Ash cap soils typically supply more water to plants, because: (1) ash holds relatively large amount of water, (2) ash cap soils are typically deeper, and (3) ash caps have less rock in the top soil than mixed ash soils. Thus ash cap soils are typically more productive than mixed ash and

[15] Ameliorate means that the ash improved the soil.

have abundant ground cover. Ash cap soils typically support mixed conifers including true fir, whereas mixed ash soil typically does not support true fir. In addition, ash cap soil has a high porosity and little clay, so it has a high infiltration rate. Because of the more extensive ground cover and higher infiltration rates, ash cap soils tend to produce less runoff, and thus the hazard of erosion on ash cap soils is less than other forested soils. However, if runoff does occur on ash cap soils, the soil particles are easily detached and eroded.

Areas with steeper slopes are more erodible than areas with flatter slopes. Erosion hazard of forest soils is low on slopes less than 30 percent, and moderate on slopes greater than 30 percent.

As described in the Soil Quality section above, Clarno formation tuffs and breccias tend to weather to clayey soil. When wet, clay has low bearing strength so slumps and small landslides are not uncommon in Clarno terrain. Numerous small failures have been located by the project hydrologist in the middle portion of the Beaver Creek drainage, and evidence of other small slumps appear along County Road 20 on the north side of the Middle Fork John Day River. Large landslides also exist. The terrestrial ecological unit inventory shows 250 acres of mass movement between the upper end of Cress and Horse creeks. The soil resource inventory (Carlson 1974) shows landslide deposits on 650 acres near Balance Creek, 410 acres near Dunston Creek, and 60 acres east of East Fork Coyote Creek. Brooks et al. (1984) identify a 50-acre landslide southeast of Ragged Rocks. Unmapped landslides probably also exist. Many of the landslides probably started during the ice ages, when there was abundant water and less vegetation. The landslides continue to slowly move downhill with shallow creep and slumps, often only several yards across. If roads are built on landslides, care is needed to avoid causing more movement. Unconsolidated landslide deposits can be a source of sediment to streams, but abundant vegetation supported by landslides and overlying volcanic ash help control soil erosion.

Environmental Consequences

Methodology

Effects of proposed actions on erosion are analyzed by the project soil scientist using professional judgement and information gathered from past monitoring on similar areas within the Malheur National Forest.

Spatial and Temporal Context for Effects Analysis

The spatial context for effects analysis is each proposed unit, and flow paths that might connect it to a stream. Unless otherwise noted, the temporal context is directly after operations cease, when effects are maximum.

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

Past and present activities relevant to soil cumulative effects analysis listed in Appendix E – Past, Ongoing, and Reasonably Foreseeable Actions are timber harvest, roads, and fuel treatments. Soil assessments indicate fire suppression, livestock grazing, off-highway vehicle use, firewood cutting, invasive plant treatments, and other past and ongoing activities have negligible effects on soil in proposed harvest units.

None of the foreseeable actions are likely to meaningfully impact soil.

Alternative 1 – No Action

Direct and Indirect Effects

Alternative 1 would cause no erosion. However, one consequence of alternative 1 is that the risk of a high-severity wildfire would continue to increase (see the Fire and Fuels section), increasing the hazard of soil erosion.

Cumulative Effects

Because there are no direct or indirect effects, no cumulative effects would occur.

Alternatives 2 and 3

Direct and Indirect Effects

Temporary Roads and Road Activities

During temporary road construction, use, and rehabilitation, and during road decommissioning, soil may be eroded from the road surface. The sediment would be deposited within 20 feet of the edge of the road. Subsoiling would slightly increase the erosion risk for about 2 years.

As described in the Watershed section, best management practices (USDA Forest Service 2012) would control erosion from road activities. Road closure would probably decrease road erosion within a few years because of less disturbance.

Skidder Logging

Erosion from skidder logging is closely related to displacement, compaction, and puddling, as described in the Soil Quality section above.

Forwarder Logging, Biomass Harvest, and Tree Tipping

As described in the Soil Quality section above, compaction, displacement, and puddling from forwarder logging, biomass harvest, and tree tipping is expected to be less than from skidder logging. In addition, the slash crushed in forwarder trails provides ground cover and roughness that further controls erosion, so erosion is expected to be less.

Subsoiling or Winter Logging

Subsoiling bares soil, forms channels, makes soil particles more easily detachable, and disrupts roots, thus raising the risk of erosion for a few years. However, subsoiling also increases infiltration which decreases the risk of erosion. This increased infiltration, and the subsoiling design criteria, would control sediment production so it would be negligible.

Winter logging greatly decreases detrimental impacts, and so decreases the potential for erosion.

Skyline and Helicopter Logging

Logs that drag during skyline logging can displace soil and concentrate erosive runoff in furrows. Required cross drains would divert runoff from the furrows, so the amount of erosion would be negligible, and soil would be unlikely to leave the unit.

Helicopter logging does not cause noticeable ground disturbance in units. However, helicopter landings tend to be large and heavily impacted, which could cause erosion. As described in the Watershed section, best management practices are expected to control this erosion.

Yarding with Tops Attached, Grapple Piling and Pile Burning, and Mastication

These activities are not expected to remove enough ground cover or cause enough rutting to change erosion.

Prescribed Burning and Unplanned Ignitions

Soil effects from prescribed burning would be minor. Ground cover would decrease, especially during fall burns. However, burning would be controlled so as to avoid decreasing ground cover below Malheur Forest Plan standards (Forest-wide standard 127), so erosion would not be meaningful. The ground cover would recover between 1 and 5 years.

Soil effects from fireline construction would be minor. Erosion would be controlled by a design criterion that requires waterbars and bans firelines that go down draw bottoms. Firelines impact a negligible area of soil.

Summary of Soil Erosion from Logging and Fuel Control

For alternatives 2 and 3, even under the highest erosion scenario (skidder logging), sediment is not expected to leave any unit, so no adverse effects on water quality are expected from activities in units. Furthermore, there would be no skidding on highly erodible soil, and thus no permanent impairment of land productivity is expected. Soil erosion resulting from any alternative would be negligible.

Dry Meadow and Scabland Flat Bunchgrass Restoration

For the first 5 or 10 years, these activities are expected to have negligible effects on erosion because the (1) small effects of machine traffic and (2) felled trees left on site, would counterbalance each other. After that, the additional ground cover from native herbaceous species may decrease erosion.

Other Proposed Activities

Table 9. Effect of certain proposed activities on soil erosion

Proposed activity	Erosion	Explanation
Aspen restoration	negligible	Relatively low volume removed, relatively rapid regrowth of ground cover, and best management practices and project design criteria for riparian habitat conservation areas would control erosion.
Bat gate installation	none	Use of existing road or pack stock.
Rock pit use, disposal sites, and recreation system changes	negligible	Best management practices and project design criteria would control erosion.
Non-commercial thinning including whitebark pine and western white pine restoration	negligible	Non-commercial so no heavy equipment use.

Cumulative Effects

The spatial context for effects analysis is each proposed unit, and flow paths that might connect it to a stream. Unless otherwise noted, the temporal context is directly after operations cease, when effects are maximum.

Scarifying roads during decommissioning under the Aquatic Restoration Decision would slightly increase the erosion risk for about 2 years. This risk would be controlled with revegetation and large woody debris. Only a few acres would be affected by road decommissioning. Thus erosion from road scarification is expected to be negligible. For large woody debris treatments, ARBO

II[16] requires that soil disturbance be confined to the minimum area and erosion be minimized. Other activities listed in Appendix E – Past, Ongoing, and Reasonably Foreseeable Actions, such as past timber harvest and recreation, would have negligible effect on soil erosion in the units.

As described in the Direct and Indirect Effects, Soil Erosion section above, the amount of soil erosion from the Ragged Ruby Project proposed activities (including temporary roads) is negligible. The additive, cumulative effects of the Ragged Ruby Project plus past, ongoing, and future projects on soil erosion also would be negligible because they are both so small and they occur on different parts of the planning area.

Organic Matter and Nutrients

Affected Environment

Methodology

Existing condition is inferred from the effects of processes that add and remove nutrients and organic matter from these sites.

Existing Condition

Fire usually decreases the total amount of nutrients on the land (pounds per acre) by volatilization and sometimes by wind and water erosion. However, easily available forms of some nutrients (particularly nitrogen and phosphorus) usually increase for a year or more after fire. Fire suppression has caused nutrients to accumulate from the atmosphere, from mineral weathering, and from nitrogen fixation (mostly by ceanothus). Organic matter and nutrients probably have accumulated above natural amounts, although this accumulation has been partially offset by nutrient removals during past logging and fuel treatments.

Prior to fire suppression, forest canopies were less dense than now, so grasses and forbs were more abundant. Grasses and forbs have more organic matter and nutrients in roots, whereas trees have more organic matter and nutrients above the mineral soil in wood, foliage, and forest floor (litter and duff). Consequently, before fire suppression, more organic matter and nutrients remained protected from fire in the topsoil, whereas now organic matter and nutrients are more exposed. In addition, fires of today have a greater tendency to be moderate to high severity (see Fire and Fuels section). Thus wildfires of today probably remove more organic matter and nutrients, both because more organic matter is exposed and because severe fires consume a greater percentage of the exposed organic matter.

Moderate and severe wildfires burned part of the planning area in 1994 and 1996, and enough organic matter and nutrients were consumed that amounts may have decreased below what existed before fire suppression. However, on many of these sites ceanothus has been fixing nitrogen and continues to do so.

[16] Programmatic biological opinion for aquatic restoration activities in the States of Oregon, Washington and portions of California, Idaho and Nevada (USDI FWS 2013).

Environmental Consequences

Methodology

Consequences for soil nutrients and organic matter are inferred from the effects of processes that add and remove nutrients and organic matter from these sites.

Spatial and Temporal Context for Effects Analysis

The spatial context for effects analysis is the proposed units. Unless otherwise noted, the temporal context is after operations cease, when effects would be greatest.

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

Past and present activities relevant to nutrients and organic matter listed in Appendix E – Past, Ongoing, and Reasonably Foreseeable Actions are timber harvest, fuel treatments, and wildfire suppression. None of the foreseeable actions are likely to meaningfully impact soil nutrients and organic matter in the units.

Alternative 1

Direct and Indirect Effects

Alternative 1 would cause no changes in the trends for forest floors and nutrients. Forest floors and nutrients have accumulated due to decades of fire suppression, and this trend would continue. However, one consequence of alternative 1 is that the risk of moderate- and high-severity wildfire would continue to increase. In addition, fire suppression has caused organic matter and nutrients to be more aboveground, exposed to fire. If a high-severity wildfire were to occur, much organic matter and nutrients would be volatilized, possibly decreasing the amount of organic matter and nutrients below amounts present before fire suppression.

Cumulative Effects

Because there are no direct or indirect effects, no cumulative effects would occur.

Alternatives 2 and 3

Direct and Indirect Effects

Logging, especially yarding with tops attached, biomass utilization, and tree tipping would remove nutrients and organic matter in logs and foliage, and pile burning, prescribed burning, and unplanned ignitions (including in non-commercial thinning units) would remove nutrients and organic matter during burning. This removal, especially of nitrogen, may decrease site productivity a few percent on some sites. However, on most sites, productivity is probably limited by water, not by nutrients or organic matter. Also most nutrients and organic matter would remain in the soil, in the remaining forest floor, and in remaining trees. So removal by logging and fire is expected to have minimal effects. Aspen restoration and dry meadow and scabland flat bunchgrass restoration would remove less nutrients and organic matter, and so would have less effect.

Bat gate installations, road activities, and recreation system changes would not remove nutrients or organic matter.

Cumulative Effects

Removing organic matter and nutrients by logging and fire would move many sites back toward their fertility status before fire suppression, because nutrient and organic matter loss in fires was common then. Under the action alternatives, more organic matter and nutrients would be cycled through the mineral soil and less through the forest floor. Before fire suppression, little dead wood existed, because low-severity fires likely burned it up. However, fires possibly left more nutrients on site than piling and burning of slash does. Because these high-frequency fire ecosystems have persisted for thousands of years with relatively thin forest floor and dead wood, these ecosystems are adapted to low levels of surface organic matter, so removal of some organic matter would have only a small adverse effect. Under the alternatives 2 and 3, more organic matter and nutrients would be cycled through the mineral soil and less through the forest floor, so organic matter and nutrients would be less liable to volatilize if a severe wildfire occurs.

Except for past and present logging and fire, activities listed in Appendix E – Past, Ongoing, and Reasonably Foreseeable Actions, such as grazing and recreation, would have negligible effect on nutrients and organic matter in the units.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

All alternatives would be consistent with Malheur Forest Plan soil protection standards. The following list shows specific Malheur Forest Plan Forest-wide standards (USDA Forest Service 1990a, pages IV-37 to IV-40) and how they are met in alternatives 2 and 3:

- Forest-wide standard 101: Harvest timber from slopes which are less than 35 percent using ground skidding equipment and from slopes greater than 35 percent using cable or aerial systems. Approve exceptions through the environmental analysis process, which will include a logging feasibility analysis.

  On patches with greater than 35 percent slope, where timber would be harvested using ground skidding equipment, it is not feasible to use cable or aerial systems, in most cases because the inclusions are small. A project design criterion prohibits ground based equipment on slopes greater than 45 percent.

- Forest-wide standard 103: Timber harvest is prohibited on lands classified as unsuitable for timber management . . .

  Lands unsuitable for timber harvest are not included in proposed units. A project design criterion prohibits skidding on small inclusions of highly erodible non-forest within units.

- Forest-wide standard 104: Restrict logging and post-sale operations when necessary to protect roads, soil, . . .

  A project design criterion prohibits logging and post-sale operations on soil that is too wet.

- Forest-wide standard 125: Evaluate the potential for soil displacement, compaction, puddling, mass wasting, and surface soil erosion for all ground-disturbing activities.

  As described in this analysis, the potential for detrimental soil impacts was evaluated by a combination of soil assessments, TEUI maps, topographic maps, monitoring of past activities, and professional judgement.

- Forest-wide standard 126: The total acreage of all detrimental soil conditions shall not exceed 20 percent of the total acreage within any activity area, including landings and system roads. . . .

  The evaluation of the potential for detrimental soil impacts indicates that standard project design criteria would keep detrimental soil impacts at or below 20 percent of the acreage (including roads) in most units. For the few units or sub-units where this is not true, special project design criteria were prescribed to reduce or ameliorate impacts so that this standard is met in all units.

- Forest-wide standard 127: [This standard gives minimum percent effective ground cover levels following land management activities, depending on soil erosion hazard class. For instance, for low erosion hazard class, the minimum effective ground cover is 30 to 40 percent in the second year following disturbance.]

  Burn bosses are aware of this standard, and would burn under conditions so as to meet it.

- Forest-wide standard 128: Seed a disturbed soil that occurs within 100 to 200 feet of a stream or areas further than 200 feet that could erode into a stream.

  This project would not disturb soil within 100 to 200 feet of streams.

- Forest-wide standard 129: Seed all skid trails with slopes greater than 20 percent.

  This standard would be met through these areas being naturally re-vegetated, for instance by plants that survive the traffic, by the seedbank, and by seeds brought in by wind or animals. If an area does not have adequate potential to naturally re-vegetate, then it would be seeded using a native seed mix.

As stated in the Regulatory Framework section, compliance with the Malheur Forest Plan means that the action alternatives meet all legal and regulatory requirements.

Watershed

Regulatory Framework

The regulatory framework is summarized in the Ragged Ruby Watershed Report. Malheur Forest Plan goals, objectives, and standards address: (1) the provisions for favorable water flow (quantity, quality, and timing); (2) compliance with the Clean Water Act (by meeting the water quality standards established by the State of Oregon), compliance with the State of Oregon guidance (for protecting the waters of the State using watershed best management practices), and implementation of the State Water Quality Management Plan; (3) management of riparian areas to protect or enhance their value for water quality, fish habitat, wildlife, and other uses based on current vegetative conditions and a schedule to move them toward the desired condition; (4) the need for soil and water improvement activities; (5) integration of mitigation into management activities; (6) rehabilitation of disturbed areas; and (7) analysis of site-specific water quality effects as part of project planning and watershed cumulative effects where they are identified as an issue.

The Malheur Forest Plan established management area 3B – Anadromous Riparian Areas to address many of the goals, objectives, and standards above. Two amendments to the Malheur Forest Plan, Amendment 29 and PACFISH, amended Forest-wide and management area 3B objectives and standards in various ways as described in the Ragged Ruby Watershed Report.

Amendment 29 and PACFISH established riparian management objectives, some of which overlap; where riparian management objectives overlap, those in Amendment 29 are considered more protective than those in PACFISH because they are based on local information. PACFISH also establishes standard width riparian habitat conservation areas as described in chapter 2 that do not exactly correspond with the management area 3B buffers described in the original Malheur Forest Plan. Riparian habitat conservation areas are composed of an inner core of management area 3B and an outer band allocated to at least one other management area. Management area 3B also includes "those Class IV streams and upland areas, which have high water table conditions during some parts of the growing season. Class IV channels will be recognized as the important link between uplands and the downslope perennial streams. They will be managed to ensure bank and channel stability" and are considered to include ephemeral draws in the Ragged Ruby planning area.

Key ephemeral draws are buffered under the Malheur Forest Plan to maintain (bank) stability and to prevent erosion. Generally, buffers are about 5 to 15 feet wide on either side of the identified draws, depending on draw condition and adjacent, proposed activities. Ephemeral draws are identified on the Malheur National Forest's Class 5 Ephemeral Draw feature set in the geographic information system.

Management area 3B, but not riparian habitat conservation area, also includes "dry" quaking aspen stands. Aspen are protected under either the Unique Habitat Wildlife Malheur Forest Plan standard for drier stands or as category 3 or 4 wetlands, depending on classification of the stand.

Because the methodology sections for determining the existing condition and the effects of the alternatives are similar for each issue, they are summarized by issue, rather than separately for the Affected Environment and Effects sections of each issue.

Resource Indicators

Two analysis issues, Watershed Condition and Water Quality – Temperature are identified in the Ragged Ruby Watershed Report. Issue statements are:

- Watershed condition (processes, functions, and condition): As described in the Existing Condition section, overland and streamflow leave the planning area at accelerated rates and under modified timing regimes due to alterations in hydrologic processes, functions, and condition, caused by past management activities implemented before the application of watershed best management practices. These conditions are likely to persist for centuries in the absence of active restoration. Proposed activities would create additional ground disturbance and connections that may further increase the magnitude and intensity of, and further modify the duration and timing of overland flow. A few of the proposed activities, such as trail relocation and scabland restoration may decrease the magnitude, intensity, and duration of runoff, increase infiltration, and improve water quality.
- Water quality – temperature: Altered landscape conditions have also impaired water quality in some streams by converting runoff that would infiltrate into overland flow that leaves the landscape at an accelerated rate, altering flow timing and quantity. Streams were included on the State of Oregon Department of Environmental Quality's Clean Water Act section 303(d) list of Water Quality Impaired Waterbodies in the 1990s and 2000s for either of two beneficial uses related to fish and stream temperature. Streams were reclassified as "water quality limited, [Total maximum daily

load] TMDL approved[17]" after the John Day Basin Total Maximum Daily Load and Water Quality Management Plan was completed in 2010 (ODEQ 2010). Factors affecting temperature in streams with impaired water quality may include alterations to watershed condition resulting from changes in ground disturbance, overland flows, or other environmental factors resulting from proposed or alternative activities.

Resource Elements, Indicators, and Measures are identified as shown in Table 10.

Table 10. Resource elements, indicators, and measures for assessing effects to watershed resources

Resource element	Resource indicator	Measure	Source
Watershed condition (processes, functions, and condition)	Area on which disturbance (exposure of mineral soil and detrimental soil conditions) from proposed activities is occurring and which contributes to composite watershed hazard	• Logging system (acres) • Temporary roads (miles) • Change in composite watershed hazard based on change in hazard by landscape element (qualitative)	Malheur Forest Plan standards and guidelines (USDA Forest Service 1990a) (Reid 1993)
Water quality	Oregon Department of Environmental Quality category	Change in category classification	Malheur Forest Plan standards and guidelines (USDA Forest Service 1990a); Clean Water Act

Watershed Condition

Affected Environment

Methodology

Watershed condition was chosen as a watershed analysis issue and resource element because these two subwatersheds were evaluated as functional-at-risk under the Watershed Condition Framework (USDA Forest Service 2011b). Watershed condition is defined as the state of the physical and biological characteristics and processes within a watershed that affect the hydrologic and soil functions supporting aquatic ecosystems" (USDA Forest Service 2011a). The methodology used to describe existing condition and analyze effects of the proposed activities on watershed condition is similar, and both are summarized in this section.

The functioning-at-risk rating is based on the inherent characteristics of the physiographic region in which the project is located, the presence of legacy conditions resulting from over a century of management activities (many of which were implemented prior to the development and application of watershed best management practices), and the interactions between these that affect watershed processes and functions. Watershed processes and functions that operate at the project-scale are described by landscape element due to the complexity of interactions and to demonstrate connectivity. Watershed hazard is used to summarize processes across landscape elements from ridgetops to streamflow due to the presence of legacy conditions. Watershed condition, processes, and function result from complex interactions among the landscape characteristics of the planning area and other physical parameters like climate, geology, topography, and soils that drive the hydrologic cycle. The concept of watershed hazard

[17] Please see http://www/deq/state.or.us/wq/assessment/rpt2010/results.asp.

incorporates the five important characteristics' of properly functioning watersheds that are relevant in the planning area landscape.

Similar to other earth scientists, watershed specialists assess and interpret available information, and then integrate it, based on knowledge of basic principles of hydrology and watershed science, with the physical and biological characteristics of the landscape, and with information interpolated from other sources, in order to describe watershed condition. Using this approach allows for maximum use of available information while recognizing that watershed science is not exact; few data are available because of the inherent difficulties of collecting hydrologic and other watershed-related data and the complexity and variability inherent to the discipline. In particular, the geology of the planning area is complex; it differs from that commonly associated with the Blue Mountains physiographic province. The climate is also distinctive. Integrating these factors across the landscape from ridgetop to stream channel and streamflow results in a reasoned understanding of watershed condition.

The landscape elements are: (1) hillslopes and ephemeral swales, management area 3B, riparian habitat conservation areas, valleys, and ephemeral draws; stream banks, stream channels, and ephemeral draws; water quantity and timing, hydrologic response, and ground water recharge; and (2) water quality. These elements are similar to some of the watershed condition indicators, adjusted for the characteristics of the planning area (USDA Forest Service 2011a). The analysis focuses on hillslopes and ephemeral draws where most of the activities are proposed. The analysis also focuses on areas considered sensitive to disturbance, which include management area 3B and riparian habitat conservation areas, valleys, and ephemeral draws. Assumptions made in this analysis are presented in the Ragged Ruby Watershed Report.

General water quality is considered as part of watershed condition in order to provide information about how it is affected by watershed processes and functions. Water quality – temperature is used as an independent issue and resource element later in this analysis.

The concept of watershed hazard is also used to summarize watershed condition. Natural watershed hazard is based on the inherent characteristics of the physical parameters and the innate characteristics of the landscape elements in the planning area. Composite watershed hazard is based on natural watershed hazard as modified by the incorporation of these alterations.

Assumptions made in this analysis are presented in the Ragged Ruby Watershed Report.

The planning area includes portions of the Granite Boulder Creek – Middle Fork John Day River and Balance Creek – Middle Fork John Day River subwatersheds that lie within the administrative boundary of the Malheur National Forest or the Umatilla National Forest and small portions of adjacent subwatersheds where connected actions are proposed, called "connected subwatersheds" in this analysis.

Incomplete and Unavailable Information

Extensive hydrological and watershed data are unavailable because comprehensive, detailed assessments have not been completed. Also watershed science is not exact and few data are available. The common practice for watershed specialists, like other earth scientists, is to integrate available information with knowledge of basic principles of watershed science and with the physical and biological characteristics of the landscape. Integrating these factors results in a reasoned understanding of watershed processes, functions, and condition. This understanding can be used to evaluate effects of proposed activities. For the Ragged Ruby Project, this understanding is laid out in the Existing Condition section, which forms the basis for the comparison of alternatives. This process of integration of available information with basic principles is consistent with 40 Code of Federal Regulations 1502.22 (Incomplete or unavailable information).

Spatial and Temporal Context for Effects Analysis

The direct and indirect effects of the proposed or alternative activities on watershed conditions (process, functions, and condition) and hazard will be analyzed.

Existing Condition

Hillslopes and Ephemeral Swales

The influence of soils on watershed functioning and their relative condition are described in the Ragged Ruby Watershed Report. Various soils tend to have flashy hydrologic responses when precipitation or snowmelt exceed infiltration rates, storage capacity, or transmissivity rates.

Roads are a common disturbance on hillslopes and swales. Generally, three mechanisms cause most disturbance related to roads: erosion, interception and rerouting of subsurface flow, and concentrating and routing of overland flow. The first two are common in many forested environments as discussed in the literature. The third (concentration and routing of overland flow) is common and of particular concern in this climate and geology, but uncommon in other areas. Descriptions of road condition are provided in the Ragged Ruby Watershed Report where log or biomass haul is proposed, roads are proposed for closing or decommissioning, or where temporary roads are proposed. Rutting and other conditions that may concentrate overland flow were observed on about 35 of the 140 roads on which haul is proposed. About 10 percent of the roads proposed for haul are considered less impactive on watershed functioning than the “typical” road because they are grown in. Temporary roads are proposed for locations on undisturbed hillslopes and on former road templates where natural or passive decommissioning was initiated about 20 years ago.

Trail changes are proposed for about 17 segments of trail. Proposed changes include co-location of trails on existing road segments, decommissioning of segments, new construction of generally short trail segments, and decommissioning of trail segments. Most changes are proposed for trail segments in or near the Vinegar Hill-Indian Rock Scenic Area in the Greenhorn Mountain Inventoried Roadless Area or along the western portion of the Davis Creek Trail with improvements proposed for the eastern and central portions of that trail.

Management Area 3B, Riparian Habitat Conservation Areas, Valleys, and Ephemeral Draws

PACFISH standard-width riparian habitat conservation areas were identified for the planning area and for the connected subwatersheds where activities are proposed; on average they comprise less than 10 percent of the area. Most management area 3B is incorporated within riparian habitat conservation areas. Two exceptions are ephemeral draws and aspen stands. Ephemeral draws form the link between the hillslopes and the drainage network and are discussed in more detail in the Streambanks, Stream Channels, and Ephemeral Draws section below.

About eight kinds of activities are proposed for these areas ranging from non-commercial thinning to haul to trail activities. Heavy in-growth of conifers, similar to the adjacent hillslope forest, is common in these areas. Aspen conditions are described in chapter 3, Forest Vegetation section. Balance Lake is a natural lake formed by a large ancient landslide that originated near the southwestern ridge crest that forms the planning area boundary. Based on informal observations over about two decades, the lake is continuing to fill naturally with sediment; aquatic and riparian plants are colonizing the shallower waters.

For the purposes of this analysis, riparian roads are defined as roads located within riparian habitat conservation areas, many of which are proposed for haul. About 30 percent of the roads within the planning area include riparian segments. Roads may be located on lower hillslopes or toeslopes, immediately adjacent to and encroaching on stream channels within defined channels, or in draw bottoms. See Ragged Ruby Aquatic Resources Report for descriptions of road densities. The mechanisms by which these roads affect watershed function are similar to those described for hillslope roads and include concentrations of overland flow, erosion (due to multiple factors, at the road surface), and interception of subsurface flow; these account for a substantial portion of the watershed disturbance and hazard associated with riparian roads. Rutting and other conditions that may concentrate overland flow were observed on about 25 percent of the riparian roads on which haul is proposed. About 25 percent of the roads proposed for haul are considered less impactive on watershed functioning than the “typical” road because they are grown in. The proposed activities include installing portions of six temporary roads in riparian habitat conservation areas with five of the locations reusing former road templates and one location proposed for an undisturbed location. Descriptions of road condition where log or biomass haul is proposed, roads are proposed for closing or decommissioning, or where temporary roads are proposed are provided in the Ragged Ruby Watershed Report.

Trail changes are proposed in about 10 riparian habitat conservation areas. Proposed changes range from undesignating or decommissioning trail segments to new construction of generally short trail segments to hardening or otherwise improving approaches to stream crossings. Most changes are proposed for trail segments in or near the Vinegar Hill-Indian Rock Scenic Area in the Greenhorn Mountain Inventoried Roadless Area or along the western portion of the Davis Creek Trail with improvements proposed for the eastern and central portions of that trail.

Stream Banks, Stream Channels, and Ephemeral Draws

Stream channels, including beds and banks, are highly altered due to ongoing activities and legacy conditions. Ephemeral draw conditions are also altered. Alterations differ based on physiographic characteristics, especially aspect, but most commonly affect the concentration and timing of overland flow into the drainage network. Haul is proposed at about 123 of the nearly 200 stream crossings in the 2 planning area subwatersheds and at about 6 locations where seeps or overland flow originating at seeps is present. Stream crossings increase watershed hazard because culverts commonly constrain channels and limit access to floodplains where the energy of high flows is dissipated. Minor to major rutting or similar drainage concerns are present at about 17 of the 123 crossings proposed for haul. Trail changes are proposed at about 5 stream crossing locations; improvements are proposed at about 12 crossings on the Davis Creek Trail.

Water Quantity and Timing

The streamflow regime is inherently highly variable due to the range of physiographic conditions in the planning area. It generally consists of snowmelt dominated and controlled by elevation. It is differentiated on the two sides of the river by influences attributed to topography and aspect.

Quantity and timing of runoff has been altered by legacy activities that exposed mineral soil, decreased infiltration, intercepted subsurface flow, increased overland flow, or reduced floodplain and in-channel storage, and by persisting conditions. Past activities that altered upland

and ephemeral draw soils and simplified valley and channel conditions (as described elsewhere in this section) are roads influencing the timing and duration of runoff. Roading and reduction of channel and valley local hyporheic[18] and floodplain storage have altered the watershed’s ability to capture, store, and safely release runoff without alteration in timing and duration. This is characterized primarily by acceleration in rates accompanied by an increase in magnitude, both of which are indicators of elevated watershed hazard.

Studies from areas with different climates and soils indicate that timber harvest may influence runoff. Helvey and Fowler (1995) found that peak flows resulting from snowmelt do not increase following the creation of hydrologic openings in 90 percent of an area from timber harvest on a nearby forest. Results for the creation of openings in which more than 90 percent of trees have been removed are mixed, depending on the method of analysis. They also found that peak flows from snowmelt occur earlier when openings are created. A cursory review of past timber harvests indicates that created openings are below these thresholds.

The hydrologic response is based on a balance of accumulation of snow and other moisture and the mechanisms and volumes by which it is released and distributed, which are highly variable and somewhat controlled by elevation and weather events. Patterns of snowmelt and rapidly increasing streamflow are often more variable, less abrupt, and more limited in magnitude than in other locales due to physiographic characteristics.

The effect of wet convection storms (thunderstorms) on streamflow may range from negligible to substantial, depending on a number of factors related to the storm. Similarly, the effect of storms on streamflow in the planning area is variable because storms often track either downstream (to the north) or across the watershed (to the east), resulting in either more pronounced or more moderate effects on streamflow.

The primary areas for ground water recharge are ephemeral draws (USDA Forest Service 2007b). Ground water transmission in the planning area is likely complex due to the complexity of the geology associated with island arc terranes[19] (Gannett 1984).

Water Quality

The water quality parameter that is not met in the planning area is stream temperature, which is based on a beneficial use of fish habitat with various fish life cycle requirements. Based on this information, water quality – temperature was selected for another resource element for this environmental analysis and is addressed in its own section. Although legacy disturbance has not caused conditions that have resulted in additional water quality listings by Oregon Department of Environmental Quality, the reduction of channel and valley local hyporheic and floodplain storage has altered the watershed’s ability to capture, store, and safely release runoff without alteration in timing and duration. These are characterized primarily by acceleration in rates of runoff accompanied by an increase in magnitude, both of which are indicators of elevated watershed hazard that may result in water quality concerns.

Greenhorn Mountain Inventoried Roadless Area

The boundary of the Greenhorn Mountain Inventoried Roadless Area in the Granite Boulder Creek – Middle Fork John Day subwatershed appears to have been drawn intentionally to

[18] Hyporheic denotes an area or ecosystem beneath the bed of a river or stream that is saturated with water and that supports invertebrate fauna which play a role in the larger ecosystem.
[19] Island arc terrane refers to a fragment of crustal material formed on, or broken off from one tectonic plate and accreted or "sutured" to crust lying on another plate.

include the granodiorite ("granitic") soils at the ridge crest. Although these granitics are not as decomposed as those of the Idaho Batholith, their characteristics still include a vulnerability to overland flow concentration and gully erosion ("unzipping") when runoff events exceed infiltration capacity. This vulnerability increases when alterations occur that decrease infiltration capacity. Fred Hall (1973) identified shifts in vegetation from native to non-native species, typical of historical overgrazing dating from before and just after the Malheur National Forest was established in 1907. This shift, along with observations of reduced organic matter, pedestaling, gullying, and erosion to foliating bedrock on steeper slopes in the Beaver Creek drainage, in Lemon Creek and other parts of the Granite Boulder Creek drainage, and in adjacent, connected subwatersheds, increases the low-to-moderate watershed hazard of this area to moderate. The combination of altered processes and the location at the top of the ridge has produced uncharacteristic sheet and rill erosion, where multiple shallow rills widened in a lattice-like fashion to form sheets of erosion, and also eroded additional armored pathways elsewhere that now concentrate overland flow. These conditions, along with intensive rainfall, were the primary factors contributing to the initiation of debris torrents in Lemon and Beaver creeks in September 1998, and in Wray and Badger creeks in the adjacent connected Big Boulder Creek subwatershed in September and July 1998, respectively. Gullies, probably related to early mining practices, are also present. The granitic soils at high elevations are considered cryptic (cold) and "droughty" (sandy); reestablishing vegetation is difficult under the area's climate, southerly aspect, and excessively drained soils. Natural watershed hazard is considered low-to-moderate due to the sensitivity of the soils, difficulty in establishing vegetation, and climate. Composite watershed hazard is considered moderate plus due to the extensive and persistent alteration.

Dixie Butte Inventoried Roadless Area

Although a substantial portion of the Dixie Butte Inventoried Roadless Area also lies on granodiorite bedrock and soils, its northerly aspect and deeper ash surface soil contribute to extensive forest cover that appears relatively undisturbed. Old "Center Stock Driveway" signs above 6,000 feet in elevation confirm the likelihood that some disturbance can likely be attributed to grazing practices used before the establishment of the Malheur National Forest in 1907. Although these areas are not common, they appear to be focused in the headwaters of Butte Creek and its tributaries where extensive areas of mineral soil remain exposed or are vegetated with non-native annual species, and where areas that appear to have once been seeps are now drained and support only relic facultative species, both of which may indicate the proximity of sheep bedding grounds. It appears that heavy historical livestock use in stream channels and valleys have contributed to erosion down to bedrock and simplified riparian plant communities and channel and floodplain structure. The result of these conditions appears to be the concentration of overland flow from precipitation and snowmelt and accelerated streamflow that runs off too rapidly and early. The capacity to capture, store, and safely release overland flow is substantially diminished in some drainages. Natural watershed hazard is considered to be low due to the ash cap and general north aspect. Although overall composite watershed hazard is probably in the low range, it is estimated to rise to low-to-moderate where historical disturbance has occurred.

Watershed Hazard

Natural watershed hazard and the related natural physical perturbations are based on the inherent characteristics of the physiographic region and the physical environment and, to a lesser extent, to ecosystems within the planning area. The natural watershed hazard[20], which is based on the inherent characteristics of the topography, climate, geology, and soils, varies with the geology and soils in the planning area. The overall natural watershed hazard is considered low plus. The natural watershed hazard over much of the area is considered low, primarily due to the presence of ash cap soils or other soils with a high ash content, but shifts to low-to-moderate on areas of Clarno and granodiorite and to moderate on areas of or below serpentinite soils and geology.

Composite watershed hazard is based on the integration of natural watershed hazard and perturbations with legacy impacts, ongoing human disturbance, and other alterations to the physical environment and ecosystems. The composite watershed hazard in the project subwatersheds, integrated from ridgetop to streamflow, is considered low-to-moderate plus, relative to that associated with the inherent natural characteristics of the two project subwatersheds in this physiographic region. This rating reflects the persistent alterations to stream channels, valleys, and high-elevation soils (described in the Ragged Ruby Watershed Report); transitory (over 50 years) soil conditions in former harvest units; and roading and railroad berms, especially in valleys, balanced with a widely variable climate. The majority of runoff events are not expected to initiate episodes of overland flow concentration or erosion, although moderate or relatively rare high intensity runoff events may result in episodes of concentrated overland flow or erosion.

Environmental Consequences

Methodology

The discussion of direct, indirect, and cumulative effects of the proposed activities on watershed condition is similar to that described for the affected environment. Composite watershed hazard is used to integrate the effects across the landscape from ridgeline to streamflow, and serves as a qualitative cumulative watershed effects model as well as a method for evaluating cumulative effects under the National Environmental Policy Act.

For watershed condition, several measures (including area for tractor yarding) were selected in order to describe the variety of disturbance and rehabilitation activities that are proposed, and their interactions at different locations on the landscape. Tractor yarding is the single proposed or alternative activity in which the greatest amount of mineral soil is likely to be exposed or otherwise altered, regardless of alternative; however, other activities may occur closer to streams or riparian areas. The amount of mineral soil exposed or other soil alteration occurring from tractor yarding is approximately proportional to the area yarded (see Ragged Ruby Soils Report). Ground disturbance, especially the exposure of mineral soil where it occurs, is the single effect with the greatest potential to concentrate overland flow; detach, mobilize, and transport sediment particles; or create new or exacerbate existing erosion features. The measure of tractor yarding and other disturbance areas is based on acres of yarding system identified in the proposed and alternative actions. Other proposed and alternative activities, such as installing or removing temporary roads (which also expose or otherwise alter mineral soil), are generally proposed in proportions similar to that of tractor yarding by alternative. Tractor yarding is discussed by landscape element where appropriate, although it is confined primarily to hillslopes under the proposed and alternative activities. The effects from the variety of disturbance and rehabilitative activities are integrated in composite watershed hazard.

[20] Natural watershed hazard refers to the intensity and magnitude of watershed vulnerability and potential response to environmental disturbance based on the physiographic and characteristic biological attributes of a given drainage or area before the development of a new state of equilibrium.

Composite watershed hazard is part of the measures for watershed function because of the legacy conditions of the landscape. It is based on an integration of conditions of landscape elements. Legacy conditions, combined with the proposed or alternative actions, have the potential to increase overland flow, sediment transport, or erosion (if realized, and likely on a stochastic basis under the local climate). New ground disturbance would likely exacerbate the effects of legacy conditions and their associated processes. Composite watershed hazard also incorporates the: (1) exposure and alteration of mineral soil during implementation of proposed or alternative activities (such as trail building or temporary road installation or removal); and (2) the spatial relationship (proximity and topographic conditions) of these activities to one another, to legacy conditions, to the stream or draw network, or to other elements likely to affect overland flow, sediment transport, or erosion. Understanding of composite watershed hazard is also based on understanding of watershed primary functions and conditions as described in the Affected Environment, Methodology section. Composite watershed hazard is a subjective evaluation of the interactions between proposed and alternative activities, and the altered watershed processes, functions, condition, and landscape elements of the planning area, based on professional knowledge and judgment (according to accepted practice for the discipline). Additional discussion of composite watershed hazard is found in the Ragged Ruby Watershed Report Appendix H.

Cumulative effects on watershed condition were assessed by considering the watershed processes and characteristics of the analysis area; the proposed activities, especially those considered ground disturbing; and foreseeable activities and events affecting the hydrologic connectivity of the area. Past and ongoing activities were incorporated into the existing condition. A more detailed description of analysis methods is found in the Ragged Ruby Watershed Report Appendix H.

Water quality was selected as a source element because the planning area lies in the John Day River Basin, for which a Total Maximum Daily Load and Water Quality Management Plan (hereafter Plan) (ODEQ 2010) has been completed by Oregon Department of Environmental Quality. The completion of the Plan is required under the Clean Water Act to address streams on the Section 303(d) List of Water Quality Impaired Waterbodies (hereafter List). Streams on this List did not meet water quality standards and were considered in violation of the Clean Water Act prior to the completion of the Plan.

Alternative 1 – No Action

Direct and Indirect Effects

No activities are proposed under alternative 1, thus no direct or indirect effects are expected for any of the watershed processes, functions, and condition of the landscape elements. However, due to the dynamic nature of watershed processes and functions and their alterations, watershed condition is expected to continue to change as summarized below and described in more detail in the Ragged Ruby Watershed Report.

Hillslopes and Ephemeral Draws

Under alternative 1, the conditions and processes described for the existing condition (including for hillslope roads) would continue as described in the Ragged Ruby Watershed Report.

Management Area 3B, Riparian Habitat Conservation Areas, Valleys, and Ephemeral Draws

The most likely effect under alternative 1, as described in the Ragged Ruby Watershed Report, is little to no change in riparian habitat conservation area conditions (including riparian roads) since neither rare (large) runoff events nor uncharacteristically intense wildfires are likely to occur in a given year. Should a rare runoff event occur, floodplain and valley bottom erosion and scour would affect riparian conditions and processes in the inner riparian habitat conservation areas of some sub-drainages.

Riparian areas would remain vulnerable to scour during rare, large runoff events, during which riparian vegetation may be broken or unrooted due to the shallow rooting zone provided by altered substrate, although placement of coarse wood in valleys under foreseeable activities implemented under the Aquatic Restoration Decision would slow overland flows, trap sediment, dissipate energy, and promote riparian recovery over the following two to three decades.

Balance Lake is expected to continue to fill naturally with sediment. The aquatic and riparian plants currently colonizing shallower areas would be expected to expand as sediments accumulate.

Aspen stands would continue to grow as described in the Ragged Ruby Wildlife or Silviculture reports; tree mortality may increase as a result of continuing conifer competition. Small amounts of coarse woody debris (such as branches and stems) would accumulate around aspen, slowing runoff and enhancing infiltration. Other riparian vegetation would continue to grow under a variety of conditions as described in the Ragged Ruby Watershed Report.

Stream Banks, Stream Channels, and Ephemeral Draws

Streambank and channel stability and coarse woody debris recruitment would be expected to remain about the same as described for existing conditions for up to 10 years. Ongoing watershed processes would continue to function in response to the existing conditions and maintain scoured channels until coarse and large wood falls or until placement of coarse wood in channels under foreseeable activities implemented under the Aquatic Restoration Decision occurs. Stabilized conditions may improve as described in the Ragged Ruby Watershed Report.

Water Quantity and Timing, Hydrologic Response, and Ground Water Recharge

Altered watershed processes and functions may continue to gradually recover over several decades to centuries as altered conditions on hillslopes, riparian habitat conservation areas, valleys and stream channels, and draws recover.

Ongoing watershed processes would continue to function in response to the existing conditions and the inherent feedback loops that are part of those processes. The gradual recovery over several decades to centuries of most hillslope, riparian habitat conservation area, management area 3B, and stream channel conditions is expected to result in water quantity parameters shifting toward patterns that existed prior to European-American settlement, although this shift is considered unmeasurable due to the complexity associated with sampling.

Recharge of ground water would continue as described for the existing condition.

Water Quality

Water quality parameters would likely gradually improve over decades to centuries as coarse and large wood falls into stream channels and increases stream complexity, including in-channel and floodplain storage. More detailed discussion about stream temperature is found in the Water Quality – Temperature Environmental Consequences section.

Greenhorn Mountain Inventoried Roadless Area

The existing condition would persist with the areas of granitic soils remaining functional-at-risk and vulnerable to large, rare runoff events for centuries.

Dixie Butte Inventoried Roadless Area
The existing condition would persist with some stream channels and valleys in the headwaters of Butte Creek and its tributaries remaining functional-at-risk and vulnerable to large, rare runoff events until coarse and large wood fell in decades to centuries.

Composite Watershed Hazard
With alternative 1, no additional land management activity-related disturbance would occur. The watershed hazard would remain the same as the existing condition in the short term. The presence of riparian roads would continue to limit stream channel recovery. Over the long term, watershed hazard would generally decrease as recovery from past activities continues, although localized areas of active erosion would continue as chronic, localized hazards.

- Greenhorn Mountain Inventoried Roadless Area: The composite watershed hazard for the roadless area is expected to remain moderate plus due to the altered condition of the granodioritic soils on the upper slopes.
- Dixie Butte Inventoried Roadless Area: The composite watershed hazard for the roadless area is considered to be low-to-moderate plus because the conditions are similar to those of most of the north-facing slope.

Cumulative Effects
Because there are no direct or indirect effects, no cumulative effects would occur. However, because the subwatersheds are not properly functioning and disturbance is present, cumulative watershed effects with altered processes and functions (as described in the Existing Condition section) would continue to be expressed, until interrupted by natural events, or other management activities are implemented. Foreseeable activities, such as aquatic restoration actions included in Appendix E – Past, Ongoing, and Reasonably Foreseeable Actions, are covered under the Aquatic Restoration Decision and could still occur. Restoration implemented under this decision would result in a reduced watershed hazard rating, as a result of reducing the disturbance that catches, concentrates, channels, and redirects overland and streamflow.

Foreseeable Activities
The foreseeable activities that are authorized under the Aquatic Restoration Decision (large and coarse woody debris placement in streams, draws, and eroding hillslopes) are expected to improve riparian vegetation, floodplain function, stream channel functions, rates and timing of runoff, and water quality. Improving watershed processes, function, and condition, or "capturing, storing, and safely releasing runoff' would incrementally reduce watershed hazard during the first year and toward low-to-moderate over one to three decades as the aquatic treatments became fully effective and some legacy alterations continued to recover. Watershed hazard may be reduced if conditions on the granodioritic soils in the Greenhorn Mountain Inventoried Roadless Area were arrested.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies
Alternative 1 is consistent with the Malheur Forest Plan standards and guidelines and PACFISH since no activities are proposed that would degrade riparian-dependent resources and fish.

Alternative 1 is consistent with the Clean Water Act since no activities are proposed that would degrade water quality.

Alternative 1 is consistent with the requirements of the associated total maximum daily load, water quality management, and water quality restoration plans (ODEQ 2010, USDA Forest

Service 2014c) because no activities are proposed and passive management would provide long-term protection.

See Ragged Ruby Watershed Report for details.

Alternative 2

Direct and Indirect Effects

Hillslopes and Ephemeral Swales

The most likely effect on overall watershed function from yarding and landings on hillslopes and ephemeral swales under alternative 2 is little or no change when individual units are considered, compared to alternative 1, because watershed best management practices (see Ragged Ruby Watershed Report Appendix F) associated with the proposed activities are expected to control runoff and sediment transport under common runoff events. When the sum of the proposed units and their distribution across the landscape is considered, the additional disturbance raises the watershed hazard at least proportionately (discussed below) compared to alternative 1.

Because the proposed activities would be implemented in subdrainages that have been previously disturbed by management activities, including extensive roading outside the inventoried roadless areas, a slight probability exists that previous disturbance would become connected to ground disturbance associated with the proposed actions and, possibly, extend the drainage network headward or create concentrations of runoff or sediment that could be transported beyond unit boundaries. However, overland flow is not expected to be concentrated enough to cause accelerated erosion or to deliver increased sediment to riparian filter strips in most locations under common rainfall events.

Similarly, riparian filter strips and best management practices associated with the proposed activities are expected to control runoff and sediment transport in the units where biomass harvesting is proposed.

Few changes in hillslope roads are proposed under alternative 2. Condition on about 220 of the roads where haul is not proposed would remain similar to that described generally in the existing condition. Effects of proposed log or biomass haul; proposed road closures or decommissioning; or location and use of temporary roads are described in the Ragged Ruby Watershed Report. In general, activities that increase disturbance would be expected to increase composite hazard; activities that rehabilitate areas would be expected to decrease composite hazard.

Effects of trail changes that are proposed for about 17 segments of trail are described in the Ragged Ruby Watershed Report, but in general, activities that increase disturbance would be expected to increase composite hazard; activities that rehabilitate areas would be expected to decrease composite hazard.

Management Area 3B, Riparian Habitat Conservation Areas, Valleys, and Ephemeral Draws

Prescribed burning in riparian habitat conservation areas is not expected to expose mineral soil because it would be expected to burn with low intensity as described per the design elements listed in chapters 1 and 2 and Appendix C – Project Design Criteria. Implementing non-commercial thinning in 13 areas would reduce fuel loading without increasing ground disturbance, resulting in riparian areas that are more resilient to future fire or would have a slightly reduced hazard following some wildfires. Non-commercial thinning is not expected to alter shade measurably, as the restriction on size of material to be thinned and locations specified would maintain shade provided by smaller trees. Other effects of non-commercial thinning in riparian habitat conservation areas are described in the Ragged Ruby Watershed Report.

Project design criteria would control potential for sediment to be detached and removed when mineral soil is exposed during the proposed tree tipping or tree removal following tipping or felling in aspen stands. Fencing and other practices proposed to protect aspen are not expected to cause mineral soil exposure, detachment, or mobilization in measurable amounts; they would enhance aspen condition as described in the Ragged Ruby Silviculture Report, which would also enhance riparian condition.

Activities are not proposed within the category 3 riparian habitat conservation area around Balance Lake. The category 3 riparian habitat conservation area is expected to filter sediment that may be transported from nearby slopes and to allow infiltration of concentrated overland flow. Effects from public use of National Forest System Road 2050000 would likely continue. Road use project design criteria are expected to control dust created by log haul.

The existing condition would continue on most roads not proposed for haul until the next routine cycle of maintenance was instituted. Roads would continue to intercept subsurface flow, concentrate overland flow, route sediment, constrain streams, reduce floodplain storage and flood-energy dissipation, and produce dust as described in the Existing Condition section.

Effects of proposed log or biomass haul; proposed road closures or decommissioning; or location and use of temporary roads are described in the Ragged Ruby Watershed Report but in general, activities that increase disturbance would be expected to increase composite hazard; activities that rehabilitate areas would be expected to decrease composite hazard.

Pre- and post-haul maintenance would occur on the 17 roads located in riparian habitat conservation areas where rutting was noted, with the rutting smoothed out during pre-haul maintenance. As with any haul road, watershed hazard would increase during the period of haul. Post-haul maintenance, during which drainage would be installed, would be expected to control overland flow and sediment mobilization as described above.

The effects of trail changes that are proposed for about 17 segments of trail are described in the Ragged Ruby Watershed Report, but in general, activities that increase disturbance would be expected to increase composite hazard; activities that rehabilitate areas would be expected to decrease composite hazard.

Stream Banks, Stream Channels, and Ephemeral Draws

Watershed hazard described in the Existing Condition would continue to be present at the approximately 74 stream crossings (41 crossings in the Granite Boulder Creek – Middle Fork John Day River subwatershed, and 33 crossings in the Balance Creek – Middle Fork John Day River subwatershed) where no activities are proposed. Dust generated in the vicinity of the 123 stream crossings (93 crossings in the Granite Boulder Creek – Middle Fork John Day River subwatershed, and 30 in the crossings of Balance Creek – Middle Fork John Day River subwatershed) where haul is proposed would be controlled as described in the project design criteria. Decommissioning of the National Forest System Road 2010219 crossing would allow the flow to stay in its natural channel and for connections between the channel and floodplain to become reestablished.

Watershed hazard would increase during the time the temporary road crossings (usually with culverts and their associated fill) were in place constraining the channel. Requiring the fill to be removed and end hauled[21], and the channel and valley to be reshaped consistent with up and downstream segments would accelerate the recovery of hydrologic function and reduce watershed hazard over time because the current constraints on the channel would be alleviated.

Application of sustainable trail practices, watershed best management practices, and project design criteria would control sediment and overland flow at the two proposed crossings on Granite Boulder Creek and its tributary. The effects of the proposed changes for trail crossings are described in the Ragged Ruby Watershed Report, but in general, the proposed activities that rehabilitate or improve crossings would be expected to decrease composite hazard

Water Quantity and Timing, Hydrologic Response, Ground Water Recharge

Since water is the limiting growth factor in most of the planning area, thinning of either commercial or non-commercial sized trees is expected to make more water available for the remaining trees rather than increase water yield. Neither commercial nor non-commercial thinning is expected to measurably alter snow accumulation, sublimation[22], or melt off of snow, especially given the natural variability displayed by nearby snowpack telemetry sites.

Helvey and Fowler (1995) found that peak flows resulting from snowmelt do not increase following the creation of hydrologic openings on up to 90 percent of a drainage during timber harvest on a nearby forest. Hydrologic openings would not be created during the proposed activities.

The amount of ground disturbance is also unlikely to affect the release and distribution of overland flow under common runoff events because of the application of project design criteria and watershed best management practices to control overland flow and sediment mobilization. The creation of additional ground disturbance may alter release and distribution of overland flow under moderate to rare, large runoff events.

Recharge of ground water would continue as described for the existing condition because the existing condition in ephemeral draws is expected to continue or be improved because they would be protected from yarding.

Water Quality

Water quality parameters (non-temperature) are not expected to be affected by the proposed activities because project design criteria and watershed best management practices are expected to control overland flow and sediment mobilization. More detailed discussion about stream temperature is found in the Water Quality – Temperature section.

Greenhorn Mountain Inventoried Roadless Area – The existing condition would persist with the areas of granitic soils remaining functioning-at-risk and vulnerable to large, rare runoff events for centuries. The change in watershed hazard from trail work is expected to be neutral but with slightly different changes in Granite Boulder Creek – Middle Fork John Day River subwatershed compared to the connected Big Boulder Creek subwatershed. The new construction of the northern Tempest Mine Trail #256 segment in the upper West Fork Granite Boulder Creek drainage is expected to slightly increase local watershed vulnerability as discussed in the

[21] End haul occurs when excavated material excess to that road section is placed in a truck and moved away from immediate work site.

[22] Sublimation is the transition of a substance directly from the solid to the gas phase, without passing through the intermediate liquid phase.

Hillslope and Riparian subsections. Watershed vulnerability in the Wray Creek drainage of Big Boulder Creek subwatershed is expected to decline slightly when the segment of National Forest System Road 4555000 is decommissioned and stormproofed as it is converted to the Sunrise Butte Trail #255 with a narrower footprint.

Dixie Butte Inventoried Roadless Area – The existing condition would persist, with some stream channels and valleys in the headwaters of Butte Creek and its tributaries remaining functioning-at-risk and vulnerable to large, rare runoff events until coarse and large wood falls in decades to centuries.

Composite Watershed Hazard

Although the proposed activities are consistent with the Clean Water Act requirements, the additional disturbance and exposure of mineral soil associated with proposed yarding, temporary roads, and construction, maintenance of new trails, and other activities provide additional opportunities for overland flow to be produced, concentrated, and rerouted under moderate or large, rare events due to persistent legacy alterations. The magnitude and intensity of effects that would result from increased runoff connectivity varies depending on the scale of the proposed activities and their proximity to persisting alterations.

The expected changes in watershed hazard, associated with the proposed activities, were qualitatively evaluated and integrated with the analysis of effects of the proposed activities by landscape element. Based on this evaluation, the composite watershed hazard for the proposed activities is expected to increase to moderate plus plus during the period of active implementation, and to decline to moderate plus in the year(s) following post-haul road maintenance, installation of best management practices in harvest units, implementation of proposed road decommissioning, and closing and stormproofing of the roads post-haul. Proposed trail and trailhead changes are essentially neutral when compared to the extent of other proposed activities. Composite watershed hazard would continue to decline, approaching low plus over three to five decades.

Cumulative Effects

The list of foreseeable activities in Appendix E – Past, Ongoing, and Reasonably Foreseeable Actions was reviewed. Past and ongoing activities were incorporated into the existing condition description. The temporal and spatial boundaries were defined in the cumulative effects section near the beginning of the Environmental Consequences section. The foreseeable activities authorized under the Aquatic Restoration Decision (including large and coarse woody debris placement in streams, draws, and on eroding hillslopes; installation of beaver support structures; road decommissioning and relocation; water developments; and fencing) are expected to improve riparian vegetation, floodplain function, stream channel function, rates and timing of runoff, and water quality in complement to the activities included in this analysis, as would aquatic restoration activities on private land. Improving watershed processes, functions, and condition, or “capturing, storing, and safely releasing runoff” would reduce watershed hazard to medium or less at the first year and toward medium-low over one to three decades as the aquatic treatments become fully effective and as legacy disturbances and disturbances associated with the proposed timber harvest and selected activities recover. The proposed activities are not expected to have cumulative effects with: ongoing grazing according to Endangered Species Act consultation terms and conditions, mining activities, or other permitted activities (such as firewood cutting or special use authorizations) because project design criteria and best management practices are incorporated into permits and operating plans. Since non-commercial thinning on private land is not expected to create ground disturbance, cumulative effects with the proposed activities are not expected.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Malheur Forest Plan

The Ragged Ruby Project is consistent with the Malheur Forest Plan because it would not measurably increase watershed impacts as described in the Environmental Consequences section. Alternatives 2 and 3 are in compliance with the Malheur Forest Plan because the project design criteria and the site-specific water quality analysis (which are an integral part of these alternatives and analysis) are consistent with the provisions of PACFISH and with the applicable Malheur Forest Plan standards and guidelines (specifically, standards 120 and 121). The composite watershed hazard analysis is a surrogate for a watershed cumulative effects analysis (standard 121).

Clean Water Act

The Ragged Ruby Project is consistent with the Federal Water Pollution Control Act of 1972 (Public Law 92-500, also known as the Clean Water Act) because watershed best management practices are consistent with the Forest Service's memorandum of understanding with Oregon Department of Environmental Quality and with the National Best Management Practice Program (they are intended to control non-point source pollution and are integral parts of these action alternatives in accordance with the memorandum of understanding) (see Appendix C – Project Design Criteria, and Ragged Ruby Watershed Report Appendices E and F – Project Design Criteria and Watershed Best Management Practices).

The activities proposed in alternatives 2 and 3 are consistent with the associated total maximum daily load, water quality management, and water quality restoration plans (ODEQ 2010, USDA Forest Service 2014c) because riparian ecosystems would be protected by avoidance. The limited, incidental activities proposed near streams wound not measurably, adversely impact stream temperature. For example, increases in stream temperature resulting from increased solar influx following the incidental removal of riparian vegetation shade at a limited number of trail crossings, and the limited size of the crossings, would not be measurable and, consequently, not great enough to meet the human-use allowance.

See Ragged Ruby Watershed Report for details.

Alternative 3

Direct and Indirect Effects

Hillslope and Ephemeral Swales

The effects of alternative 3 are similar to those described for alternative 2 when considering individual units because project-specific and general project design criteria and watershed best management practices would be similarly applied. When the sum of the proposed units and their distribution across the landscape is considered, the reduced disturbance decreases the watershed hazard proportionately (discussed below) compared to alternative 2, but raises it compared to alternative 1.

Few changes in hillslope roads are proposed under alternative 3. Alternative 3 is similar to alternative 2 except there would be 7 fewer miles maintained or reconstructed, with a slight decrease in watershed hazard compared to alternative 2. Road closures, decommissioning, and relocation are the same. Other road management is the same. These conditions would likely contribute to a neutral effect on watershed hazard as fewer less-impactive, grown-in roads, and fewer rutted roads would be maintained to "typical" road standards.

The proposed trail changes are the same for alternative 3 as for alternative 2, except trails would not be improved to allow bicycle access and certain trail realignments would not occur. Effects are expected to be the same because sustainable trail practices, project design criteria, and best management practices would be adjusted to alternative 3 activities, and would control overland flow concentration and sediment mobilization.

Management Area 3B, Riparian Habitat Conservation Areas, Valleys, and Ephemeral Draws

The proposed riparian activities, including roading and trail work, are the same for alternative 3 as for alternative 2 except one less temporary road would be installed in the overlapping category 2 riparian habitat conservation areas for Balance Creek and a tributary near National Forest System Road 2045500 in the Balance Creek – Middle Fork John Day Subwatershed. Effects are expected to be the same or less, as the same project design criteria and best management practices would apply and would control overland flow concentration and sediment mobilization. The disproportionate increase to watershed hazard from Temporary Road 14, because of its location near a confluence, would not occur.

The effects on Balance Lake and its riparian habitat conservation area are expected to be the same as those described for alternative 2 because the proximity and type of proposed activities is the same.

Streambanks, Stream Channels, and Ephemeral Draws

The proposed stream crossings, including those that would be used for haul, or constructed, decommissioned, or relocated for roads, temporary roads, and trails, are the same for alternative 3 as for alternative 2. Effects are expected to be the same, as the same project design criteria and best management practices would apply and would control overland flow concentration and sediment mobilization.

Water Quantity and Timing, Hydrologic Response, and Ground Water Recharge

Since water is the limiting growth factor in this physiographic region, the effects of alternative 3 are expected to be the same as those for alternative 2 except that the available water per tree would likely be more similar to stands left unthinned as described in the Existing Condition section.

Recharge of groundwater would continue as described for the existing condition because ephemeral draws would be protected from yarding due to project design criteria and best management practices.

Water Quality

Water quality parameters (non-temperature) are not expected to be affected by the proposed activities because project design criteria and watershed best management practices are expected to control overland flow and sediment mobilization. More detailed discussion about stream temperature is found in the Water Quality – Temperature section.

Greenhorn Mountain Inventoried Roadless Area

The effects would be the same as those described for alternative 2.

Dixie Butte Inventoried Roadless Area

The effects would be the same as those described for alternative 2.

Composite Watershed Hazard

The effects on composite watershed hazard in alternative 3 are similar to those described for alternative 2 except less ground would be disturbed by harvest activities. Although less ground disturbance would likely result in development of about 15 percent fewer opportunities for connections that would concentrate overland flow or mobilize sediment, much of this reduction is on the north aspects where, overall, there are fewer legacy impacts with which to connect. Watershed hazard is expected to increase to moderate-plus during the period of active implementation and gradually decline over several decades, as described for alternative 2.

Cumulative Effects

Same as described for alternative 2.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Same as described for alternative 2.

Other Relevant Mandatory Disclosures

The proposed alternatives would have no impact on floodplains or wetlands as described in Executive Orders 11988 and 11990. Wetlands that meet the jurisdictional definition (Army Corps of Engineers) are found in the Ragged Ruby planning area. These areas would be avoided during activities as described in the project design criteria, protected under PACFISH, and mapped as determinations are made.

Water Quality – Temperature

Affected Environment

Methodology

Water quality is evaluated based on the Oregon Department of Environmental Quality biennial water quality assessment under the Clean Water Act; the effective assessment is 2012. Because a total maximum daily load and water quality management plan (ODEQ 2010) has been completed for the John Day River Basin, streams that were formerly included on the Clean Water Act Section 303(d) Oregon List of Water Quality Impaired Waterbodies (classified as category 5 streams in Clean Water Act-required biennial assessments) are now considered category 4A (water quality impaired, total maximum daily load approved) since they are addressed in the John Day River Plan. The mainstem segment of the Middle Fork John Day River and four of its tributaries that lie in the planning area are considered category 4A (water quality impaired, total maximum daily load approved) for either of two temperature parameters; these are described further in the Existing Condition section for Water Quality – Temperature. Water quality – temperature for non-listed streams is addressed because these streams are also covered by the total maximum daily load and water quality management plan. Analysis for them as well as the four water quality impaired streams is based on the analysis and assumptions described in the Methodology section for Watershed Condition.

The Regulatory Framework Appendix D to the Ragged Ruby Watershed Report discusses the several inconsistent Malheur Forest Plan, as amended standards that pertain to water quality – temperature. The final Forest-wide standard (#117) is that the Forest Service meet the Clean

Water Act as described and summarized above in the Regulatory Framework section of this section and provided in the Regulatory Framework Appendix D.

Existing Condition

The John Day River Basin Total Maximum Daily Load and Water Quality Management Plan was completed by Oregon Department of Environmental Quality as lead agency in December 2010. The total maximum daily load primarily addresses the pollutant of temperature in the basin, including its occurrence in streams in the planning area. Prior to the completion of the total maximum daily load and water quality management plans, several streams in the planning area were included on the State Clean Water Act Section 303(d) List of Water Quality Impaired Waterbodies (hereafter List) for two beneficial uses related to the pollutant of temperature. The completion of the Environmental Protection Agency-approved total maximum daily load and water quality management plan effectively de-listed the streams and reclassified them as category 4A (water quality impaired, total maximum daily load approved), and shifted legal requirements for water quality management to state-identified designated monitoring agencies, including the USDA Forest Service. The Forest Service, as a designated monitoring agency, with the Umatilla National Forest as the lead, completed a Water Quality Restoration Plan for the John Day River Basin (USDA Forest Service 2014c) as required in the total maximum daily load and water quality management plan. Consequently, while none of the streams in the planning area are included on the most recent 2012 List for temperature, the conditions that caused them to be listed (for example, not meeting stream temperature standards for various beneficial uses) remain. The streams listed as category 4A streams (water quality impaired, total maximum daily load approved) are Butte, Ruby, Ragged, and Granite Boulder creeks, all in Granite Boulder Creek – Middle Fork John Day subwatershed, and a segment of the mainstem of the Middle Fork John Day River, most of which is located in the Balance Creek – Middle Fork John Day River subwatershed.

Water temperatures in other perennial streams are considered to be elevated; these streams are automatically included in the total maximum daily load and water quality management plan by the Oregon Department of Environmental Quality and, as such, are included in the Forest Service Water Quality Restoration Plan.

Environmental Consequences

Methodology

The professional approach and standards described in the methodology sections for the Watershed Condition (both in the Affected Environment and Environmental Consequences sections) were used to evaluate the proposed activities and their likely direct, indirect, and cumulative effects on water quality – temperature and factors influencing temperature based on the two beneficial uses for fish in the planning area addressed in the John Day River Basin Total Maximum Daily Load and Water Quality Management Plan (ODEQ 2010).

Incomplete and Unavailable Information

Stream temperatures are available only for a few streams in the planning area. The accepted watershed professional approach is to use the available data to reason the likely condition for areas where such data are unavailable.

Spatial and Temporal Context for Effects Analysis

The timeframe ranges from 1 year to several decades and is specified in the effects discussion.

The spatial context for this resource element are the individual streams listed as category 4A (water quality impaired, total maximum daily load approved) by Oregon Department of Environmental Quality.

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

Foreseeable activities considered include activities proposed under the Aquatic Restoration Decision, and any other activities associated with increasing or rehabilitating ground disturbance as listed in Appendix E – Past, Ongoing, and Reasonably Foreseeable Actions. Past activities were incorporated into the existing condition.

Alternative 1 – No Action

Direct and Indirect Effects

No activities are proposed under alternative 1, thus no direct or indirect effects to water quality – temperature are expected. Ongoing watershed processes would continue to function in response to the existing conditions and the inherent feedback loops that are part of those processes. The gradual recovery of most uplands, riparian habitat conservation areas, and management area 3B locations, and stream channel conditions (as previously described) is expected to improve characteristics such as narrow, deep streams and shade from riparian vegetation that contributes to lower summer water temperatures. These conditions are expected to develop over much of the area, but isolated areas of disturbance due to wildlife travel, and impacts from ongoing activities or conditions such as rilling or roading would continue. Similarly, small amounts of disturbance to riparian conditions, which are not expected to cause measurable changes in conditions, are permitted under grazing permits and would be expected to continue. Improvement in conditions that influence water quality – temperature are not expected to be measurable for at least 10 years because of the lag time associated with the establishment and growth of riparian species, particularly hardwood shrubs and trees. Improvement in riparian vegetation would also enhance the filtering and sediment-trapping capacity of riparian areas. Rare events that result in alterations to channels may result in temporary, probably unmeasurable, increases in temperature. These conditions would last until riparian vegetation reestablished. Changes in stream temperature would also be moderated by the presence of conifer shade. Uncharacteristic wildfire would likely result in the loss of conifer and hardwood shade, resulting in increased temperatures for about 10 to 30 years until streamside vegetation either matured (riparian hardwoods) or conifers reestablished.

The water quality assessment classification (category 4A: water quality limited, total maximum daily load approved) is unlikely to improve under alternative 1 because there would be little change in the basic factors affecting stream temperature in the planning area for decades or possibly centuries until in-channel and floodplain complexity and water storage increased as a result of coarse and large woody debris accumulation.

Cumulative Effects

Because there are no direct or indirect effects on water quality – temperature from proposed activities, no cumulative effects would occur. In the absence of proposed activities, the implementation of foreseeable activities authorized under the Aquatic Restoration Decision would be expected to gradually improve water quality – temperature on the tributary streams over the next one to two decades, or sooner, as stream function, especially instream complexity and water storage, improve. Improvement in water temperature would likely result in an improved rating under the water quality assessment for each individual stream. Improvement in water quality – temperature on the tributary streams would contribute to improvement in the Middle Fork John Day River mainstem segment, but since its temperature is dependent on a much larger complex of conditions and uncertainty, predicting a change at the lower end of the cumulative effects boundary is beyond the factors considered in this analysis.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Alternative 1 is consistent with these requirements because no activities are proposed and passive management would provide long-term protection.

Alternative 2

Direct and Indirect Effects

Very few of the proposed activities are expected to affect shade. See the discussion of riparian thinning in the Ragged Ruby Watershed Report. The effects of temporary roads (in riparian habitat conservation areas) on shade and stream temperature are discussed below. Recreational trail crossings are not expected to remove shade provided by the overstory.

Use of Temporary Road 5 is not expected to affect shade on the perennial flow in Dry Creek and its unnamed tributary because it is located on a relic roadbed that does not contain vegetation providing shade to the streams. Reuse of the roadbed is likely to delay the natural decompaction process by another 20 years and return limited amounts of subsurface flow to Dry Creek, as the decompaction that has occurred to date by passive mechanisms (such as root growth and freeze/thaw action) would be recompacted by use.

Use of Temporary Road 9 is not expected to affect shade on the perennial flow in an unnamed tributary to Beaver Creek because it is located on a relic roadbed that does not contain vegetation providing shade to the streams. Reuse of the roadbed is likely to delay the natural decompaction process by another 20 years and return limited amounts of subsurface flow to the tributary, since passive decommissioning would be recompacted by use.

Use of Temporary Road 21 is not expected to affect shade on the perennial flow in Ragged Creek because it is located outside the primary shade zone, near the outer boundary of the riparian habitat conservation area and heads away from the riparian habitat conservation area. It is expected to intercept a minimal amount of subsurface flow moving between the hillslope, the valley, and Ragged Creek for the approximately 50 years that decompaction is expected to take since the road is likely to be blocked, camouflaged, and stormproofed, but not decompacted.

The application of watershed best management practices and project design criteria that limit activities in the primary shade zone and maintain stream shade would control the amount of additional solar radiation likely to reach streams, and control the potential for stream temperature increases.

Use of Temporary Road 15, along a category 4 segment of Balance Creek, is not expected to affect stream temperature because the category 4 segment is likely to be dry during the summer when stream temperatures are warm and the Clean Water Act standards most commonly apply.

Other proposed activities occur outside riparian habitat conservation areas and would not affect shade or other parameters that control temperature. The proposed activities are consistent with the Oregon Department of Environmental Quality's John Day River Basin Total Maximum Daily Load and Water Quality Management Plan (ODEQ 2010) and the Forest Service's Water Quality

Restoration Plan for these reasons. They are also consistent with the Forest Service Pacific Northwest Region and Oregon Department of Environmental Quality 2014 Memorandum of Understanding for Implementing the Clean Water Act, Including Streams Included on the Clean Water Act section 303(d) List of Water Quality Impaired Waters (ODEQ and USDA 2014). These proposed activities are consistent with regulation; as such, they are likely to allow the existing condition to be maintained and prevent degradation in temperature. However, the water quality assessment classification (category 4: water quality limited, total maximum daily load approved) is unlikely to improve as a result of implementation of these activities, because there would be little change in the basic factors affecting stream temperature in the planning area for decades or possibly centuries.

Cumulative Effects

The geographic and temporal scales for cumulative effects are the same as those for direct and indirect effects.

Past and present actions were incorporated into the existing condition. Foreseeable actions under the Aquatic Restoration Decision would likely supplement the proposed activities to improve water quality – temperature by providing wood structure in stream channels and on floodplains and hillslopes that would help capture, store, and safely release water in ways that would indirectly provide cooler streamflows in one to two decades after implementation, as stream function, especially instream complexity and water storage, improve in response to the foreseeable actions. Improvement in stream function would likely result in an improved rating under the water quality assessment for the individual streams. Improvement in water quality – temperature on the tributary streams would contribute to improvement in the Middle Fork John Day River mainstem segment, but since its temperature is dependent on a much larger complex of conditions and uncertainty, predicting a change at the lower end of the cumulative effects boundary is beyond the factors considered in this analysis.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

For both action alternatives, the discussion under the previous resource element, watershed condition, also applies to this resource element. This is because the Clean Water Act addresses several facets of pollution, and because in the Ragged Ruby planning area (where stream function remains altered from legacy activities implemented before the development and application of watershed best management practices), water quality – temperature is not expected to be affected measurably by the proposed activities.

Alternative 3

Direct and Indirect Effects

Direct and indirect effects for alternative 3 are the same as those described for alternative 2 because none of the changes between the alternatives would affect shade, in-channel water storage, floodplain storage, or water quality – temperature. However, the water quality assessment classification (category 4: water quality limited, total maximum daily load approved) is unlikely to improve as a result of implementation of these activities, because there would be little change in the basic factors affecting stream temperature in the planning area for decades or possibly centuries, as described for alternative 2.

Cumulative Effects

These are the same as those described for alternative 2 for the same reasons.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Same as described for alternative 2.

Forest Vegetation

Regulatory Framework

Malheur Forest Plan

Proposed activities of the project are based on the management direction established in the Malheur National Forest Land and Resource Management Plan (USDA Forest Service 1990a). This includes Forest goals for timber management (goals 24 to 26, page IV-2) and Forest-wide standards for timber harvest, reforestation, and stand improvement (standards 89 to 115, pages IV–36 to 38), insects and disease (standards 186 to 187, page IV–45), and aspen (standard 57, page IV-31). Aspen is also included with management area 3A standard 8, page IV-56).

Regional Forester's Forest Plan Amendment 2 (Eastside Screens)

Additional management direction has been provided in "Interim Management Direction Establishing Riparian, Ecosystem and Wildlife Standards for Timber Sales" (USDA Forest Service 1995a; also known as Regional Forester's Eastside Forest Plan Amendment 2 "Eastside Screens").

National Forest Management Act

The National Forest Management Act provides standards and policies that regulate timber harvest.

Resource Indicators

The analysis indicators for assessing effects of each alternative and for comparing alternatives include historical range of variability as defined by structural stages across the landscape, stand density, species composition, and the extent to which the area is treated to achieve these objectives and provide for the accelerated restoration strategy of treating more acres and providing forest restoration jobs. These indicators and how they are measured are described in the Existing Condition section above.

Table 11. Resource indicators and measures for assessing effects to forest vegetation

Resource indicator	Measure	Source
Structural stages to be within, or moving towards the historical range of variability	Percentage change of structural stages in relation to historical range of variability	Regional Forester's Forest Plan Amendment #2 (USDA Forest Service 1995a)
Stand density across the planning area	Percentage change of acres above the management zone, within the management zone, and below the management zone as defined by maximum stand density index	Suggested stocking levels for forest stands in Northeastern Oregon and Southeastern Washington: an implementation guide for the Umatilla National Forest (Powell 1999)
Species composition and proportion of early seral species	Percentage of early seral species across plant association groups	Forest succession along a productivity gradient following fire exclusion (Johnston 2017)
Wood products and forest restoration jobs provided	Acres mechanically treated	Malheur National Forest Land and Resource Management Plan (USDA Forest Service 1990a)

Structural Stages, Stand Density, Species Composition, and Wood Products

Affected Environment

Methodology

Information concerning stands has been gathered through a combination of photo interpretation, formal timber stand exams in 1992-1993, 1998-2001, 2006, and 2015-2016, and walk-throughs in 2016-2017.

Existing Condition – Forest Structure and Density

Historical timber harvest facilitated the removal of the large ponderosa pine, western white pine, western larch, and Douglas-fir in the Ragged Ruby planning area. This, combined with fire suppression, cumulatively changed stand conditions within the planning area, allowing for the build-up of surface fuels, increases in stand density, and ingrowth of late seral species that create ladder fuels. This has changed the fire regime in the dominant forest types to less frequent, mixed-severity and high-severity events with larger stand-replacement patch sizes. There were several fires in the planning area that have escaped initial attack, and/or burned with high severity. See the Fire and Fuels section, and the Ragged Ruby Silviculture Report for more information.

The ingrowth of late seral species and increased stand densities have also helped to create conditions promoting insect outbreaks. A mountain pine beetle outbreak in the 1960s and 1970s killed many pine trees in the Middle Fork John Day River drainage. A spruce budworm outbreak in the mid-1980s and early 1990s has created dead and down grand fir and Douglas-fir, and live grand fir and Douglas-fir with poor crowns, reduced growth, and dead or forked tops.

Historically, fire was the dominant disturbance on the landscape. Frequent, low-severity fires were agents of stability, favoring fire-resistant species (ponderosa pine, western larch, and to a lesser extent Douglas-fir) and development of more open, park-like stands with little vertical structure. They also kept the ground vegetation dominated by fire-adapted grasses such as pine grass and elk sedge. Shade-tolerant species (grand fir and Douglas-fir) were generally susceptible to these fires due to their thinner bark when young, and persistent, low-hanging crown characteristics.

Fire severity in the Cool Moist and Cold Dry forests within the planning area were predominately low severity, although some mixed severity and relatively small (1 to 100 acres) stand-replacement patches did occur across the landscape through time. These small, stand-replacement events are evident across the planning area today because they are dense pole patches of lodgepole pine and western larch.

Warm Dry and Hot Dry forests are very different from Cool Moist or Cold Dry forests with respect to inherent productivity and structural and compositional attributes. Ponderosa pine forests are typically less dense, are dominated by ponderosa pine (or on the more productive sites by ingrowth of grand fir) and tend to have a single canopy layer. Mixed conifer forests are much denser, are dominated by grand fir, and tend to have multiple canopy layers. However, because all sites historically experienced similar fire disturbance regimes, this tended to equalize stand biomass and species composition across the landscape. Historically, ponderosa pine and mixed conifer forests were very similar with respect to basal area and, to a lesser extent, species composition (Johnston 2017).

Existing Condition – Plant Association Groups

There are eight upland forest plant association groups that occur within the planning area as displayed in Table 12 below. According to Powell (2012) it is not appropriate to conduct a historical range of variability analysis for a plant association group within a planning area if it is less than 1,000 acres because a full complement of cover types, structural stages, or tree density classes would not be expected for such a small acreage. The planning area is greater than 15,000 acres; therefore it is of the appropriate size to conduct a historical range of variability analysis (Powell 2012). Four plant association groups: Hot Dry Upland Forest, Warm Dry Upland Forest, Cool Moist Upland Forest, and Cold Dry Upland Forest are close to or exceed 1,000 acres and will be analyzed for historical range of variability based on structure stages. However, Cool Wet, Cool Dry, Warm Moist and Warm Very Moist plant association groups, as well as riparian forests, juniper woodlands, mountain mahogany, and non-forest environments will not be discussed further in this section. For more information, see the Ragged Ruby Silviculture Report.

Table 12. Plant association groups within the Ragged Ruby planning area

Plant association group	Acres within planning area	Percent of planning area
Hot Dry Upland Forest	1,000	3
Warm Dry Upland Forest	17,500	47
Cool Moist Upland Forest	7,720	21
Cool Dry Upland Forest	860	2
Cold Dry Upland Forest	5,160	14
Warm Moist Upland Forest	860	2
Warm Very Moist Upland Forest	300	1
Cool Wet Upland Forest	160	>1
Juniper	370	1
Riparian forest	210	1
Non-forest	3,080	8
Total	37,220*	

*The total acres includes National Forest System and private lands within the Granite Boulder Creek and Balance Creek subwatersheds.

Warm Dry Upland Forest and Cool Moist Upland Forest are the most prevalent plant association groups within the planning area, with Warm Dry covering almost half of the area and Cool Moist almost one-fourth of the area. Structural stages for the planning area are displayed in Table 13 below. All structural stages are represented. Late and old structure includes old forest single stratum and old forest multi-strata, and there is a total of 37 percent of late and old structure within the Ragged Ruby planning area.

Table 13. Structural stages within the Ragged Ruby planning area

Structure	Acres within Upland Forest	Percent of Upland Forest
Stand initiation	2,030	6
Stem exclusion open canopy	3,840	11
Stem exclusion closed canopy	5,170	15
Young forest multi-strata	5,250	16
Understory reinitiation	5,020	15
Old forest single stratum	610	2
Old forest multi-strata	11,890	35
Total	33,810*	

*The total acres is the sum of the Upland Forest and Riparian Forest plant association groups. Acres do not add up exactly due to rounding.

The main tree species that occur within the Ragged Ruby planning area include ponderosa pine, Douglas-fir, western larch, grand fir, and lodgepole pine. Western white pine, western juniper, subalpine fir, whitebark pine, and Engelmann spruce also occur, but to a much lesser extent. Figure 1 below illustrates the percent species composition by trees per acre and basal area per acre. Grand fir is the most abundant tree in the planning area; approximately half of the number of trees per acre. However, it has a lower proportion of basal area (35 percent), because the ponderosa pine and Douglas-fir trees within the planning area tend to be larger and in many cases much older.

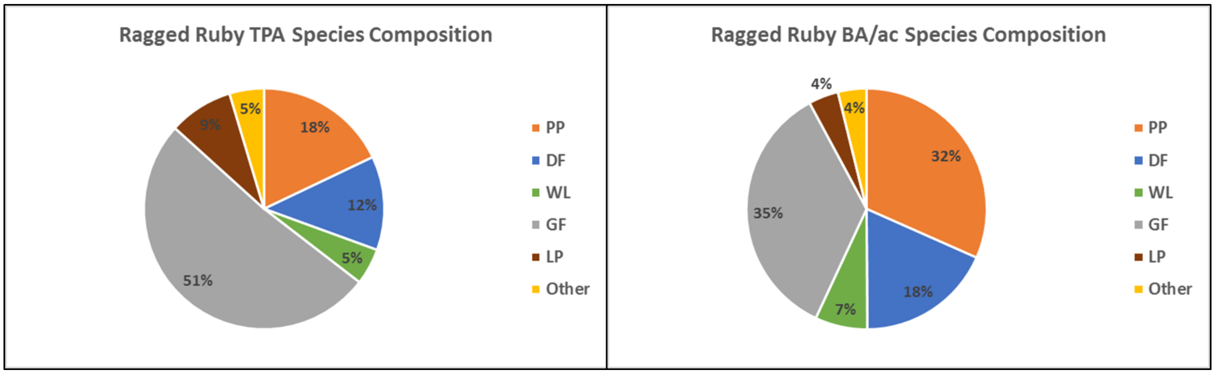


Figure 1. Species composition by trees per acre (TPA) and basal area per acre (BA/ac) for all forested stands within the Ragged Ruby planning area. Species include ponderosa pine (PP), Douglas-fir (DF), western larch (WL), grand fir (GF), and lodgepole pine (LP). "Other" species include western white pine, western juniper, subalpine fir, whitebark pine, and Englemann spruce.

Stand density index is a common measure of density that allows comparisons across units independent of individual tree age or size (Powell 1999). For any given average tree size for each species there is a limit to the number of trees per acre that may coexist in a stand. This limit is known as the maximum stand density index. The percent of maximum stand density index is an index of intra-tree competition for site resources and is an indication of overall stand health, including tree growth and mortality, susceptibility to tree mortality from insects and diseases, and fire hazard. Percent maximum stand density index is generally divided into categories that define tree growth, stand growth, and mortality. Below the management zone (0 to 35 percent maximum stand density index), there may be natural regeneration and there is generally high individual tree growth within the stand. The management zone (35 to 60 percent maximum stand density index) is where silviculturists tend to prescribe to manage within, because site resources are generally being captured into tree growth and there is high stand growth. Above the management zone (greater than 60 percent maximum stand density index) is where consistent competition-induced tree mortality begins to occur. As density increases above the management zone there is generally high mortality and stands stagnate. As stands grow above the management zone, susceptibility to insect infestation and high-severity stand replacement wildfire increases. Figure 2 below shows the percentage of area within the Ragged Ruby planning area below, within, and above the management zone. Approximately half of the Ragged Ruby planning area is above the management zone, with high stand densities that are susceptible to competition-induced tree mortality, insect and disease infestation, and high-severity wildfire.

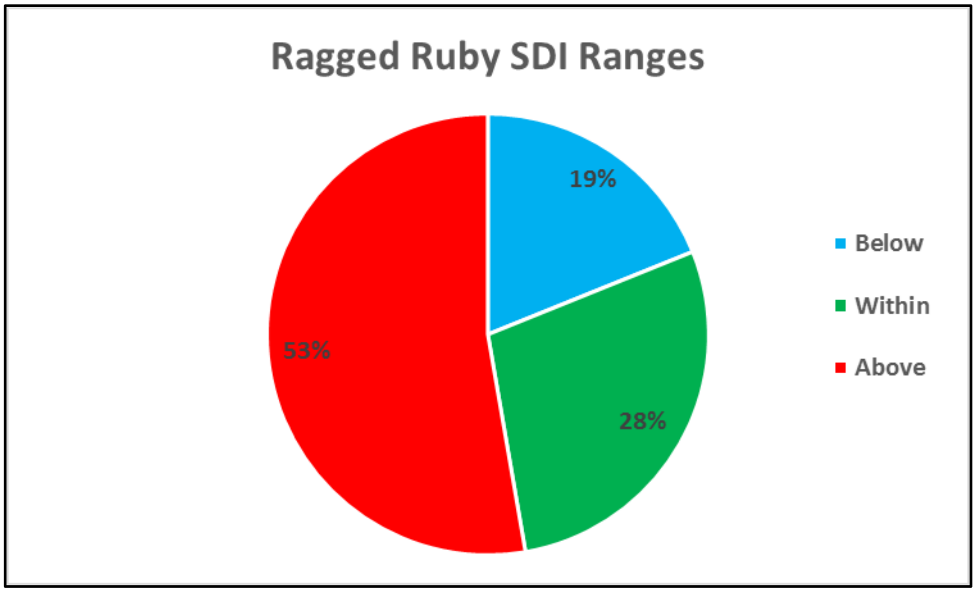


Figure 2. Stand density index (SDI) ranges for all forested stands within the Ragged Ruby planning area. Ranges are percent maximum stand density index and include: Below the management zone (0 to 35 percent maximum stand density index); within the management zone (35 to 60 percent maximum stand density index); and above the management zone (60 to 100 percent maximum stand density index).

Snags are abundant in the Ragged Ruby planning area and this data is displayed in Table 14 below. These numbers are averages from the stand exam data for each plant association group (the Warm Moist and Warm Very Moist Upland Forest plant association groups are not included because exam data was not collected in stands with these classifications). These are actual numbers, not imputed data, for those stands with exams that were selected to represent the planning area. High levels of snags are due to high stand densities that increase competition-induced tree mortality, and previous insect outbreaks, diseases, and the Summit and Reed Fires.

Table 14. Average of medium and large snags per acre within the Ragged Ruby planning area

Plant association group	Acres	Percent of planning area	Snags 10-20 inches diameter at breast height	Snags >20 inches diameter at breast height	Total snags >10 inches diameter at breast height
Warm Dry Upland Forest	17,500	47	6.1	1.4	7.6
Hot Dry Upland Forest	1,000	3	3.8	1.3	5.1
Cool Moist Upland Forest	7,720	21	9.2	2.0	11.2
Cold Dry Upland Forest	5,160	14	11.1	2.3	13.4
Cool Dry Upland Forest	860	2	4.6	1.7	6.3
Cool Wet Upland Forest	160	<1	11.0	1.9	12.9
Weighted average			7.6	1.7	9.3

Hot Dry Plant Association Group

Hot Dry forests occupy approximately 1,000 acres (3 percent of the planning area). They generally occur across residual and Mollisol soils and are located in the lower elevations of the Ragged Ruby planning area.

Species Composition and Density

The Hot Dry plant association group includes many of the ponderosa pine plant associations (Powell et al. 2007). Ground vegetation generally consists of Idaho fescue, bluebunch wheatgrass, mountain big sagebrush, and mountain mahogany.

Species composition includes nearly pure stands of ponderosa pine. In many locations juniper is also increasing its range into this plant association group. Many of these stands historically were woodland/savannah due to shallow soils and historical fire regimes. These stands are characterized by few old and mature trees per acre, and typically many smaller, younger trees growing in. These stands are typically low density, and where density does get higher, often experience tree mortality from mountain pine beetle. Figure 3 illustrates that ponderosa pine has a higher proportion of basal area than its corresponding trees per acre. This is due to the fact that most of the large old trees within this plant association group are ponderosa pine, and other species are predominately young ingrowth.

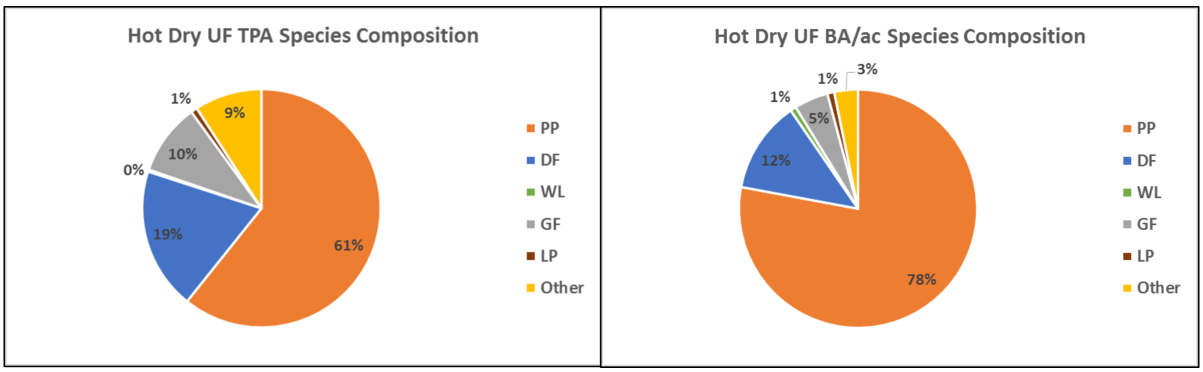


Figure 3. Species composition by trees per acre (TPA) and basal area per acre (BA/ac) for the Hot Dry plant association group. Species include ponderosa pine (PP), Douglas-fir (DF), western larch (WL), grand fir (GF), and lodgepole pine (LP). "Other" species includes western white pine, western juniper, subalpine fir, whitebark pine, and Englemann spruce.

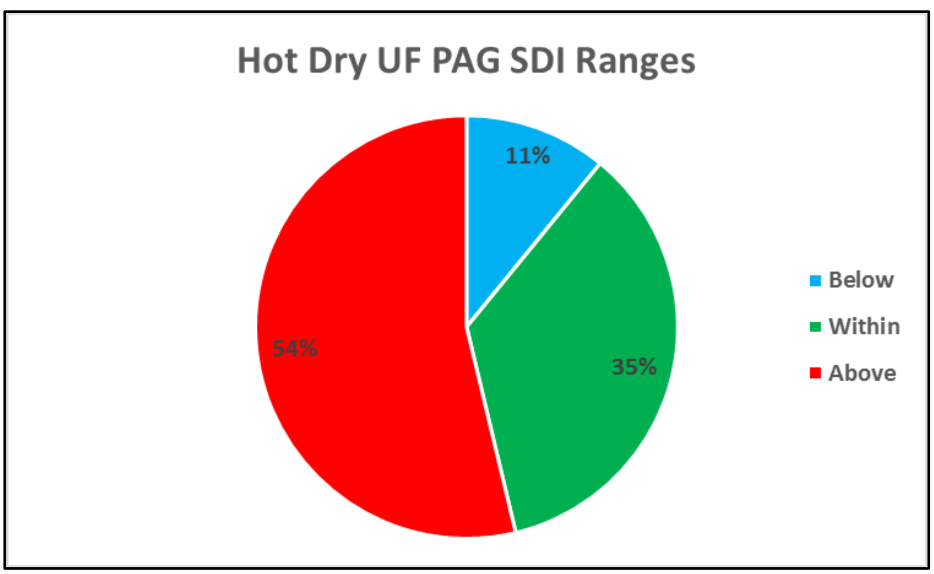


Figure 4. Stand density index (SDI) ranges for Hot Dry upland forest stands within the Ragged Ruby planning area. Ranges are percent maximum stand density index and include: Below the management zone (0 to 35 percent maximum stand density index); within the management zone (35 to 60 percent maximum stand density index); and above the management zone (60 to 100 percent maximum stand density index).

Over half of the area within the Hot Dry plant association group is above the management zone, with high stand densities that are susceptible to competition-induced tree mortality, insect and disease infestation, and high-severity wildfire.

Hot Dry Plant Association Group Structure and the Historical Range of Variability

Table 15 below displays how the existing structure within the Hot Dry plant association group compares to the historical range of variability. Currently, stem exclusion open canopy, stem exclusion closed canopy, and understory reinitiation are within the historical range of variability. Stand initiation is slightly below the historical range of variability, and old forest single stratum is significantly below the historical range of variability. Young forest multi-strata and old forest multi-strata are significantly above the historical range of variability, suggesting that treatment of the understory in these structure classes could shift the Hot Dry plant association group to more within the historical range of variability for the planning area.

Table 15. Hot Dry plant association group historical range of variability analysis

Structure type	Percent historical range of variability[1]	Percent existing condition
Stand initiation	5-15	3
Stem exclusion open canopy	5-20	12
Stem exclusion closed canopy	0-5	0
Young forest multi-strata	5-10	39
Understory reinitiation	0-5	0
Old forest single stratum	20-70	0
Old forest multi-strata	5-15	46

[1]From Powell (1998).

Warm Dry Plant Association Group

Warm Dry forests occupy approximately 17,500 acres (47 percent of the planning area). They also generally occur across residual and Mollisol soils. In the southern portion of the planning area (south of the Middle Fork John Day River) these forests are located in the lower and mid elevations of the hillslope. In the northern portion of the planning area they are generally located in the lower elevations and on south-facing slopes at higher elevations.

Species Composition and Density

The Warm Dry plant association group is represented by an array of plant associations (Powell et al. 2007) and includes many of the ponderosa pine plant associations, some of the Douglas-fir plant associations and a few of the drier grand fir plant associations (up to and including the grand fir/birchleaf spirea association). Ground vegetation generally consists of pine grass, elk sedge, common snowberry, and birchleaf spirea.

Species composition includes nearly pure stands of ponderosa pine to mixes where grand fir is currently the dominant species and Douglas-fir, ponderosa pine, western larch, and lodgepole pine occur in lesser amounts. In some locations juniper is also increasing its range into the Warm Dry plant association group. The pure ponderosa pine stands are generally young and even-aged due to the nature of past harvests. There is low structural diversity and a relative lack of larger-diameter trees and snags. The mixed conifer stands are generally uneven-aged, with trees ranging from seedlings and saplings to large, old trees (300 plus years). The large, old trees tend to be early seral, ponderosa pine and Douglas-fir, and the younger trees are predominantly grand fir. These stands tend to be very dense, have more structural diversity than the pure ponderosa pine stands, and have a greater number of large-diameter trees and snags. As with the Hot Dry plant association group, ponderosa pine is the dominant large, old tree within this plant association group.

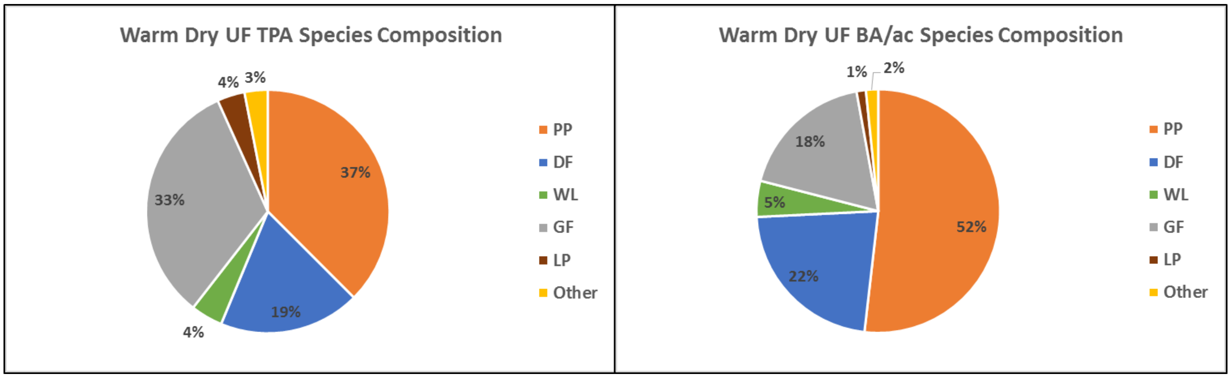


Figure 5. Species composition by trees per acre (TPA) and basal area per acre (BA/ac) for the Warm Dry plant association group. Species include ponderosa pine (PP), Douglas-fir (DF), western larch (WL), grand fir (GF), and lodgepole pine (LP). “Other” species includes western white pine, western juniper, subalpine fir, whitebark pine, and Englemann spruce.

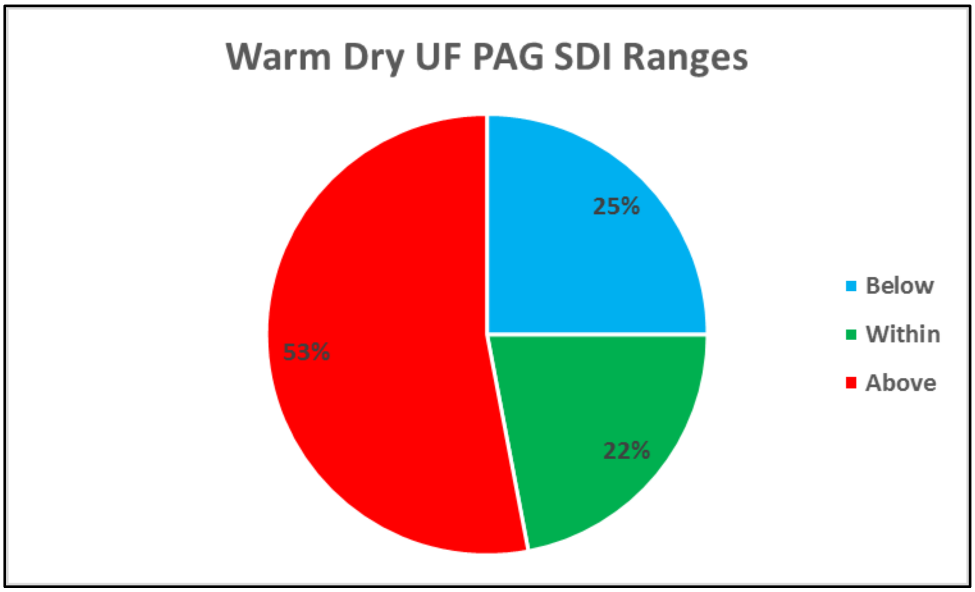


Figure 6. Stand density index (SDI) ranges for Warm Dry upland forest stands within the Ragged Ruby planning area. Ranges are percent maximum stand density index and include: Below the management zone (0 to 35 percent maximum stand density index); within the management zone (35 to 60 percent maximum stand density index); and above the management zone (60 to 100 percent maximum stand density index).

Over half of the area within the Warm Dry plant association group is above the management zone, with high stand densities that are susceptible to competition-induced tree mortality, insect and disease infestation, and high-severity wildfire.

Warm Dry Plant Association Group Structure and the Historical Range of Variability
Table 16 displays how the existing structure within the Warm Dry plant association group compares to the historical range of variability. Currently, stand initiation, stem exclusion open canopy, and young forest multi-strata are within the historical range of variability; stem exclusion closed canopy, understory reinitiation, and old forest multi-strata are above the historical range of variability; and old forest single stratum is the only structure class that is below the historical range of variability.

Table 16. Warm Dry plant association group historical range of variability analysis

Structure type	Percent historical range of variability[1]	Percent existing condition
Stand initiation	5-15	8
Stem exclusion open canopy	5-20	12
Stem exclusion closed canopy	1-10	16
Young forest multi-strata	5-25	25
Understory reinitiation	1-10	12
Old forest single stratum	15-55	3
Old forest multi-strata	5-20	23

[1]From Powell (1998).

Cool Moist Plant Association Group

Cool Moist forests occupy approximately 7,720 acres (21 percent of the planning area). They generally occur where ash soils exist, on north-facing slopes, and in draw bottoms. South of the Middle Fork John Day River they are located in the mid and upper elevations. North of the Middle Fork John Day River they are located in the upper elevations of Granite Boulder Creek.

Species Composition and Density

The Cool Moist plant association group is represented by an array of plant associations (Powell et al. 2007), indicating the wide range of environments they occupy. The Cool Moist plant association group includes many of the grand fir, lodgepole pine (grand fir), lodgepole pine (subalpine fir), and subalpine fir plant associations. Ground vegetation generally consists of big huckleberry, queencup beadlily, grouse huckleberry, twinflower, false bugbane, Pacific yew, and a wide variety of herbs and shrubs.

Most stands within the Cool Moist plant association group are mixed conifer. Species composition includes ponderosa pine, lodgepole pine, western larch, Douglas-fir, grand fir, Engelmann spruce, and western white pine. These stands are generally uneven-aged, with trees ranging from seedlings and saplings to large, old trees (300 plus years). The large, old trees tend to be early seral ponderosa pine, western larch, Douglas-fir, and western white pine. However, large, old grand fir also exist in moist pockets and protected areas. Younger trees are predominantly grand fir. However, due to the productivity of these sites, small openings in the canopy also provide the conditions for natural regeneration of early seral species. These stands tend to be very dense, have a high degree of structural diversity, and have many large-diameter trees and snags.

Species composition within Cool Moist stands varies based on location within the planning area. Stands south of the Middle Fork John Day River appear to historically have been mixed conifer dominated by western larch. Many of these stands have large, old western larch, ponderosa pine, western white pine, Douglas-fir, and grand fir, with dense understories of grand fir, lodgepole pine, and western larch in some cases. Stands north of the Middle Fork John Day River appear to historically have been slightly drier. These stands currently have large, old ponderosa pine, western larch, and Douglas-fir with dense understories of grand fir, lodgepole pine, Douglas-fir, ponderosa pine, and western larch.

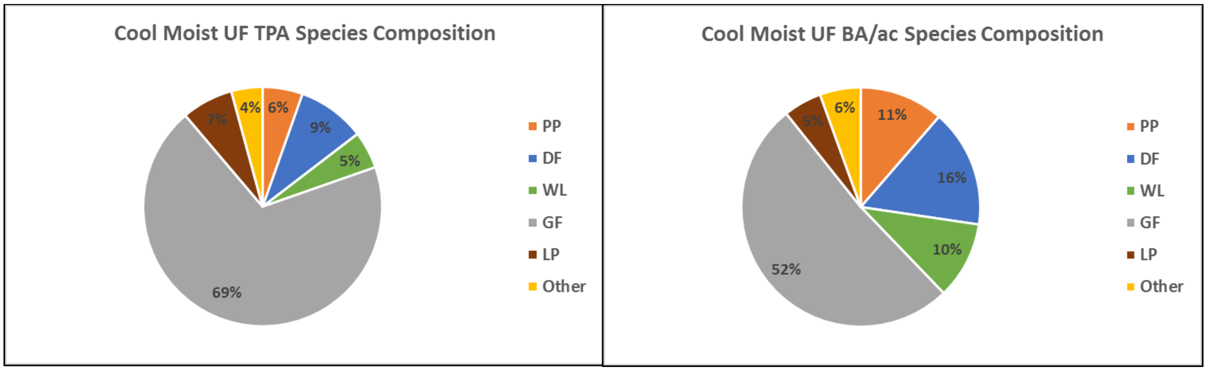


Figure 7. Species composition by trees per acre (TPA) and basal area per acre (BA/ac) for the Cool Moist plant association group. Species include ponderosa pine (PP), Douglas-fir (DF), western larch (WL), grand fir (GF), and lodgepole pine (LP). "Other" species includes western white pine, western juniper, subalpine fir, whitebark pine, and Englemann spruce.

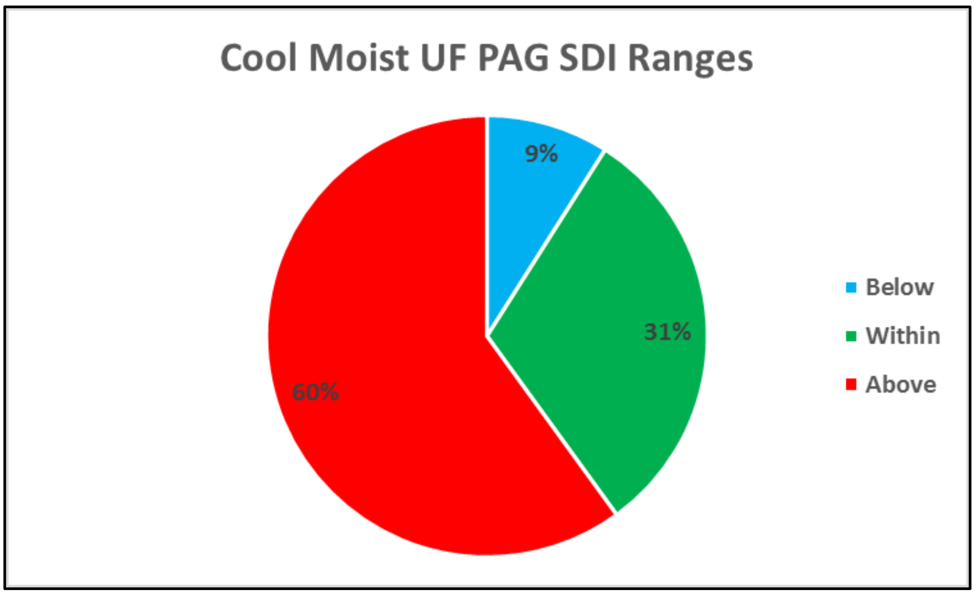


Figure 8. Stand density index (SDI) ranges for Cool Moist upland forest stands within the Ragged Ruby planning area. Ranges are percent maximum stand density index and include: Below the management zone (0 to 35 percent maximum stand density index); within the management zone (35 to 60 percent maximum stand density index); and above the management zone (60 to 100 percent maximum stand density index).

Approximately 60 percent of the area within the Cool Moist plant association group is above the management zone, with high stand densities that are susceptible to competition-induced tree mortality, insect and disease infestation, and high-severity wildfire.

Cool Moist Plant Association Group Structure and the Historical Range of Variability

Table 17 below displays how the existing structure within the Cool Moist plant association group compares to the historical range of variability. Currently, stand initiation, stem exclusion closed canopy, and old forest single stratum are within the historical range of variability; stem exclusion open canopy and old forest multi-strata are above the historical range of variability; and young forest multi-strata and understory reinitiation are below the historical range of variability.

Table 17. Cool Moist plant association group historical range of variability analysis

Structure type	Percent historical range of variability[1]	Percent existing condition
Stand initiation	1-10	1
Stem exclusion open canopy	0-5	17
Stem exclusion closed canopy	5-25	14
Young forest multi-strata	40-60	5
Understory reinitiation	5-25	1
Old forest single stratum	0-5	2
Old forest multi-strata	10-30	61

[1]From Powell (1998).

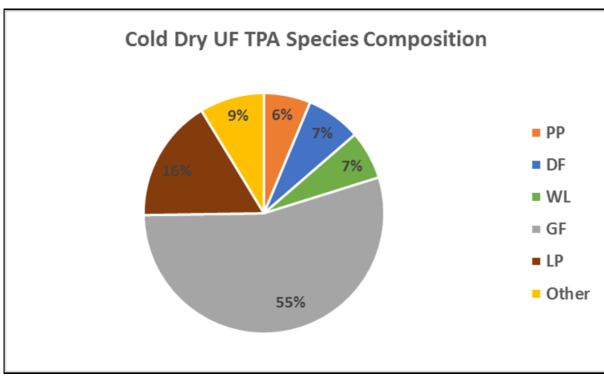
Cold Dry Plant Association Group

Cold Dry forests occupy approximately 5,160 acres (14 percent of the planning area). They generally occur in the Greenhorn Mountain and Dixie Butte inventoried roadless areas. They are also scattered in small pockets throughout the planning area in areas of cold air drainage.

Species Composition and Density

The Cold Dry plant association group is represented by an array of plant associations (Powell et al. 2007), indicating the wide range of environments it occupies. This plant association group is predominantly lodgepole pine and subalpine fir plant associations, but also includes some grand fir associations. Ground vegetation generally consists of elk sedge, pinegrass, grouse huckleberry, heartleaf arnica, pinemat manzanita, and snowbrush ceanothus.

Most stands within the Cold Dry plant association group are dominated by grand fir, and in the higher elevations lodgepole pine and subalpine fir. Other species include ponderosa pine, western larch, Douglas-fir, and Engelmann spruce. Grand fir/grouse huckleberry is also a common plant association within the Cold Dry plant association group in the Ragged Ruby planning area. These stands are generally mixed conifer and species composition includes ponderosa pine, lodgepole pine, western larch, Douglas-fir, grand fir, and Engelmann spruce. Most Cold Dry stands are generally uneven-aged, with trees ranging from seedlings and saplings to large, old trees (300 plus years). The large, old trees tend to be a mixture of ponderosa pine, western larch, grand fir, and Douglas-fir. Younger trees are predominantly grand fir and lodgepole pine. These stands tend to be very dense, have a high degree of structural diversity, and have many large-diameter trees and snags.



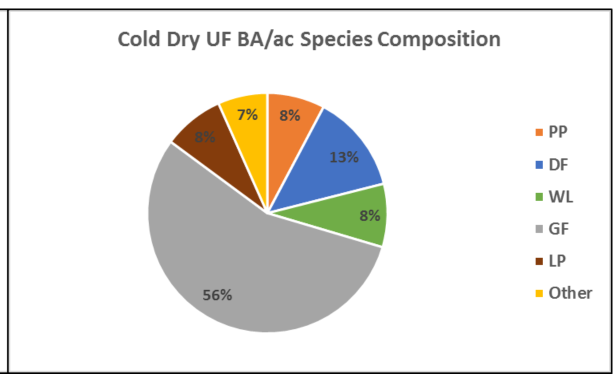


Figure 9. Species composition by trees per acre (TPA) and basal area per acre (BA/ac) for the Cold Dry plant association group. Species include ponderosa pine (PP), Douglas-fir (DF), western larch (WL), grand fir (GF), and lodgepole pine (LP). "Other" species includes western white pine, western juniper, subalpine fir, whitebark pine, and Englemann spruce.

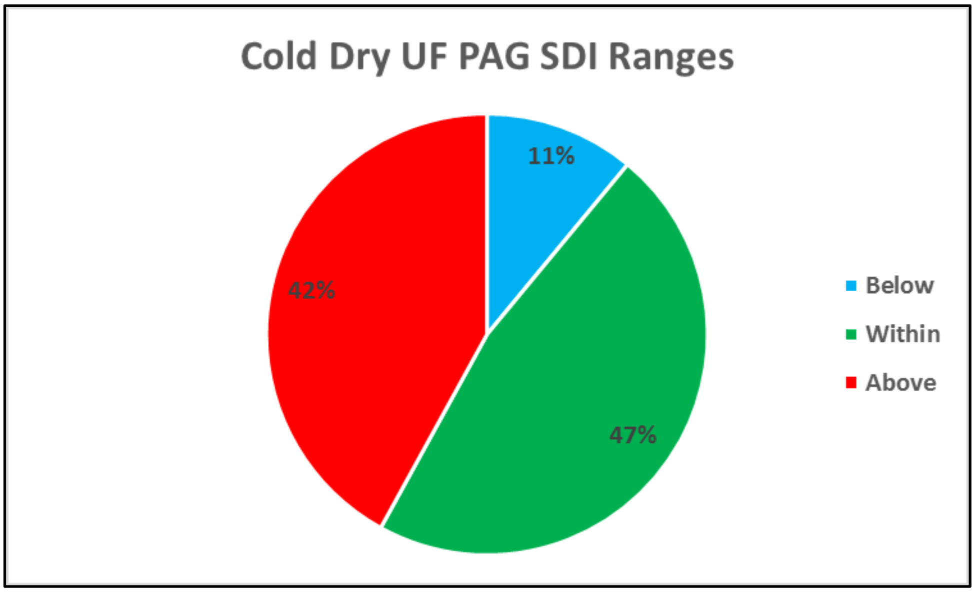


Figure 10. Stand density index (SDI) ranges for Cold Dry Upland Forest stands within the Ragged Ruby planning area. Ranges are percent maximum stand density index and include: Below the management zone (0 to 35 percent maximum stand density index); within the management zone (35 to 60 percent maximum stand density index); and above the management zone (60 to 100 percent maximum stand density index).

Approximately half of the area within the Cold Dry plant association group is within the management zone. Slightly less than half is above the management zone with high stand densities that are susceptible to competition-induced tree mortality, insect and disease infestation, and high-severity wildfire.

Cold Dry Plant Association Group Structure and the Historical Range of Variability

Table 18 below displays how the existing structure within the Cold Dry plant association group compares to the historical range of variability. Currently, stand initiation, stem exclusion open canopy, stem exclusion closed canopy, and old forest single stratum are within the historical range of variability; understory reinitiation and old forest multi-strata are above the historical range of variability; and young forest multi-strata is the only structure class below the historical range of variability.

Table 18. Cold Dry plant association group historical range of variability analysis

Structure type	Percent historical range of variability[1]	Percent existing condition
Stand initiation	1-20	3
Stem exclusion open canopy	0-5	0
Stem exclusion closed canopy	5-20	15
Young forest multi-strata	10-40	0
Understory reinitiation	5-25	44
Old forest single stratum	0-5	0
Old forest multi-strata	10-40	46

[1]From Powell (1998).

Existing Condition – Aspen Stands

Aspen is found in approximately 31 locations within the planning area. Aspen provides unique habitat for many wildlife species within coniferous forests, and it is currently much reduced from its historical extent. It appears that the combination of fire suppression, heavy grazing by both domestic and wild ungulates, conifer encroachment, and lowering of the water table has reduced the survival of aspen on the Malheur National Forest.

Many of the aspen stands within the Ragged Ruby planning area have either been treated through past projects and/or burned in the Summit Fire. Many of these stands are young and have fences that need to be extended and repaired to allow for suckering to expand. Aspen is considered a shade-intolerant species. Some of the stands within the Ragged Ruby planning area are still in need of conifer reduction to release light and moisture for the aspen.

Table 19. Aspen historical range of variability analysis

Age	Structure type	Percent historical range of variability[1]	Percent existing condition
0-40	Stand initiation	45-50	14
40-80	Stem exclusion, understory reinitiation, and young forest multi-strata	45-50	43
80+	Old forest single stratum and old forest multi-strata	5-10	43

[1]From Swanson et al. (2010).

These characteristics put most of the stands in the subwatershed in an old forest single stratum/old forest multi-strata or a stem exclusion/understory reinitiation/young forest multi-strata structural stage. Stem exclusion/understory reinitiation/young forest multi-strata is within the historical range of variability. Old forest single stratum/old forest multi-strata and stand initiation are not within the historical range of variability.

Existing Condition – Disturbance Processes

The Ragged Ruby planning area has historically and is currently being affected by many disturbance agents. These include insects, diseases, fire, and human-related disturbances such as timber harvest, fire suppression, and grazing. Fire is by far the major natural disturbance agent in the Middle Fork John Day River drainage. Fire has played a major role in shaping the structure, species composition, and density of this area, and would continue to play this role into the future. The role of fire on the landscape and the relatively recent fire events are discussed in the Historical Condition section, as well as previous timber harvest, fire suppression, and grazing. The current conditions for insects and disease are discussed below. A more comprehensive description can also be found in McWilliams et al. (2015).

Insects

There are many insects present within the Ragged Ruby planning area which include bark beetles and defoliators. Currently, all of the insects present are at endemic levels, except mountain pine beetle activity in western white pine. At endemic levels, they play an important role in contributing to structural diversity and providing dead wood habitat for wildlife and soil productivity. Scattered individual tree mortality creates small openings in stands where pockets of understory can establish.

Bark beetles are the most common insects present in the dry forests. The mountain pine beetle is likely the most currently active beetle in the Ragged Ruby planning area. It has been working for approximately a decade in the Dixie Butte Inventoried Roadless Area and surrounding area, killing pockets and individual trees of western white pine. Cumulatively, this tree mortality has been significant in the western white pine population of the planning area. It has also been active on Dixie Butte killing the larger, mature whitebark pine trees on the mountain.

The western pine beetle is the primary bark beetle working in stands dominated by large, old ponderosa pine. It causes scattered individual tree mortality, killing large, old ponderosa pine trees that have been weakened by drought stress and high stand densities.

Mountain pine beetle and pine engraver are beetles that generally attack trees within dense thickets of small to medium diameter ponderosa pine and lodgepole pine. Due to past management practices, denser stands within the planning area that have a high proportion of sapling- to pole-sized ponderosa pine or lodgepole pine that are currently at risk for mountain pine beetle and pine engraver tree mortality.

Fir engraver activity is currently prevalent in dry and moist mixed conifer stands due to the combination of high stand densities and increased proportion of grand fir occupying these sites. Fir engraver attacks grand fir trees that are pole-sized and larger causing tree mortality, topkill, and branch flagging (Goheen and Willhite 2006).

The main defoliating insect present within the Ragged Ruby planning area is the spruce budworm. This insect feeds on the current-year foliage of predominantly grand fir, but may also attack Douglas-fir, Engelmann spruce, and western larch. They cause localized branch dieback and topkill after a few years of heavy defoliation, and may kill trees after 4 to 5 years of sustained feeding (Goheen and Willhite 2006).

Diseases

There are many diseases prevalent within the Ragged Ruby planning area. The major diseases include dwarf mistletoes, armillaria, annosus, white pine blister rust, and Indian paint fungus. As with insects, these diseases play an important role in creating structural diversity, creating a source of snags and downed logs, providing important wildlife habitat, and recycling nutrients to maintain soil productivity. At severe levels, these diseases can greatly inhibit tree growth and old forest structure. They also provide unique wildlife habitat, such as roosting sites for grouse.

The primary species infected by dwarf mistletoe are ponderosa pine, western larch, lodgepole pine, and Douglas-fir. Historically, dwarf mistletoe was present in low levels. It predisposed the occasional tree to bark beetle attack or torching by fire. Frequent fires likely kept overall levels of mistletoe low due to "fire pruning" of infected branches and through potential negative impacts of the heat and smoke on developing mistletoe plants. Mistletoe is currently abundant in the Ragged Ruby planning area. A large portion of the pole-sized to mature western larch is infected with mistletoe, which is the primary reason for western larch tree mortality. Douglas-fir mistletoe is also found in isolated pockets within many of the Cool Moist stands.

The primary root diseases in the Ragged Ruby planning area are annosus and armillaria that result in small "centers" of tree mortality and associated gaps in the forest canopy. They are generally found in conjunction with bark beetles. Historically, root disease infection levels were generally low because of the higher proportion of early seral species and lower stand densities. Frequent fires also helped keep root diseases at low levels due to the promotion of soil fungi that compete with pathogenic fungi, and through beneficial effects of fire on soil nutrients and nutrient cycling.

There are scattered centers of annosus throughout the planning area that are generally associated with previous logging. Annosus is spread by spores in the air entering cut stumps and moving down through the roots. Its main hosts are grand fir, Engelmann spruce, and Douglas-fir, but it may also infect ponderosa pine. It causes severe root and butt decay, growth loss, and tree mortality (Goheen and Willhite 2006).

Armillaria is found in scattered centers predominantly on ash soils and ridgetops in the Ragged Ruby planning area. It is spread by the roots of trees and primarily infects grand fir and Douglas-fir, although in severe cases it may infect ponderosa pine and planted western larch. It causes severe root and butt decay, growth loss, and tree mortality (Goheen and Willhite 2006).

White pine blister rust is found on western white pine and whitebark pine in the Ragged Ruby planning area. It is actively killing young, planted western white pine in a few of the higher elevation plantations with the planning area. However, only some of the plantations are experiencing tree mortality and it is unknown as to why it is only occurring in some locations. White pine blister rust is also infecting naturally regenerated western white pine and whitebark pine. In larger trees it is working in conjunction with mountain pine beetle to kill these trees.

Conks of Indian paint fungus are prevalent in the planning area associated with Cool Moist stands and late seral tree species. Indian paint fungus is a pathogen that weakens the main stem of live trees by causing rust red stringy rot of the heartwood. Loss of significant wood volume by the advanced decay of the heartwood of host trees infected by this pathogen often makes infected trees unmerchantable over time.

Environmental Consequences

Methodology

Modeling was used to project stand development through 40 years for future structural stages, stand density, and species composition. The FSVeg Data Analyzer program was used to run the nearest neighbor analysis and forest vegetation simulator on all of the forested stands within the Ragged Ruby planning area. The nearest neighbor analysis populates stands without current stand exam data using similar stands with exam data. The forest vegetation simulator model, with the Blue Mountains variant, was used to grow stands to 2017, and then apply prescriptions to the stands proposed and project stand growth and development for 40 years. All mechanical treatments proposed within the Ragged Ruby planning area, as well as the first application of prescribed burning, were simulated in this analysis. Forest vegetation simulator projections were then used to compare stand structure, stand density, and species composition between the no action and action alternatives to determine if they met project goals. Long-term projections become estimates at best; however, results do show trends and are useful for comparing different alternatives.

Assumptions for estimating effects include:

- Historical range of variability approximates the desired future condition.
- The future climate will be within the current range of variation.
- Current insects and diseases will continue to inhabit the forest and populations will fluctuate depending on stand conditions.
- The current trends in forest stand composition, structure, and density will continue, assuming that no further mechanical vegetation management would occur.
- Regeneration resulting from opening up stands in the Warm Dry plant association group would be kept at low levels by periodic underburning.

Assumptions for the FSVeg Data Analyzer model include:

- Benchmarks for the future structural stage analysis are set at 10 and 40 years in the future.
- The mechanical treatments in the action alternatives are only applied once, at the start of the modeling time period. They are not repeated again within the 40 year modeling cycle.
- The prescribed burning in the action alternatives is only applied once in the first cycle of forest vegetation simulator. Prescribed burning was not repeated again within the 40 year modeling cycle.
- The stands without mechanical treatment or prescribed fire are grown using the assumptions for alternative 1.
- No other disturbances occur that result in stand replacement (wildfire, insects, wind, etc.).

The above modeling constraints are used to simplify the analysis and are only for comparative purposes between the no action and action alternatives. They are not intended to accurately predict actual future conditions. Based on science and professional knowledge, it is reasonable to believe that climate change and future disturbances will occur that will affect the vegetation in the Ragged Ruby planning area. However, due to the uncertainty and unpredictability of these events, or how forest vegetation will respond to them, they were not incorporated in this analysis. These assumptions were made because it is impossible to predict when, where, and to what extent future disturbances would occur and because there is still great uncertainty to the effects of climate change. Scientists agree that the future climate in the Blue Mountains will be hotter, but there is great uncertainty as to whether it will be drier or wetter. Changes in the amount, form, and timing of precipitation could have drastic effects on forest extent, composition, and diversity.

Spatial and Temporal Context for Effects Analysis

The spatial boundary used for the direct and indirect effects analysis includes the Granite Boulder Creek-Middle Fork John Day River and the Balance Creek-Middle Fork John Day River subwatersheds. This boundary includes private and National Forest System lands. The boundary used for the cumulative effects analysis includes the Ragged Ruby planning area and the directly adjacent recent projects and associated subwatersheds that drain into the Middle Fork John Day River. This includes the Summit Fire and Reed Fire areas, the Big Mosquito project to the northwest, the Camp Lick planning area to the southwest, and the Galena project to the east. This area is approximately 157,000 acres.

The timeframe for the direct and indirect effects of vegetation management is relatively short term for forest development. Direct and indirect effects are assessed 10 and 40 years after treatment. The timeframe for cumulative effects is relatively long term for forest development and includes cumulative effects of past logging, current restoration treatments, and the Ragged Ruby Project on species composition, stand density, and stand structure.

Past, Ongoing, and Reasonably Foreseeable Actions Relevant to Cumulative Effects Analysis

The past activities that have cumulative effects to forest vegetation within the Ragged Ruby planning area as described in Appendix E – Past, Ongoing, and Reasonably Foreseeable Actions include historical timber harvest, more recent timber harvesting in the 1970s through the 1990s, fire suppression, wildfire, timber salvage, planting following regeneration harvest and wildfire, and livestock grazing. Most of these activities are discussed at length in the historical condition section of this section. Until recently, timber salvage was a common practice on the Malheur National Forest. Most, if not all of the fires that occurred in the planning area or the near vicinity had some level of salvage logging occur after the fire. Salvage helped prepare sites and pay for extensive planting following stand replacement wildfire. Planting within wildfires and regeneration harvests was generally dense, up to 680 trees per acre, and planted predominantly ponderosa pine, but also western larch, western white pine, Douglas-fir, and even lodgepole pine in some areas. Dense planting, along with abundant natural regeneration in some areas, provided for young, dense stands of predominantly early seral species.

Historical grazing practices began with primarily high numbers of sheep in the area in the late 1800s and early 1900s. In the early to mid-1900s, grazing transitioned into primarily cattle grazing and is currently 100 percent cattle grazing. Cattle numbers have dramatically decreased over time and grazing is currently a vigorously monitored and managed activity within and adjacent to the planning area. Due to historical grazing practices, fire suppression, and the climate of the early 1900s, natural regeneration of tree species was stimulated, beginning the density increases of the 20th century. Current grazing practices generally do not impact the competing vegetation enough to influence natural regeneration success.

The recent past and present activities that have cumulative effects to forest vegetation include plantation maintenance, the Summit and Reed Fire Restoration Project, the Balance Wildland Urban Interface Project, the Galena Project, the Big Mosquito project, grazing as stated above, and continued fire suppression. The Plantation Maintenance, Plantation Maintenance Lower Middle Fork, and Plantation Maintenance Camp Creek Projects are within the cumulative effects boundary. See Ragged Ruby Silviculture Report for more information.

Two reasonably foreseeable actions that would cumulatively have an effect on the vegetation in the Middle Fork John Day River drainage are the Camp Lick Project (approximately 15,500 acres of mechanical treatment and approximately 32,080 acres of prescribed burning are proposed), and the Aquatic Restoration Decision (potential actions include non-commercial thinning, tree felling, and tree tipping to promote riparian restoration and aquatic habitat across approximately 1,780 acres).

These projects in total would mechanically treat approximately 52,900 acres and prescribe burn approximately 76,000 acres. They would account for treatment across approximately 34 percent and 48 percent, respectively, of the cumulative effects analysis area.

Alternative 1 – No Action

Direct and Indirect Effects

Given no action, the Ragged Ruby planning area would continue to grow on its current trajectory. Forested stands would continue to be overstocked with high proportions of late seral species. Stand structure would shift from predominantly young forest structure to predominantly old forest structure, doubling the amount of late and old structure (old forest single stratum and old forest multi-strata) in 40 years. The proportion of the planning area above the management zone would increase from currently approximately half of the area to approximately 79 percent of the area in 40 years. Changes in species composition were analyzed for all alternatives as well; however, changes were slight and will not be discussed further. See Ragged Ruby Silviculture Report for breakouts of these acres and percentages for each plant association group.

Table 20. Structural stages for alternative 1 (no action) within the Ragged Ruby planning area

Structure type	Percent existing condition	Percent 2029	Percent 2059
Stand initiation	6	2	2
Stem exclusion open canopy	11	12	9
Stem exclusion closed canopy	15	16	16
Young forest multi-strata	16	15	3
Understory reinitiation	15	15	5
Old forest single stratum	2	2	6
Old forest multi-strata	35	39	59

Table 21. Stand density index ranges for alternative 1 within the Ragged Ruby planning area

Management zone	Percent existing condition	Percent 2029	Percent 2059
Below	19	13	8
Within	28	27	13
Above	53	61	79

Hot Dry Plant Association Group

Species Composition and Density

Given no action, the species composition in pure ponderosa pine stands would continue to be predominantly ponderosa pine over time. However, there continues to be a decrease in abundance of ponderosa pine within this plant association group and an increase in the abundance of western juniper in the drier stands and an increase in abundance of grand fir in the moister stands. The proportion of area below or within the management zone would decrease, and in 40 years would only be approximately 40 percent of the area within the Hot Dry plant association group.

Table 22. Stand density index ranges for the Hot Dry Upland Forest stands for alternative 1 within the Ragged Ruby planning area

Management zone	Percent existing condition	Percent 2029	Percent 2059
Below	11	9	8
Within	35	36	31
Above	54	55	61

Hot Dry Plant Association Group Structure and the Historical Range of Variability

Table 23 below displays how alternative 1 within the Hot Dry plant association group compares to the historical range of variability through time. Over time, old forest multi-strata would continue to be above the historical range of variability, increasing in abundance to approximately 90 percent of the Hot Dry plant association group. After 40 years, the Hot Dry plant association group would be deficient in all structural stages except old forest multi-strata and stem exclusion open canopy.

Table 23. Hot Dry plant association group historical range of variability analysis for alternative 1

Structure type	Percent historical range of variability[1]	Percent existing condition	Percent 2029	Percent 2059
Stand initiation	5-15	3	0	0
Stem exclusion open canopy	5-20	12	7	6
Stem exclusion closed canopy	0-5	0	0	0

Structure type	Percent historical range of variability[1]	Percent existing condition	Percent 2029	Percent 2059
Young forest multi-strata	5-10	39	40	0
Understory reinitiation	0-5	0	2	0
Old forest single stratum	20-70	0	0	7
Old forest multi-strata	5-15	46	51	87

[1]From Powell (1998).

Warm Dry Plant Association Group

Species Composition and Density

Given no action, the species composition in pure ponderosa pine stands would continue to be predominantly ponderosa pine over time, with an increase in the abundance of western juniper in the hotter, drier stands. Late seral species in the mixed conifer stands would continue to increase in abundance. The proportion of area below or within the management zone would decrease and in 40 years would only be approximately 27 percent of the area within the Warm Dry plant association group.

Table 24. Stand density index ranges for the Warm Dry Upland Forest stands for alternative 1 within the Ragged Ruby planning area

Management zone	Percent existing condition	Percent 2029	Percent 2059
Below	25	18	11
Within	22	22	16
Above	53	60	73

Warm Dry Plant Association Group Structure and the Historical Range of Variability

Table 25 below displays how alternative 1 within the Warm Dry plant association group compares to the historical range of variability through time. Over time, old forest multi-strata would continue to be above the historical range of variability, increasing in abundance to approximately half of the area within the Warm Dry plant association group. There is a trend that after 40 years the Warm Dry plant association group would be deficient in young forest structure (stand initiation, young forest multi-strata, and understory reinitiation) as well as old forest single stratum.

Table 25. Warm Dry plant association group historical range of variability analysis for alternative 1

Structure type	Percent historical range of variability[1]	Percent existing condition	Percent 2029	Percent 2059
Stand initiation	5-15	8	0	0
Stem exclusion open canopy	5-20	12	15	15
Stem exclusion closed canopy	1-10	16	18	20
Young forest multi-strata	5-25	25	24	4
Understory reinitiation	1-10	12	13	0
Old forest single stratum	15-55	3	2	8
Old forest multi-strata	5-20	23	28	53

[1]From Powell (1998).

Cool Moist Plant Association Group

Species Composition and Density

Given no action, species composition proportions show very little change over the next 40 years. However, for Douglas-fir and western larch, the proportions of trees per acre stay the same, but the proportions of basal area per acre steadily decline. This indicates tree mortality in the large, old trees that is likely due to competition stress and dwarf mistletoe infections. The proportion of area below or within the management zone would decrease and in 40 years would only be approximately 9 percent of the area within the Cool Moist plant association group.

Table 26. Stand density index ranges for the Cool Moist Upland Forest stands for alternative 1 within the Ragged Ruby planning area

Management zone	Percent existing condition	Percent 2029	Percent 2059
Below	9	3	0
Within	31	28	9
Above	60	69	91

Cool Moist Plant Association Group Structure and the Historical Range of Variability

Table 27 below displays how alternative 1 within the Cool Moist plant association group compares to the historical range of variability through time. Over time, old forest multi-strata would continue to be above the historical range of variability, increasing in abundance to approximately 76 percent of the area within the Cool Moist plant association group. There is a trend that after 40 years the Cool Moist plant association group would be deficient in young forest structure (stand initiation, young forest multi-strata, and understory reinitiation).

Table 27. Cool Moist plant association group historical range of variability analysis for alternative 1

Structure type	Percent historical range of variability[1]	Percent existing condition	Percent 2029	Percent 2059
Stand initiation	1-10	1	0	0
Stem exclusion open canopy	0-5	17	16	6
Stem exclusion closed canopy	5-25	14	12	11
Young forest multi-strata	40-60	5	4	4
Understory reinitiation	5-25	1	1	0
Old forest single stratum	0-5	2	1	3
Old forest multi-strata	10-30	61	66	76

[1]From Powell (1998).

Cold Dry Plant Association Group

Species Composition and Density

Given no action, the lodgepole pine stands would continue to grow and experience competition-induced tree mortality. Late seral species and lodgepole pine in the mixed conifer stands would continue to increase in abundance and compete with the large, old ponderosa pine and western larch. Ponderosa pine would continue to grow and increase in abundance as well. The proportion of area below or within the management zone would decrease and in 40 years would only be approximately 11 percent of the area within the Cold Dry plant association group.

Table 28. Stand density index ranges for the Cold Dry Upland Forest stands for alternative 1 within the Ragged Ruby planning area

Management zone	Percent existing condition	Percent 2029	Percent 2059
Below	11	7	3
Within	47	40	8
Above	42	53	89

Cold Dry Plant Association Group Structure and the Historical Range of Variability

Table 29 below displays how alternative 1 within the Cold Dry plant association group compares to the historical range of variability through time. Over time, stand initiation, stem exclusion open canopy, stem exclusion closed canopy, and old forest single stratum would continue to be within the historical range of variability, even though there is no stem exclusion open canopy or old forest single stratum structure present. There is a trend that after 40 years the Cold Dry plant association group would be deficient in young forest multi-strata, and would have an abundance of understory reinitiation and old forest multi-strata.

Table 29. Cold Dry plant association group historical range of variability analysis for alternative 1

Structure type	Percent historical range of variability[1]	Percent existing condition	Percent 2029	Percent 2059
Stand initiation	1-20	3	3	5
Stem exclusion open canopy	0-5	0	0	0
Stem exclusion closed canopy	5-20	15	17	16
Young forest multi-strata	10-40	0	0	0
Understory reinitiation	5-25	44	42	28
Old forest single stratum	0-5	0	0	0
Old forest multi-strata	10-40	38	38	51

[1]From Powell (1998).

Aspen Stands

Given no action, fire suppression, grazing by both domestic livestock and wild ungulates, conifer encroachment, and lowering of the water table would continue at its current rate. Since most of the aspen stands within the Ragged Ruby planning area are either in the stem exclusion/understory reinitiation/young forest multi-strata, or old forest single strata/old forest multi-strata stages, many stands are likely to continue growing until trees reach maturity. Many of the mature trees in the old forest stages are close to the end of their natural life cycle; however, aspen has been regenerating in many of these stands. If existing fences are not repaired or expanded, it is likely that browse may prevent aspen suckering any further and prevent aspen stands from expanding their size within the Ragged Ruby planning area.

Disturbance Processes

Given no action, stand densities across the planning area would continue to increase. This would increase the risk of insect outbreaks of western spruce budworm, mountain pine beetle, and western pine beetle in the planning area. It would also increase the risk of a large-scale, stand replacement fire. Effects from diseases such as mistletoe, Indian paint fungus, armillaria, and annosus would continue to increase due to high stand densities and high proportions of late seral species.

Cumulative Effects

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

Alternative 2

Direct and Indirect Effects – Silviculture Treatments

Alternative 2 proposes to mechanically treat approximately 9,200 acres and prescribed burn approximately 34,000 acres. Restoration treatments include dry pine restoration, mixed conifer restoration, dry meadow and scabland flat bunchgrass restoration, whitebark pine and western white pine restoration, and aspen restoration. Activities within these treatments include commercial thinning, non-commercial thinning, tree felling, tree tipping, piling, pile burning, jackpot burning, and prescribed burning. Given these treatments, stand structure would shift with the proportion of young forest structure decreasing and the proportion of old forest structure increasing over a 40-year time period. When comparing old forest structure after 40 years, alternative 1 (65 percent) and alternative 2 (63 percent) are predicting approximately the same proportion; however, for alternative 2, there would be twice as much old forest single stratum. When comparing density over 40 years, predictions for alternative 2 are that density would be lower with approximately 36 percent of the planning area within or below the management zone, as compared to approximately 21 percent for alternative 1. Proposed activities in alternative 2 would also shift species composition over 40 years; however, changes were slight. See Ragged Ruby Silviculture Report for breakouts of these acres and percentages for each plant association group.

For the effects analysis of silviculture treatments, results for 2020 are directly after mechanical treatments have been simulated. Results for 2029 include effects that occur after all fuels treatments and prescribed burning have been simulated.

Table 30. Structural stages for alternative 2 within the Ragged Ruby planning area

Structure type	Percent existing condition	Percent 2020	Percent 2029	Percent 2059
Stand initiation	6	7	2	2
Stem exclusion open canopy	11	21	17	11
Stem exclusion closed canopy	15	13	14	16
Young forest multi-strata	16	11	10	2
Understory reinitiation	15	13	17	5
Old forest single stratum	2	6	5	12
Old forest multi-strata	35	30	34	51

Table 31. Stand density index ranges for alternative 2 within the Ragged Ruby planning area

Management zone	Percent existing condition	Percent 2020	Percent 2029	Percent 2059
Below	19	32	22	12
Within	28	31	34	24
Above	53	37	44	64

Hot Dry Plant Association Group

Species Composition and Density

Alternative 2 would mechanically treat approximately 32 percent and prescribed burn approximately 69 percent of the Hot Dry plant association group. Given these actions, the species composition in all stands treated would continue to be predominantly ponderosa pine over time. Most natural regeneration would be killed with prescribed burning. Collectively, these treatments would reduce the proportion of the Hot Dry plant association group that is above the management zone, which is approximately 38 percent directly after treatment. When comparing density over 40 years, predictions for alternative 2 are that density would be lower given treatment, with approximately 56 percent of the Hot Dry plant association group within or below the management zone, as compared to approximately 39 percent for alternative 1.

Table 32. Stand density index ranges for the Hot Dry Upland Forest stands for alternative 2 within the Ragged Ruby planning area

Management zone	Percent existing condition	Percent 2020	Percent 2029	Percent 2059
Below	11	31	30	27
Within	35	31	29	29
Above	54	38	41	44

Hot Dry Plant Association Group Structure and the Historical Range of Variability

Table 33 displays how alternative 2 within the Hot Dry plant association group compares to the historical range of variability through time. Over time, old forest multi-strata would continue to be above the historical range of variability, increasing in abundance to approximately 69 percent of the area, and old forest single stratum would increase in abundance to be within the historical range of variability. There is a trend that after 40 years the Hot Dry plant association group would be deficient in young forest structure (stand initiation and young forest multi-strata) and understory reinitiation. When comparing structure over 40 years, both alternatives 1 (no action) and 2 would tend to be deficient in young forest structure. However, alternative 2 would increase the proportion of old forest single stratum from approximately 0 to 25 percent over time.

Table 33. Hot Dry plant association group historical range of variability analysis for alternative 2

Structure type	Percent historical range of variability[1]	Percent existing condition	Percent 2020	Percent 2029	Percent 2059
Stand initiation	5-15	3	3	0	0
Stem exclusion open canopy	5-20	12	21	17	6
Stem exclusion closed canopy	0-5	0	0	0	0
Young forest multi-strata	5-10	39	24	25	0
Understory reinitiation	0-5	0	8	2	0
Old forest single stratum	20-70	0	3	10	25
Old forest multi-strata	5-15	46	41	45	69

[1]From Powell (1998).

Warm Dry Plant Association Group

Species Composition and Density

Alternative 2 would mechanically treat approximately 25 percent and prescribed burn approximately 92 percent of the Warm Dry plant association group. Given these actions, the species composition in all stands treated would continue to be predominantly ponderosa pine over time. The proportion of ponderosa pine increases directly after treatment, while the proportion of grand fir decreases. However, over time, those changes diminish due to tree ingrowth and move back closer to their existing condition proportions. Collectively, these treatments would reduce the proportion of the Warm Dry plant association group that is above the management zone, from approximately 53 percent to approximately 39 percent directly after treatment. When comparing density over 40 years, predictions for alternative 2 are that density would be lower given treatment, with approximately 40 percent of the Warm Dry plant association group within or below the management zone, as compared to approximately 27 percent for alternative 1.

Table 34. Stand density index ranges for the Warm Dry Upland Forest stands for alternative 2 within the Ragged Ruby planning area

Management zone	Percent existing condition	Percent 2020	Percent 2029	Percent 2059
Below	25	35	26	16
Within	22	26	30	24
Above	53	39	45	60

Warm Dry Plant Association Group Structure and the Historical Range of Variability

Table 35 displays how alternative 2 within the Warm Dry plant association group compares to the historical range of variability through time. Over time, old forest multi-strata would continue to be above the historical range of variability, increasing in abundance to approximately 44 percent of the area, and old forest single stratum would increase in abundance to be within the historical range of variability. There is a trend that after 40 years the Warm Dry plant association group would be deficient in young forest structure (stand initiation and young forest multi-strata) and understory reinitiation. When comparing structure over 40 years, both alternatives 1 (no action) and 2 would tend to be deficient in young forest structure. However, alternative 2 would increase the proportion of old forest single stratum from approximately 3 to 15 percent over time.

Table 35. Warm Dry plant association group historical range of variability analysis for alternative 2

Structure type	Percent historical range of variability[1]	Percent existing condition	Percent 2020	Percent 2029	Percent 2059
Stand initiation	5-15	8	8	0	0
Stem exclusion open canopy	5-20	12	24	22	16
Stem exclusion closed canopy	1-10	16	14	16	20
Young forest multi-strata	5-25	25	18	17	4
Understory reinitiation	1-10	12	10	15	0
Old forest single stratum	15-55	3	5	5	15
Old forest multi-strata	5-20	23	21	25	44

[1]From Powell (1998).

Cool Moist Plant Association Group

Species Composition and Density

Alternative 2 would mechanically treat approximately 40 percent and prescribed burn approximately 99 percent of the Cool Moist plant association group. Given these actions, the species composition in all stands treated would be predominantly early seral. Late seral species in these stands would be retained in more moist areas and would be more aligned with their historical abundance. Late seral species would predominantly be removed during mechanical treatments, and natural regeneration would be killed with prescribed burning. Stands that are not proposed for treatment would continue to be dominated by grand fir. Collectively, these treatments would reduce the proportion of the Cool Moist plant association group that is above the management zone to approximately 67 percent directly after treatment. When comparing density over 40 years, predictions for alternative 2 are that density would be lower given treatment, with approximately 36 percent of the Cool Moist plant association group within or below the management zone, as compared to only approximately 9 percent for alternative 1.

Table 36. Stand density index ranges for the Cool Moist Upland Forest stands for alternative 2 within the Ragged Ruby planning area

Management zone	Percent existing condition	Percent 2020	Percent 2029	Percent 2059
Below	9	36	19	4
Within	31	31	42	32
Above	60	33	40	64

Cool Moist Plant Association Group Structure and the Historical Range of Variability

Table 37 below displays how alternative 2 within the Cool Moist plant association group compares to the historical range of variability through time. Over time, old forest multi-strata would continue to be above the historical range of variability, increasing in abundance to approximately two thirds of the area, and old forest single stratum would increase in abundance to be above the historical range of variability as well. There is a trend that after 40 years the Cool Moist plant association group would be deficient in young forest structure (stand initiation, young forest multi-strata, and understory reinitiation). When comparing structure over 40 years, both alternatives 1 (no action) and 2 would tend to be deficient in young forest structure and tend to have an abundance of old forest structure. However, alternative 2 would increase the proportion of old forest single stratum from approximately 2 to 10 percent over time.

Table 37. Cool Moist plant association group historical range of variability analysis for alternative 2

Structure type	Percent historical range of variability[1]	Percent existing condition	Percent 2020	Percent 2029	Percent 2059
Stand initiation	1-10	1	2	0	0
Stem exclusion open canopy	0-5	17	31	21	12
Stem exclusion closed canopy	5-25	14	8	7	10
Young forest multi-strata	40-60	5	2	1	1
Understory reinitiation	5-25	1	2	11	1
Old forest single stratum	0-5	2	12	9	10
Old forest multi-strata	10-30	61	44	51	66

[1]From Powell (1998).

Cold Dry Plant Association Group

Species Composition and Density

Alternative 2 would mechanically treat approximately 13 percent and prescribed burn approximately 99 percent of the Cold Dry plant association group. Given these actions, the species composition in lodgepole pine stands treated would continue to be predominantly lodgepole pine due to the prolific nature of the species. In the mixed conifer stands, late seral species would predominantly be removed during mechanical treatments, and natural regeneration would be killed with prescribed burning. Other species that exist in each of these stands, including western larch, ponderosa pine, and Englemann spruce, increase in proportion following treatment and would be left to grow and provide for natural regeneration. Collectively, these treatments would slightly reduce the proportion of the Cold Dry plant association group that is above the management zone, which was modeled to be approximately 34 percent directly after treatment. When comparing density over 40 years, predictions for alternative 2 are that density would be lower given treatment, with approximately 21 percent within or below the management zone, as compared to only approximately 11 percent for alternative 1.

Table 38. Stand density index ranges for the Cold Dry Upland Forest stands for alternative 2 within the Ragged Ruby planning area

Management zone	Percent existing condition	Percent 2020	Percent 2029	Percent 2059
Below	11	16	11	5
Within	47	50	44	16
Above	42	34	45	80

Cold Dry Plant Association Group Structure and the Historical Range of Variability

Table 39 below displays how alternative 2 within the Cold Dry plant association group compares to the historical range of variability through time. Over time, old forest single stratum would not exist and old forest multi-strata would increase from within the historical range of variability to being above the historical range of variability. There is a trend that after 40 years the Cold Dry plant association group would be deficient in young forest multi-strata structure. When comparing structure over 40 years, both alternatives 1 (no action) and 2 would tend to be deficient in young forest structure and old forest single stratum.

Table 39. Cold Dry plant association group historical range of variability analysis for alternative 2

Structure type	Percent historical range of variability[1]	Percent existing condition	Percent 2020	Percent 2029	Percent 2059
Stand initiation	1-20	3	7	4	8
Stem exclusion open canopy	0-5	0	0	0	0
Stem exclusion closed canopy	5-20	15	17	19	18
Young forest multi-strata	10-40	0	0	0	0
Understory reinitiation	5-25	44	37	38	25
Old forest single stratum	0-5	0	0	0	0
Old forest multi-strata	10-40	38	38	38	49

[1]From Powell 1998

Aspen Stands

Alternative 2 would mechanically treat 94 percent, prescribed burn 94 percent, and fence 33 percent of the aspen stands within the Ragged Ruby planning area. These actions would prevent browsing from cattle and wild ungulates, decrease conifer encroachment, increase sunlight to the soil, and stimulate sucker production. Fencing would increase the potential for aspen stands to double their current extent. These actions should improve aspen vigor and increase the extent of aspen within the Ragged Ruby planning area.

Disturbance Processes

When compared to alternative 1 (no action), alternative 2 would decrease stand densities and the proportion of late seral species across the planning area. This would decrease the risk of insect outbreaks of western spruce budworm, mountain pine beetle, and western pine beetle. It would also decrease the effects of mistletoe, Indian paint fungus, armillaria, and annosus. Mechanical treatments and prescribed burning are designed to develop the structure that could have been developed across the landscape given the fire regimes in the Ragged Ruby planning area. Where fires historically burned very frequently with low intensity, stands have been prescribed treatments that thin from below to raise the canopy base height and diameter at breast height of the stand and leave predominantly early seral species. Where fires burned frequently with mixed severity, stands have been prescribed treatments that reduce density by thinning throughout a diameter range and increase the proportion of early seral species through specific leave tree specifications. These treatments help break up the landscape to reduce the risk that a stand-replacing crown fire could be sustained over large areas.

Direct and Indirect Effects – Prescribed Burning and Unplanned Ignitions

The direct and indirect effects of prescribed burning have been discussed in the silviculture treatments section because these treatments were modeled together using the FSVeg Spatial Data Analyzer model and together they affect stand structure, density, and species composition.

Direct and Indirect Effects – Watershed, Fisheries, and Wildlife Habitat Restoration

The direct and indirect effects of aspen restoration have been discussed in the silviculture treatments section because they are vegetation treatments. There would be no direct or indirect effects of bat gate installation to forest vegetation because these gates would only be installed on the entrances to old mine adits. The effects of other aquatic restoration treatments related to vegetation are discussed within the cumulative effects analysis because these are reasonably foreseeable actions that would affect vegetation and would be authorized through the Aquatic Restoration Decision.

Direct and Indirect Effects – Road Activities

The direct and indirect effects of road activities to forest vegetation include the cutting of trees to facilitate road maintenance and temporary road construction. The removal of trees for these activities is generally localized and would be additive to the effects discussed above for silvicultural treatments. However, these effects would be minimal across the planning area and would only slightly change the effects to stand density, species composition, and forest structure as discussed previously. There would be no direct or indirect effects to forest vegetation from changes to the road system because the roads that would be decommissioned would not be needed for future management access. All other roads (closed and open) would be available for future management needs.

Direct and Indirect Effects – Recreation System Changes

The direct and indirect effects to forest vegetation for recreation system changes would be the occasional tree that would need to be felled to facilitate realigning or decommissioning trail locations and creating new trailheads. These trees would be localized and would not change the effects of forest vegetation across the planning area as discussed above. There would be no direct or indirect effects to forest vegetation from the proposed recreation interpretive site because this site is proposed to be constructed directly adjacent to National Forest System Road 2050 at an already existing wide spot in the road and no trees would be cut for the site.

Cumulative Effects

The effects from past practices which include timber harvesting, fire suppression, grazing, wildfire, and planting have created predominantly young, overstocked stands of late seral species that currently persist across the planning area. Implementing alternative 2’s mechanical methods and prescribed burning would reduce stand density and shift species composition of the treated stands in predominantly the mid and old forest stands in all of the plant association groups. Stands that are not treated would continue on the current trajectory as defined in alternative 1 (no action).

The Plantation Maintenance and Summit and Reed Fire Restoration projects are current actions that would reduce stand density and shift species composition of the young, stand initiation stands on approximately 3,390 acres within the Ragged Ruby planning area. Riparian thinning that includes non-commercial thinning, tree felling, and tree tipping authorized through the Aquatic Restoration Decision is a reasonably foreseeable future activity that would mechanically treat approximately 1,340 acres. These projects, along with alternative 2, would cumulatively treat approximately 13,930 acres (approximately 42 percent) of the Ragged Ruby planning area. Mechanical treatments and prescribed burning combined would be widespread enough to effectively reduce stand densities, shift species composition, and reduce fuel loadings so as to reduce the risk of largescale insect and disease outbreaks or largescale wildfire.

The actions within the Ragged Ruby planning area, as well as the past, ongoing, and reasonably foreseeable actions described earlier would cumulatively have an effect on the Middle Fork John Day River drainage. These actions combined would decrease stand density, shift species composition to a larger proportion of early seral species, and move stand structure towards the historical range of variability to decrease the risk of large-scale, stand-replacement fire and epidemic insect outbreaks in the Middle Fork John Day River drainage west of Highway 7. Together, these projects would mechanically thin approximately 40 percent and prescribe burn approximately 70 percent of the cumulative effects area over an approximately 25-year time period.

Alternative 3

Direct and Indirect Effects – Silviculture Treatments

Alternative 3 proposes to mechanically treat approximately 8,200 acres and prescribed burn approximately 31,300 acres. Restoration treatments and activities are the same in alternative 3 as in alternative 2 except that alternative 3 does not include commercial removal in dry meadows or scabland flats. Differences in alternatives also include the extent (numbers of acres) and scope (level of treatment) treated within each alternative, with alternative 3 proposing less commercial thinning and prescribed burning, with fewer overall acres treated.

Given treatments proposed in alternative 3, stand structure would shift with the proportion of young forest structure decreasing and the proportion of old forest structure increasing over a 40-year time period. When comparing old forest structure after 40 years, all three alternatives are predicting approximately the same proportion; alternative 1 predicts 65 percent, alternative 2 predicts 63 percent, and alternative 3 predicts 64 percent. However, for both action alternatives there would be twice as much old forest single stratum. When comparing density over 40 years, predictions for the action alternatives are that density would be lower with approximately 36 percent of the planning area within or below the management zone for alternative 2 and approximately 34 percent for alternative 3, as compared to approximately 21 percent for alternative 1. Proposed activities would also shift species composition over 40 years; however, changes were slight. See Ragged Ruby Silviculture Report for breakouts of these acres and percentages for each plant association group.

Table 40. Structural stages for alternative 3 within the Ragged Ruby planning area

Structure type	Percent existing condition	Percent 2020	Percent 2029	Percent 2059
Stand initiation	6	7	2	2
Stem exclusion open canopy	11	20	17	11
Stem exclusion closed canopy	15	13	15	16
Young forest multi-strata	16	11	10	2
Understory reinitiation	15	13	16	5
Old forest single stratum	2	5	5	12
Old forest multi-strata	35	31	35	52

Table 41. Stand density index ranges for alternative 3 within the Ragged Ruby planning area

Management zone	Percent existing condition	Percent 2020	Percent 2029	Percent 2059
Below	19	30	21	12
Within	28	31	33	22
Above	53	39	47	66

Hot Dry Plant Association Group

Species Composition and Density

Alternative 3 would mechanically treat approximately 32 percent and prescribed burn approximately 68 percent of the Hot Dry plant association group. Given these actions, the species composition in all stands treated would continue to be predominantly ponderosa pine over time. Most natural regeneration would be killed with prescribed burning. Collectively, these treatments would reduce the proportion of the Hot Dry plant association group that is above the management zone, which is approximately 38 percent directly after treatment. When comparing density over 40 years, predictions for alternative 3 are that density would be lower given treatment, with approximately 56 percent of the Hot Dry plant association group within or below the management zone, as compared to approximately 39 percent for alternative 1.

Table 42. Stand density index ranges for the Hot Dry Upland Forest stands for alternative 3 within the Ragged Ruby planning area

Management zone	Percent existing condition	Percent 2020	Percent 2029	Percent 2059
Below	11	31	30	27
Within	35	31	29	29
Above	54	38	41	44

Hot Dry Plant Association Group Structure and the Historical Range of Variability

Table 43 displays how alternative 3 within the Hot Dry plant association group compares to the historical range of variability through time. Over time, old forest multi-strata would continue to be above the historical range of variability, increasing in abundance to approximately 69 percent of the area, and old forest single stratum would increase in abundance to be within the historical range of variability. There is a trend that after 40 years the Hot Dry plant association group would be deficient in young forest structure (stand initiation and young forest multi-strata) and understory reinitiation. When comparing structure over 40 years, all three alternatives would tend to be deficient in young forest structure. However, alternatives 2 and 3 would both more than triple the proportion of old forest single stratum over time; alternative 3 would increase the proportion from approximately 0 to 25 percent over time.

Table 43. Hot Dry plant association group historical range of variability analysis for alternative 3

Structure type	Percent historical range of variability[1]	Percent existing condition	Percent 2020	Percent 2029	Percent 2059
Stand initiation	5-15	3	3	0	0
Stem exclusion open canopy	5-20	12	21	18	6
Stem exclusion closed canopy	0-5	0	0	0	0
Young forest multi-strata	5-10	39	8	2	0
Understory reinitiation	0-5	0	24	25	0
Old forest single stratum	20-70	0	4	10	25
Old forest multi-strata	5-15	46	41	45	69

[1]From Powell (1998).

Warm Dry Plant Association Group

Species Composition and Density

Alternative 3 would mechanically treat approximately 24 percent and prescribed burn approximately 87 percent of the Warm Dry plant association group. Given these actions, the species composition in all stands treated would continue to be predominantly ponderosa pine over time. The proportion of ponderosa pine would increase directly after treatment, while the proportion of grand fir would decrease. However, over time, those changes would diminish due to tree ingrowth and move back closer to their existing condition proportions. Collectively, these treatments would reduce the proportion of the Warm Dry plant association group that is above the management zone, from approximately 53 percent to approximately 40 percent directly after treatment. When comparing density over 40 years, predictions for alternative 3 are the same as alternative 2; density would be lower given treatment, with approximately 40 percent of the Warm Dry plant association group within or below the management zone, as compared to approximately 27 percent for alternative 1.

Table 44. Stand density index ranges for the Warm Dry Upland Forest stands for alternative 3 within the Ragged Ruby planning area

Management zone	Percent existing condition	Percent 2020	Percent 2029	Percent 2059
Below	25	35	25	16
Within	22	26	29	24
Above	53	40	46	60

Warm Dry Plant Association Group Structure and the Historical Range of Variability

Table 45 displays how alternative 3 within the Warm Dry plant association group compares to the historical range of variability through time. Over time, old forest multi-strata would continue to be above the historical range of variability, increasing in abundance to approximately 44 percent of the area, and old forest single stratum would increase in abundance to be within the historical range of variability. There is a trend that after 40 years the Warm Dry plant association group would be deficient in young forest structure (stand initiation and young forest multi-strata). When comparing structure over 40 years, all three alternatives would tend to be deficient in young forest structure. However, both alternatives 2 and 3 would double the proportion of old forest single stratum over time when compared to alternative 1; and alternative 3 would increase the proportion from approximately 3 to 16 percent over time.

Table 45. Warm Dry plant association group historical range of variability analysis for alternative 3

Structure type	Percent historical range of variability[1]	Percent existing condition	Percent 2020	Percent 2029	Percent 2059
Stand initiation	5-15	8	8	0	0
Stem exclusion open canopy	5-20	12	24	22	16
Stem exclusion closed canopy	1-10	16	14	16	20
Young forest multi-strata	5-25	25	10	15	0
Understory reinitiation	1-10	12	18	17	4
Old forest single stratum	15-55	3	5	5	16
Old forest multi-strata	5-20	23	21	24	44

[1]From Powell (1998).

Cool Moist Plant Association Group

Species Composition and Density

Alternative 3 would mechanically treat approximately 30 percent and prescribed burn approximately 82 percent of the Cool Moist plant association group. Given these actions, the species composition in all stands treated would be predominantly early seral. Late seral species in these stands would be retained in more moist areas and would be more aligned with their historical abundance. Late seral species would predominantly be removed during mechanical treatments, and natural regeneration would be killed with prescribed burning. Stands that are not proposed for treatment would continue to be dominated by grand fir. Collectively, these treatments would reduce the proportion of the Cool Moist plant association group that is above the management zone to approximately 60 percent directly after treatment. When comparing density over 40 years, predictions for alternative 3 are that density would be lower given treatment, with approximately 28 percent of the Cool Moist plant association group within or below the management zone, as compared to only approximately 9 percent for alternative 1 and approximately 36 percent for alternative 2.

Table 46. Stand density index ranges for the Cool Moist Upland Forest stands for alternative 3 within the Ragged Ruby planning area

Management zone	Percent existing condition	Percent 2020	Percent 2029	Percent 2059
Below	9	28	15	4
Within	31	32	37	24
Above	60	41	48	71

Cool Moist Plant Association Group Structure and the Historical Range of Variability

Table 47 below displays how alternative 3 within the Cool Moist plant association group compares to the historical range of variability through time. Over time, old forest multi-strata would continue to be above the historical range of variability, increasing in abundance to approximately two-thirds of the area, and old forest single stratum would increase in abundance to be above the historical range of variability as well. There is a trend that after 40 years the Cool Moist plant association group would be deficient in young forest structure (stand initiation, young forest multi-strata, and understory reinitiation). When comparing structure over 40 years, all three alternatives would tend to be deficient in young forest structure and tend to have an abundance of old forest structure. However, both alternatives 2 and 3 would more than triple the proportion of old forest single stratum over time when compared to alternative 1; and alternative 3 would increase the proportion from approximately 2 to 11 percent over time.

Table 47. Cool Moist plant association group historical range of variability analysis for alternative 3

Structure type	Percent historical range of variability[1]	Percent existing condition	Percent 2020	Percent 2029	Percent 2059
Stand initiation	1-10	1	1	0	0
Stem exclusion open canopy	0-5	17	25	20	11
Stem exclusion closed canopy	5-25	14	10	8	10
Young forest multi-strata	40-60	5	2	7	1
Understory reinitiation	5-25	1	2	1	1
Old forest single stratum	0-5	2	8	6	11
Old forest multi-strata	10-30	61	51	57	67

[1]From Powell (1998).

Cold Dry Plant Association Group

Species Composition and Density

Alternative 3 would mechanically treat approximately 12 percent and prescribed burn approximately 95 percent of the Cold Dry plant association group. Given these actions, the species composition in lodgepole pine stands treated would continue to be predominantly lodgepole pine due to the prolific nature of the species. In the mixed conifer stands, late seral species would predominantly be removed during mechanical treatments, and natural regeneration would be killed with prescribed burning. Other species that exist in each of these stands, including western larch, ponderosa pine, and Englemann spruce, increase in proportion following treatment and would be left to grow and provide for natural regeneration. Collectively, these treatments would reduce the proportion of the Cold Dry plant association group that is above the management zone, which was modeled to be approximately 35 percent directly after treatment. When comparing density over 40 years, predictions for alternative 3 are that density would be lower given treatment, with approximately 20 percent within or below the management zone, as compared to only approximately 11 percent for alternative 1 and approximately 21 percent for alternative 2.

Table 48. Stand density index ranges for the Cold Dry Upland Forest stands for alternative 3 within the Ragged Ruby planning area

Management zone	Percent existing condition	Percent 2020	Percent 2029	Percent 2059
Below	11	15	10	5
Within	47	50	44	15
Above	42	35	46	81

Cold Dry Plant Association Group Structure and the Historical Range of Variability

Table 49 below displays how alternative 3 within the Cold Dry plant association group compares to the historical range of variability through time. Over time, old forest single stratum would not exist and old forest multi-strata would increase from within historical range of variability to being above historical range of variability. There is a trend that after 40 years, the Cold Dry plant association group would be deficient in understory reinitiation structure. When comparing structure over 40 years, all three alternatives would tend to be deficient in old forest single stratum, while alternative 1 and alternative 2 would also be deficient in young forest multi-strata.

Table 49. Cold Dry plant association group historical range of variability analysis for alternative 3

Structure type	Percent historical range of variability[1]	Percent existing condition	Percent 2020	Percent 2029	Percent 2059
Stand initiation	1-20	3	7	4	8
Stem exclusion open canopy	0-5	0	0	0	0
Stem exclusion closed canopy	5-20	15	18	19	18
Young forest multi-strata	10-40	0	37	38	26
Understory reinitiation	5-25	44	0	0	0
Old forest single stratum	0-5	0	0	0	0
Old forest multi-strata	10-40	38	38	38	49

[1]From Powell 1998

Aspen Stands

Alternative 3 proposes the same actions as alternative 2 and therefore the effects would be the same.

Disturbance Processes

When compared to alternative 1 (no action), alternative 3 would decrease stand densities and the proportion of late seral species across the planning area. This would decrease the risk of insect outbreaks of western spruce budworm, mountain pine beetle, and western pine beetle. It would also decrease the effects of mistletoe, Indian paint fungus, armillaria, and annosus. Mechanical treatments and prescribed burning are designed to develop the structure that could have been developed across the landscape given the fire regimes in the Ragged Ruby planning area. Where fires historically burned very frequently with low intensity, stands have been prescribed treatments that thin from below to raise the canopy base height and diameter at breast height of the stand and leave predominantly early seral species. Where fires burned frequently with mixed severity, stands have been prescribed treatments that reduce density by thinning throughout a diameter range and increase the proportion of early seral species through specific leave tree specifications. These treatments help break up the landscape to reduce the risk that a stand-replacing crown fire could be sustained over large areas.

Direct and Indirect Effects – Prescribed Burning and Unplanned Ignitions

The direct and indirect effects of prescribed burning have been discussed in the silviculture treatments section because these treatments were modeled together using the FSVeg Spatial Data Analyzer model and together they affect stand structure, density, and species composition.

Direct and Indirect Effects – Watershed, Fisheries, and Wildlife Habitat Restoration

The direct and indirect effects of aspen restoration have been discussed in the silviculture treatments section because they are vegetation treatments. There would be no direct or indirect effects of bat gate installation to forest vegetation because these gates would only be installed on the entrances to old mine adits. The effects of other aquatic restoration treatments related to vegetation are discussed within the cumulative effects analysis because these are reasonably foreseeable actions that would affect vegetation and would be authorized through the Aquatic Restoration Decision.

Direct and Indirect Effects – Road Activities

The direct and indirect effects of road activities to forest vegetation include the cutting of trees to facilitate road maintenance and temporary road construction. The removal of trees for these activities is generally localized and would be additive to the effects discussed above for silvicultural treatments. However, these effects would be minimal across the planning area and would only slightly change the effects to stand density, species composition, and forest structure as discussed previously. There would be no direct or indirect effects to forest vegetation from changes to the road system because the roads that would be decommissioned would not be needed for future management access. All other roads (closed and open) would be available for future management needs.

Direct and Indirect Effects – Recreation System Changes

The direct and indirect effects to forest vegetation from recreation system changes would be the occasional tree that would need to be felled to facilitate moving or decommissioning trail locations and creating new trailheads. These trees would be localized and would not change the effects to forest vegetation across the planning area as discussed above. There would be no direct or indirect effects to forest vegetation from the proposed recreation interpretive site because this site is proposed to be constructed directly adjacent to National Forest System Road 2050 at an already existing wide spot in the road and no trees would be cut for the site.

Cumulative Effects

The effects from past practices which include timber harvesting, fire suppression, grazing, wildfire, and planting have created predominantly young, overstocked stands of late seral species that currently persist across the planning area. Implementing alternative 3's mechanical treatments and prescribed burning would reduce stand density and shift species composition of the treated stands in predominantly the mid and old forest stands in all of the plant association groups. Stands that are not treated would continue on the current trajectory as defined in alternative 1 (no action).

The Plantation Maintenance and Summit and Reed Fire Restoration projects are current actions that would reduce stand density and shift species composition of the young, stand initiation stands on approximately 3,390 acres within the Ragged Ruby planning area. Riparian thinning that includes non-commercial thinning, tree felling, and tree tipping authorized through the Aquatic Restoration Decision is a reasonably foreseeable future action that would mechanically treat approximately 1,340 acres. These projects, along with alternative 3, would cumulatively treat approximately 12,930 acres (approximately 39 percent) of the Ragged Ruby planning area. Mechanical treatments and prescribed burning combined would be widespread enough to effectively reduce stand densities, shift species composition, and reduce fuel loadings so as to reduce the risk of largescale insect and disease outbreaks or largescale wildfire.

The actions within the Ragged Ruby planning area, as well as the past, ongoing, and reasonably foreseeable actions described earlier would cumulatively have an effect on the Middle Fork John Day River drainage. These actions combined would decrease stand density, shift species composition to a larger proportion of early seral species, and move stand structure towards the historical range of variability to decrease the risk of largescale, stand-replacement fire and epidemic insect outbreaks in the Middle Fork John Day River drainage west of Highway 7. Together, these projects would mechanically thin approximately 39 percent and prescribe burn approximately 68 percent of the cumulative effects area over an approximately 25-year time period.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Malheur Forest Plan

Alternative 1 does not propose any management actions, but allows the planning area to continue growing at its current trajectory. This alternative does not meet Malheur Forest Plan Forest goals 24 to 26 to provide a sustained flow of timber, provide and utilize wood fiber in a cost-effective manner, and provide an economic return to the public. Malheur Forest Plan standards for timber harvest, reforestation, and stand improvement (standards 89 to 115) and the Regional Forester's Eastside Forest Plan Amendment 2 do not apply to this alternative because no management actions are proposed.

Alternatives 2 and 3 propose commercial thinning, non-commercial thinning, biomass utilization, removal of post and pole material, and planting where necessary. These alternatives meet Forest Goals 24 to 26 within current management direction. They also meet Malheur Forest Plan standards 89, 94, 96, 98, and 101 to 115. Malheur Forest Plan standards 90 to 93 and 95 do not apply because they are for even-aged harvest cutting and standards 99 to 100 do not apply because they are for traditional uneven-aged harvest cutting. Traditional even-aged and uneven-aged harvesting is not proposed in either alternative. Malheur Forest Plan standard 97 which establishes the utilization standards for all species at 7.0 inches diameter at breast height would not be met because utilization standards for ponderosa pine has been increased to 8.0 inches diameter at breast height to better reflect market conditions.

Alternatives 2 and 3 also meet the Regional Forester's Eastside Forest Plan Amendment 2 (Eastside Screens) except for standard #6 scenario A (d)(2)(a) "Maintain all remnant late and old seral and/or structural live trees ≥ 21 inches diameter at breast height that currently exist within stands proposed for harvest activities" for the Warm Dry and Hot Dry plant association groups. Alternatives 2 and 3 do not meet this standard because old forest single stratum is below the historical range of variability for these plant association groups and young trees equal to or greater than 21 inches diameter at breast height are proposed for removal. Alternatives 2 and 3 also do not meet standard #5 (d) scenario A because young trees equal to or greater than 21 inches diameter at breast height are proposed for removal in Warm Dry and Hot Dry late and old structure stands. A site-specific forest plan amendment is proposed for each standard that would not be met by alternatives 2 and 3.

National Forest Management Act

Although regeneration harvests are not specifically planned in the Ragged Ruby project, the mixed conifer restoration treatment may require some regeneration. Commercial thinning within the mixed conifer restoration treatment would be implemented on a leave tree requirements basis, and would not require a target basal area. Based on the prescription, all old trees, early seral trees over 21 inches diameter at breast height, healthy early seral trees, and clumps of late seral trees would be retained. All other trees would be harvested. Implementing this prescription may create openings, and openings larger than 2 acres would be regenerated with the appropriate early seral species.

Site preparation and fuels treatments would be done to create sites for seedlings to grow without excessive competition from other vegetation. Undesired trees would be felled, and if markets exist, sold as biomass. Otherwise, they would be piled and burned to reduce slash below threshold levels. Planting of genetically adapted seedlings would be utilized to reforest openings. The seeds used to grow seedlings would be collected from superior trees within the appropriate seed zone and elevation band within the Middle Fork John Day river drainage.

No harvest is proposed in Malheur Forest Plan management areas that are classified as "unsuitable."

Botanical Resources

The required biological evaluation for the Ragged Ruby Project, the Ragged Ruby Rare Plants Report, is incorporated by reference and summarized below.

Regulatory Framework

Forest Service Manual 2670.32 and 2672.4 requires the Forest Service to: review planned activities for possible effects on endangered, threatened, proposed, or sensitive species through the biological evaluation process; avoid or minimize impacts to species whose viability has been identified as a concern; and assure that decisions would not result in loss of species viability or create significant trends toward federal listing. Furthermore, the Malheur Forest Plan requires "a biological evaluation for use in planning proposed projects when sensitive species are present or suspected to be present" (USDA Forest Service 1990a, Forest-wide standard 66, page IV-33).

Resource Indicators

The resource indicators in Table 50 are used for assessing the effects to botanical resources.

Table 50. Resource elements, indicators, and measures for assessing effects to botanical resources

Resource element	Resource indicator	Measure	Indicator source
Rare plant populations	Integrity of populations	Potential impacts to integrity	Forest Service Manual chapter 2670; US Department of Agriculture Departmental Regulation 9500-4; Malheur Forest Plan Forest-wide standards 56 and 62 (USDA Forest Service 1990a, page IV-31 to IV-32)
Known rare plant habitats	Integrity of habitats	Potential impacts to integrity	Forest Service Manual chapter 2670; US Department of Agriculture Departmental Regulation 9500-4; Malheur Forest Plan Forest-wide standards 56 and 62 (USDA Forest Service 1990a, page IV-31 to IV-32)

Rare Plant Populations

Affected Environment

Methodology

A pre-field review was conducted to determine what rare plants and rare plant habitats are known or possible within and adjacent to the planning area. The findings were used to help target specific areas for more in-depth on the ground botanical surveys. See the Ragged Ruby Rare Plants Report for a full list of sources used to inform surveyors of potential rare plants and rare plant habitats, including the Region 6 sensitive species list, geographic information system mapping layers, the U.S. Fish and Wildlife website, and more.

Botanical surveys for rare plants were conducted according to standard Forest Service procedures (Forest Service Manual 2670, section 2672.4) using the intuitive control technique (see the Ragged Ruby Rare Plants Report for description).

Existing Condition

Four rare vascular plant species and one moss species were located within the planning area: *Buxbaumia piperi* (bug on a stick) at one site, *Eleocharis bolanderi* (Bolander's spikerush) at two main areas, *Lomatium tarantularioides* (spider biscuitroot) at one main area, *Pinus albicaulis* (whitebark pine) at three main areas, and *Pyrola dentatadentate* (undulating wintergreen) at one site.

Environmental Consequences

Methodology

Species are given a "no impact" determination if: (1) they are not suspected in the planning area because the project is outside of the potential distribution and range of the species, (2) the required habitat is not present within the planning area, or (3) none of the proposed actions or alternative actions would occur in or immediately adjacent to existing populations or potential habitats, and thus would not affect the integrity of the populations or habitats [40 Code of Federal Regulations §1508.8, Forest Service Manual 2672.42(5)].

Species are given a determination of "beneficial impact" if they could be favorably affected by a particular action or alternative [40 Code of Federal Regulations §1508.8, Forest Service Manual 2672.42(5)].

A determination of "may detrimentally impact, but will not lead to a trend toward federal listing" is given for species that could possibly be negatively affected by any of the alternatives [40 Code of Federal Regulations §1508.8, Forest Service Manual 2672.42(5)]. This acknowledges that the action could have negative impacts to the integrity of the populations or habitats, but due to: (1) the complexity of the proposed action, (2) the differential impacts across the landscape, and (3) the lack of best available science, the degree and consequence of the negative impacts are not known with certainty. Additionally, this recognizes that even the most substantial impacts of the proposed action would not contribute to a trend toward listing the species under the Endangered Species Act.

Incomplete and Unavailable Information

Most surveys for this project were done before specific ground disturbing activities had been proposed. It is possible that activities may be implemented in areas that were not surveyed. Furthermore, some fungi only fruit under very specific moisture and temperature conditions, or underground, making them difficult to locate. Likewise, some sensitive plant species do not produce above-ground plants every year, are very tiny, or are difficult to identify. Therefore, field surveys accomplished within the planning may not have detected 100 percent of rare plants or populations.

There are no empirical studies on the impacts of logging, burning, or grazing to most sensitive plant species that occur on the Malheur National Forest. The strategy for management of known populations has generally been avoidance of activities that may impact populations. Therefore, all discussion of potential impacts to sensitive plant populations and habitat is based upon general experience and inferred responses based upon observations and studies of more common species.

Spatial and Temporal Context for Effects Analysis

The spatial context for effects analysis includes locations for all documented rare plant occurrences and each of the proposed units of the action alternatives. The temporal context includes the timeframe when the proposed actions would occur and the foreseeable future after the operations cease.

The geographic scale considered for cumulative effects is the planning area due to the fact that plant populations generally do not move significantly over time. The time scale for the cumulative effects analysis is from 150 years ago (when Euro-Americans arrived in the area) to 10 years into the future.

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

Projects and activities that create ground disturbance, change vegetative composition, and change domestic animal grazing patterns may cause detrimental effects to sensitive plant populations and habitats. These actions include road construction, timber harvest, fuels reduction treatments, fire suppression, recreation development, mining, and grazing. In addition, restoration efforts such as road decommissioning and stream improvements may also potentially impact sensitive plant populations and habitat. Road construction and recreation developments have permanently altered native plant habitats in limited areas of the planning area.

Livestock grazing has occurred in most of the planning area for decades and has resulted in changes to plant communities, especially in non-forested and riparian areas. Grazing has a direct effect on plants through plant herbivory and trampling. Grazing can have an indirect effect on plant species by causing changes in shade, soil compaction, soil disturbance, smothering by cow pies, and alteration of nutrient cycling.

The historical abundance and distribution of sensitive species on the Forest is not known. Past activities have likely affected their current abundance and distribution. Beginning in approximately 1990, botanical surveys and biological evaluations were conducted for most Forest Service projects planned and implemented on the Forest. As a result, activities conducted since 1990 have been designed to reduce impacts to sensitive species.

Alternative 1 – No Action

Direct and Indirect Effects

Under alternative 1, no disturbance from project activities would take place. Therefore selection of alternative 1 would have no direct or indirect effects to sensitive species assumed present in the planning area. However, environmental outcomes may still occur due to ongoing activities and natural processes.

Cumulative Effects

There would be no cumulative effects because there would be no direct or indirect effects.

Alternatives 2 and 3

Direct and Indirect Effects to Federally Listed, Proposed, and Candidate Plant Species

There are no known populations or potential habitat for any federally listed, candidate, or proposed plant species in the planning area. Therefore, this project would have no effect to any federally listed, proposed, or candidate plant species, nor require consultation with the U.S. fish and Wildlife Service.

Direct and Indirect Effects to Known Sensitive Plant Populations

All known populations of sensitive plants would be buffered from all ground disturbing activities. Some populations may be subject to prescribed burning. However, the project design criteria prescribes that a botanist be consulted before burning occurs in areas with known sensitive plant populations. These protections should adequately ensure that there are no direct or indirect impacts from project activities to the known populations of sensitive plants. Therefore, there would be **no impact** to known populations of sensitive plants from project activities associated with alternative 2 or 3.

Cumulative Effects

It is highly likely that past activities such as grazing, timber harvest, mining, road construction, and fire suppression have destroyed populations, and have altered habitats for sensitive plants. However, the effects from these past activities are not quantifiable because the details of historical activities and the historical existing conditions of sensitive plants are not always known.

Species most at risk from climate change are those with small geographic ranges (such as local endemics or locally rare species), narrow physiological tolerances, limited dispersal abilities, strong interspecific dependencies, low genetic diversity, and those that have recently experienced population declines. However, attempts to quantify the degree of change would be speculative at this point (see Ragged Ruby Rare Plants Report for more information).

Since 1990, protection and management of sensitive species and their habitats (in the form of project design criteria, avoidance, or other mitigation) have been included in the design of all projects (following Forest-wide standards 56, 62, 65, and 66, and standards for management areas 3A and 3B in the Malheur Forest Plan; and in direction and policy set forth in Forest Service Manual 2670). This has, and would continue to reduce the potential of cumulative effects to sensitive plant populations and habitats.

There are no current plans to conduct upland restoration activities in this area beyond the scope of this project for the next 10 years. Therefore, this project, foreseeable future projects, and those that have occurred in the recent past, are not likely to contribute toward cumulative detrimental effects to sensitive plant species.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Alternatives 1, 2, and 3 comply with Forest Service Policy (Forest Service Manual 2670.32) to: (1) review activities as part of the National Environmental Policy Act of 1969 to determine their potential effect on sensitive species, (2) avoid or minimize impacts to species whose viability has been identified as a concern, and (3) assure that decisions would not result in loss of species viability or create significant trends toward federal listing.

Known Rare Plant Habitats

Affected Environment

Methodology

A pre-field review was conducted to determine the probability that sensitive plant habitats are located within or adjacent to the planning area to determine the need for and intensity of botanical surveys (see Ragged Ruby Rare Plants Report for more information). Surveys were conducted according to standard Forest Service procedures (Forest Service Manual 2670, section 2672.4).

See the Ragged Ruby Rare Plants Report for a full list of sources used to inform surveyors of potential sensitive plants and habitats, including the Region 6 sensitive species list, geographic information system mapping layers, the U.S. Fish and Wildlife website, and more.

Existing Condition

Major habitats occurring within the planning area include: upland coniferous forest, aspen stands, lithosols, sagebrush shrublands, grasslands, cliffs, rock outcrops, talus, and riparian-dependent habitats. Some of these are biodiversity hotspots because their unique environmental conditions have promoted occupation by unique and rare plants. Of these habitat types, the more sensitive habitats include: lithosols (scablands), cliff/talus habitat, aspen stands, springs and seeps, and intermittent and perennial streams. See the Ragged Ruby Rare Plants Report for full descriptions.

Lithosols

Lithosols are habitats with very shallow soils on poorly weathered basalt or andesitic bedrock. This habitat type has often been called scabland. While the soils can be saturated following spring snow melt, they dry quickly and are exposed to full sun for the entire growing season. Plants adapted to this harsh environment usually bloom and fruit early in the growing season. There are several sensitive plant species that may occur in lithosol habitats. Many culturally significant plant species occur in this habitat type as well including *Balsamorhiza sagittata*, *Lomatium nudicaule*, and *Perideridia gairdneri*.

Cliffs, Rock Outcrops, and Talus

Cliffs and rock outcrops have vertical faces where generally unique species of plants are adapted. Talus is accumulated boulders and cobbles at the base of cliffs or on steep slopes. Because these habitats are largely composed of bedrock or accumulations of rock, they are assumed to be in good condition with a stable trend.

Springs and Seeps

Springs are points where groundwater emerges and flows. Groundwater also feeds seeps, but seeps do not produce perennial flow. Springs and seeps are typically small, but are well distributed on the Malheur National Forest. Seeps and springs are often developed for cattle troughs, and many have been dewatered and/or trampled due to these developments historically. Many developed springs now have fences to protect the water source. These areas provide important habitat for several sensitive mosses and liverworts.

Aspen Stands

Aspen is a widespread but uncommon species that is shade intolerant. Aspen stands have been declining in the Blue Mountains because regeneration has been greatly reduced by herbivory and competition from conifers (Shirley and Erikson 2001).

Intermittent and Perennial Streams

Intermittent streams are channelized areas where water only runs part of the year; most of the moisture in these streams comes from snowmelt runoff. Perennial streams are channelized areas where water flows all year long. These habitat types are generally quite narrow on the Malheur National Forest; they often extend upslope less than 100 feet above the water level. In flatter areas, they transition into moist and wet meadow types. Streams on most portions of the Forest are dominated by riparian shrubs and trees.

Environmental Consequences

Methodology

Habitats are given a "no impact" determination if: (1) they are not suspected in the planning area, (2) none of proposed actions or alternative actions would occur in or immediately adjacent to potential habitats, and thus would not affect the integrity of the populations or habitats [40 Code of Federal Regulations §1508.8, Forest Service Manual 2672.42(5)].

Habitats are given a determination of "beneficial impact" if they could be favorably affected by a particular action or alternative [40 Code of Federal Regulations §1508.8, Forest Service Manual 2672.42(5)].

A determination of "may detrimentally impact, but will not lead to a trend toward federal listing" is given for habitats hosting species that could possibly be negatively affected by any of the alternatives [40 Code of Federal Regulations §1508.8, Forest Service Manual 2672.42(5)]. This acknowledges that the action could have negative impacts to the integrity of the populations or habitats, but due to: (1) the complexity of the proposed action, (2) the differential impacts across the landscape, and (3) the lack of best available science, the degree and consequence of the negative impacts are not known with certainty. Additionally, this recognizes that even the most substantial impacts of the proposed action would not contribute to a trend toward listing the species found in those habitats under the Endangered Species Act.

Incomplete and Unavailable Information

Large landscape-scale restoration projects are disadvantageous to conducting thorough on-the-ground reconnaissance. Most surveys for this project were done before specific ground-disturbing activities had been proposed. Surveys are prioritized by habitats most likely to host rare species. Dry, upland coniferous forests are some of the least likely places to find rare plants, so these areas are not as thoroughly surveyed as higher-potential habitats, such as the riparian-dependent areas. Activities may be implemented in areas that were not surveyed, therefore it is possible there may be impacts to undiscovered populations of sensitive plants within some habitats.

Spatial and Temporal Context for Effects Analysis

The spatial context for effects analysis includes locations for all inventoried rare plant habitats, and each of the proposed units in alternatives 2 and 3. The temporal context includes the timeframe when the proposed actions would occur and the foreseeable future after the operations cease.

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

This analysis is analogous to the rare plants analysis (see above).

Alternative 1 – No Action

Direct and Indirect Effects

Under alternative 1, no disturbance from project activities would take place. Therefore selection of alternative 1 would have no direct or indirect effects to known rare plant habitats present in the planning area.

Years of fire suppression has resulted in increased cover of conifers in aspen stands, creating competition and reducing aspen seedling success. Without restoration actions that can reduce conifer competition and promote aspen regeneration, aspen habitats are likely to continue to decline (Shepard 2001).

Cumulative Effects

There would be no cumulative effects because there would be no direct or indirect effects.

Alternatives 2 and 3

Direct and Indirect Effects to Coniferous Forest Communities

Vegetation management actions that may have direct impacts to sensitive plants in upland coniferous forested habitats include upland restoration activities; aspen restoration; biomass removal and associated yarding, slash piling, grinding, or scattering; and application and control of prescribed burning. Potential detrimental direct effects include the destruction of sensitive plants from ground disturbance associated with cutting and yarding of trees, piling, or scattering slash. Indirect effects could result from altering the hydrologic regime and changing light intensity. Vegetation management may also alter the interaction of herbivores and plants. By opening up the canopy of the forest, grasses and other palatable plants may increase. This may in turn increase grazing activity in the treated areas. Conversely, logging-created slash may impede travel by ungulates.

Prescribed burning or slash pile burning could scorch sensitive plant individuals, and also may kill plants under and directly adjacent to slash piles. Fire line construction has the potential to directly kill or dislodge sensitive plants. Much of the prescribed burning is done in spring or early summer, when plants are actively growing. It is unknown if burning sensitive plants when they are actively growing would cause more mortality than when they may be senescent later in the summer.

Road maintenance activities contribute to the movement of invasive species along road shoulders and ditches, and to and from quarry and waste disposal areas. Invasive species may potentially outcompete or prevent the recruitment of new sensitive plant populations. Project design criteria are included that should help reduce the chance of increasing invasive plant abundance in the planning area. Closure of temporary roads should help reduce these impacts in the long-term. The risk would only occur during the time that the sale is active, until the roads are reclosed or decommissioned. The impacts of closing roads would be a **beneficial impact** as there would be reduced transport of invasive species and increased opportunity for the re-establishment of native species.

Many of the areas proposed for upland restoration and watershed, fisheries, and wildlife habitat restoration in alternatives 2 and 3 were not specifically surveyed for this project. Therefore, it must be assumed that undiscovered populations of sensitive plant species may be impacted. Since most sensitive plant species occur in specific microhabitats, the probability that sensitive plant species may occur in the planning area in these upland general forested habitats is relatively low. None of the sensitive plant species that may occur in coniferous forest habitats on the Malheur National Forest are extremely rare on a global scale. Therefore, even if project activities may impact individual plants or habitat, implementation of alternatives 2 or 3 should not increase the need for Federal listing of any sensitive species. Therefore, the determination of effects for forested communities, and any sensitive plants that may occur there, is: **may detrimentally impact, but will not lead to a trend toward federal listing.**

No impacts are expected from recreation system changes, as long as project design criteria are followed and construction is kept out of known or discovered rare plant sites.

Direct and Indirect Effects to Aspen Communities

Treatments proposed in aspen stands include upland restoration activities (with ground-based logging) and prescribed burning. Ground-disturbing activities, such as tractor logging and grapple piling, have a high potential to detrimentally impact any undiscovered populations of sensitive plants in this habitat type. Prescribed burning could potentially kill sensitive plants in this habitat.

Indirect effects of the aspen stand treatments may include changes in light and water relationships, as well as changes to ungulate grazing patterns. Indirect effects of fire include changes in plant species composition, increases in non-native invasive plants, and erosion. Protection of selected aspen stands from grazing through the use the use of fences, cages, and piling of brush and trees, is also proposed. This should help reduce the impact of grazing animals in these stands. This element of aspen treatments may have a long-term beneficial impact to any sensitive plants that may be present in aspen treatment areas.

Road activities and recreation system changes are not proposed within aspen stands and thus there would be no direct or indirect effect to aspen communities. **No impact** would occur from riparian and upland restoration treatments because those actions would not occur within aspen stands.

None of the sensitive plant species that may occur in these habitats are considered to be extremely rare on a global scale. Therefore, even if project activities may impact individual plants or habitat, implementation of this alternative should not increase the need for Federal listing of any sensitive species. In the short-term, the activities proposed in alternatives 2 or 3 **may detrimentally impact, but will not lead to a trend toward federal listing** for rare plants potentially found in aspen-dominated habitats.

Although there may be detrimental potential impacts to the habitat for the short-term due to ground disturbance, the long-term impacts to these areas should be beneficial. This is due to the fact that the aspen would be stimulated to grow new stems, the competing conifers would be removed, and the stands would be protected from ungulate grazing. Because the aspen stands would be rejuvenated and protected from cattle grazing in the long-term, alternatives 2 or 3 should have a **beneficial impact** to sensitive plant species that occur within aspen stands.

Direct and Indirect Effects to Lithosols, Sagebrush Shrublands, and Grasslands

The main potential activity that may impact this habitat type would be prescribed burning. Since these habitats have low fuel loads, and prescribed burning is usually done under low-intensity conditions; therefore, it is unlikely that fire would kill most plants in these habitat types. However, introductions of non-native invasive annual grasses including *Ventenata dubia* and *Bromus tectorum* into bunchgrass communities may affect fire behavior and increase abundance of those grasses following fire. Therefore fire should be carefully considered in these habitats where non-native invasive annual grasses have been introduced. In addition, the goal of sagebrush habitat improvement would discourage the intentional burning of sagebrush in these habitat types. Therefore, there is very little risk of detrimental effects to these habitats due to burning.

Bolander's spikerush is a sensitive plant that occurs in sagebrush and grassland areas. The documented populations in the planning area would be designated as areas to protect, and a botanist would be consulted before prescribed burning is implemented within the vicinity of the populations. The buffering standards for protection of "special" habitats should reduce the chance of impacts to any undocumented populations of this or other sensitive plant species in the planning area.

In most cases, the project design criteria would protect lithosol, sagebrush shrubland, and grassland habitats in the planning area, therefore the implementation of alternatives 2 or 3 should have **no impact** to lithosols, sagebrush shrublands, and grassland habitats, or to any sensitive species that may occur in these habitats. However, prescribed fire where there are infestations of non-native invasive annual grasses **may detrimentally impact, but will not lead to a trend toward federal listing** because increased biomass from invasive grasses might carry fire through habitat that is not adapted to intense fire and kill or reduce cover of native species and biological soil crusts.

No impacts are expected from the recreation system changes, as long as project design criteria are followed and construction is kept out of rare plant sites.

Direct and Indirect Effects to Cliffs, Rock Outcrops, and Talus

Very few human activities have potential for direct or indirect impacts to this habitat type. Prescribed burning generally does not burn in this habitat type, due to the low fuel levels. The main activity that may impact this habitat type is rock quarrying for use in temporary road construction and maintenance. The removal of rocks could directly kill plants by excavating them. Quarrying may potentially indirectly impact this habitat by exposing roots of plants that are not directly removed.

Implementation of alternatives 2 or 3 should have **no impact** to cliffs, rock outcrops, and talus habitats, or to any sensitive species that may occur there because project design criteria would protect them. However, wildlife habitat restoration, specifically construction of bat gates, **may detrimentally impact** cliffs, rock outcrops, or talus habitats, **but will not lead to a trend toward federal listing** for rare species growing in or on cliffs, rock outcrops, and talus habitats.

Direct and Indirect Effects to Riparian-Dependent Communities

The mechanisms for direct and indirect effects to riparian-dependent communities are similar to upland coniferous forest communities. See the discussion above related to potential direct and indirect impacts to coniferous forest communities for details of similar potential effects to riparian-dependent communities. Project design criteria are included in the project to protect rare plant populations that occur within riparian-dependent communities.

Many of the botanical surveys conducted for this project focused on riparian-dependent communities. However, not every acre of riparian-dependent community was surveyed. Therefore, there may be undiscovered populations of sensitive plants in these areas.

None of the sensitive plant species that may occur in riparian-dependent habitats are considered extremely rare on a global scale. Therefore, even if project activities may impact individual plants or habitat, implementation of this alternative should not increase the need for Federal listing of any sensitive species. Therefore, alternatives 2 or 3 **may detrimentally impact, but will not lead to a trend toward federal listing** in riparian-dependent habitats.

Cumulative Effects

See the discussion above on past, present, and foreseeable activities relevant to cumulative effects for details of activities that may contribute to cumulative effects for sensitive plants.

Direct and indirect effects to sensitive plant habitats have been described above. The determination of **no impact** was made for lithosol, sagebrush, grassland, cliffs, rock outcrops, and talus habitats. Since there would be no impact to these resources, there would be no cumulative effects.

A determination of **may detrimentally impact, but will not lead to a trend toward federal listing** was made for sensitive plant habitats that may occur in coniferous forest, aspen communities, and riparian-dependent communities. Historically, there have likely been detrimental effects to sensitive plant habitat in these areas. Forest Service projects are designed to minimize impacts to these communities in the present and future. The potential for negative direct and indirect effects to these habitats from the proposed activities have been minimized through the use of project design criteria. There are no current plans to conduct vegetation management activities in this area beyond the scope of this project for the next 10 years. Therefore, this project, foreseeable future projects, and those that have occurred in the recent past, are not likely to contribute toward cumulative detrimental effects to sensitive plant species.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

This project complies with Forest Service policy (Forest Service Manual 2670.32) to: (1) review activities as part of the National Environmental Policy Act of 1969 to determine their potential effect on sensitive species, (2) avoid or minimize impacts to species whose viability has been identified as a concern, and (3) assure that decisions would not result in loss of species viability or create significant trends toward federal listing.

Invasive Plants

Regulatory Framework

Executive Order 13112, Forest Service policy (including Forest Service Manual 2900) directs the agency to determine the risk of introducing, establishing, or spreading invasive plants associated with any proposed action and to provide alternatives or mitigation measures to prevent the introduction of invasive species. Other relevant law, regulation, and policy is described in greater detail in the Ragged Ruby Invasive Plants Report.

Resource Indicators

Direct and indirect physical disturbance has the potential to create bare ground and subsequently increase vulnerability of invasive plant introduction and infestation. Presence of invasive plant vectors (for example, vehicles, heavy equipment, roads, landings, prescribed burning, etc.) have the potential to introduce and spread invasive plants into disturbed areas.

Table 51. Resource element, indicator, and measure for assessing effects to invasive plants

Resource element	Resource indicator	Measure	Indicator source
Invasive plants	Potential for introduction and spread of invasive plants	Extent of ground disturbance and vector presence	Executive Order 13112; Forest Service Manual 2900; USDA Forest Service 1990a, Forest-wide standard 188, page IV-45; USDA Forest Service 2005; and USDA Forest Service 2015a

Invasive Plants

Affected Environment

Methodology

A pre-field review was conducted to determine where existing infestation sites were known to occur within the planning area. The following data sources were used for the review:

- National resource information system Forest Service database.
- Surveys for invasive plants conducted throughout the planning area from 2011 to 2016.

Existing Condition

Approximately 3,100 acres of non-native plants have been documented within the planning area. Infested acres consist of 57 total species, but only 15 species are targeted for eradication (see Table 52).

Table 52. Target invasive species

Species	Common name	Infested acres
Cardaria draba	white top	1.30
Carduus nutans	musk thistle	0.42
Centaurea diffusa	diffuse knapweed	131.11
Centaurea nigrescens	Tyrol knapweed	0.10
Centaurea solstitialis	yellow star thistle	127.19
Centaurea stoebe	spotted knapweed	273.14
Cirsium arvense	Canada thistle	399.61
Cirsium vulgare	bull thistle	38.01
Cynoglossum officinale	houndstounge	126.17
Hypericum perforatum	St. Johnswort	184.97
Linaria dalmatica	dalmatian toadflax	126.77
Linaria vulgaris	yellow toadflax	0.11
Onopordum acanthium	scotch thistle	0.12
Potentilla recta	sulphur cinquefoil	127.55

The annual invasive grasses *Bromus tectorum* (cheatgrass), *Poa bulbosa* (bulbous bluegrass), *Taeniatherum caput-medusae* (medusahead), and *Ventenata dubia* (North Africa grass) were documented on 279 acres of the planning area. The majority of non-native and invasive plants occur along roads, in rock pits, and at dispersed campsites.

Environmental Consequences

Methodology

The analysis will only consider plant species identified as "invasive" (as defined in Executive Order 13112) by: (1) the scientific literature as related to the local ecosystems, (2) the 2015 Malheur Invasive Plants Record of Decision, (3) botanists, ecologists, or invasive plant specialists with local knowledge and experience, (4) the Oregon Department of Agriculture as presented in their state noxious weeds list, and (5) new species to the ecoregion that may have the potential to become invasive (early detection rapid, response scenario).

Proposed actions are considered to have a "beneficial effect" on invasive plant management if they would reduce the distribution and size of invasive plant infestations as a direct or indirect effect of the actions. A "no effect" determination is given if there would be no net increase or decrease in the potential number and size of invasive plant infestations as a direct or indirect result of the action (or consequence of the decision, in the case of no action). A determination of "may detrimentally impact" is given for proposed actions that may increase the potential number and size of invasive plant infestations as a direct or indirect result of the action (40 Code of Federal Regulations §1508.8).

For this analysis, all invasive plant species are considered to be the same in regard to effects determinations. While some species may respond more aggressively due to: (1) the nature of the disturbances associated with the various proposed actions, and (2) the biological and ecological characteristics of the species, all of the documented invasive plants have the potential to increase in distribution and cover with an increase in ground disturbance and vector presence.

Incomplete and Unavailable Information

While there is a very high level of confidence that most invasive plant occurrences have been discovered, some areas (for example, roads, campsites, or livestock holding facilities) have perpetual disturbance or vector presence and thus new invasive plant infestations have the potential to arise on an annual basis. For this reason, these areas will continue to be surveyed and monitored for invasive plants indefinitely.

Spatial and Temporal Context for Effects Analysis

The spatial context for effects analysis includes all of the proposed units and haul routes of the action alternatives. The temporal context includes the timeframe when the proposed actions would occur, the past few decades as related to invasive plant management, and 10 years after the operations cease.

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

In the past, present, and reasonably foreseeable future, there have been and will continue to be projects and activities within the planning area that may affect invasive plants and their habitats. Projects and activities that create ground disturbance, change vegetative composition, or introduce new vectors may potentially cause increases in invasive plant populations. These actions include past timber harvest, fire suppression efforts, livestock grazing, recreation, road maintenance, firewood cutting, aquatic restoration activities, and ongoing invasive plant treatments under the 2005 Pacific Northwest Region Invasive Plant Program Preventing and Managing Invasive Plants Record of Decision (hereafter "2005 Region 6 Invasive Plants Record of Decision"; USDA Forest Service 2005). Existing conditions reflect the cumulative effects of past and present activities that have occurred in this area as part of the baseline condition.

Alternative 1 – No Action

Direct and Indirect Effects

Under alternative 1 there would be no ground disturbance and no increase in vectors as a result of the decision, and thus there would be "no effect" to the number and extent of invasive plant occurrences in the planning area. While some existing infestations would naturally increase in size, and new infestations would arise from ongoing vectors and actions, there would likely be a net decrease in invasive plants due to ongoing treatment as described and implemented under the 2015 Final Record of Decision for the Malheur National Forest Site-Specific Invasive Plants Treatment Project (hereafter "2015 Malheur Invasive Plants Record of Decision"; USDA Forest Service 2015a).

Cumulative Effects

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

Alternatives 2 and 3

Direct and Indirect Effects

Forest-wide invasive plant prevention standards and project design criteria, such as cleaning of equipment, use of weed-free mulch, gravel, and pit material, would prevent any direct introduction of invasive plant materials or seeds as a result of the proposed actions. Therefore, there would be "no effect" in terms of direct impacts to invasive plant populations. Invasive plants would not be introduced or spread as a direct result of the project.

Proposed actions including upland restoration treatments; watershed, fisheries, and wildlife habitat restoration; prescribed burning and unplanned ignitions; road activities; and recreation system changes would have the potential to create ground disturbance and subsequent bare ground areas that would be susceptible to invasive plant establishment. There would also be an increase in vector presence. This includes temporary road construction, heavy equipment impacts to soil, creation of landings and staging areas, increase in light availability due to thinning, and other similar activities. In some cases, such as slash burn pile scars, the proposed actions would create small discrete areas of bare ground where the soil has been completely sterilized. Slash pile burn scars almost always have invasive plant infestations within 1 year after being created. In some cases, over 95 percent of the burn scars become infested with invasive plants (usually Canada and bull thistles). While the total area of burn scars is negligible compared to the total planning area, the infestations can be a new source (vector) for invasive plant introductions. Therefore, the project may detrimentally impact native plant communities by increasing invasive plants.

Cumulative Effects

There have been and will continue to be projects and activities within the planning area that may cumulatively affect the number and distribution of invasive plant infestations. These actions have the potential to increase or decrease invasive plants on the landscape and most notably include timber harvest, fire suppression efforts, recreational activities, road maintenance, firewood cutting, aquatic restoration activities, livestock grazing, and ongoing invasive plant treatments.

Most of the cumulative effects from the activities described in the Past, Present, and Foreseeable Activities Relevant to Cumulative Effects Analysis section above may have, and could potentially be, detrimental from an invasive plant perspective – they increase the vector presence in the area and can create soil disturbances that are susceptible to invasive plant introduction. However, existing and future infestations would be treated before, during, and after the project is implemented. This, along with the project design criteria, would eliminate or substantially reduce the potential inadvertent spread of existing invasive plants before operations commence, and would eradicate any new infestations during and after implementation. Thus, overall beneficial cumulative effects would occur due to ongoing implementation of the treatments under the 2015 Malheur Invasive Plants Record of Decision. See the 2005 Region 6 Invasive Plants Record of Decision for details on the planning, environmental effects, and implementation strategy for invasive plant treatments.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

This project complies with Executive Order 13112 which directs federal agencies to identify actions that may affect the status of invasive species, prevent their introduction, and minimize the risk of the actions. It is also consistent with Forest Service policy (Forest Service Manual 2900) and the Malheur Forest Plan to determine the risk of introducing, establishing, or spreading invasive plants associated with any proposed action, and to reduce or eliminate that risk prior to project approval.

It also fulfills, in part, requirements of the National Environmental Policy Act of 1969 which directs federal agencies to "Ensure that environmental information is available to public officials and citizens before decisions are made and before actions are taken."

Wildlife – Proposed, Endangered, Threatened, and Sensitive Species

Regulatory Framework

The Malheur Forest Plan provides standards and guidelines for management of wildlife species and habitats. Standards and guidelines are presented at the Forest level (USDA Forest Service 1990a, pages IV-26 to IV-33) or management area level (USDA Forest Service 1990a, pages IV-50, IV-53, IV-56 to IV-57, IV-105 to IV-107, and IV-108). Guidance also comes from Forest Service Manual 2670.31, and the Regional Forester's special status species list, December 2015 was used to determine threatened, endangered, and Region 6 sensitive wildlife species discussed in this document. Laws include the National Forest Management Act and the Endangered Species Act. See Ragged Ruby Wildlife Report for more details.

Resource Indicators

Resource elements, indicators, and measures for assessing the effects to wildlife – proposed, endangered, threatened, or sensitive species are presented in Table 53.

Table 53. Resource elements, indicators, and measures for assessing effects to wildlife proposed, endangered, threatened, and sensitive species

Resource element	Resource indicator	Measure	Source
Proposed, endangered, threatened, and sensitive species	Effects to species and habitat	Effects determination	Endangered Species Act; U.S. Fish and Wildlife Service's listed species believed to or known to occur in Oregon (USDI FWS 2015a); Region 6 Regional Forester's special status species list (USDA Forest Service 2015e); Malheur Forest Plan (USDA Forest Service 1990a, Forest-wide standards 62-67, pages IV-32 to IV-33)

Species Analyzed in This Section

Species analyzed in this section include gray wolf (*Canis lupus*), Townsend's big-eared bat (*Corynorhinus townsendii)*, pallid bat (*Antrozous pallidus*), fringed myotis (*Myotis thysanodes*), American peregrine falcon (*Falco peregrinus anatum*), bald eagle (*Haliaeetus leucocephalus*), Lewis' woodpecker (*Melanerpes lewi*s), white-headed woodpecker (*Picoides albolarvatus*), Johnson's hairstreak (*Callophrys johnsoni*), silver-bordered fritillary (*Boloria selene*), western bumblebee (*Bombus occidentalis*) because either these species have habitat documented or suspected within the planning area or near enough to be impacted by project activities, or the species is suspected in the general vicinity of project activities. Townsend's big-eared bat, pallid bat, and fringed myotis will be analyzed together due to threats in common to these bat species.

Proposed, endangered, threatened, or sensitive species not included in this section include bufflehead (*Bucephala albeola*), bobolink (*Dolichonyx orizyvorus*), grasshopper sparrow (*Ammodramus savannarum*), greater sage-grouse (*Centrocercus urophasianu*s), upland sandpiper (*Bartramia longicauda*), Wallowa rosy finch (*Leucosticte tephrocotis wallowa*), pygmy rabbit (*Brachylagus idahoensis*), Canada lynx (*Lynx Canadensis*), and California wolverine (*Gulo gulo luteu*s), because either these species have no habitat within the planning area and thus would not be affected by its activities, or the species are not documented nor suspected in the general vicinity of project activities. In the case of Canada lynx, there is no designated or proposed critical habitat in the affected area.[23] See Ragged Ruby Wildlife Report for more information.

Table 54. Proposed, endangered, threatened, or sensitive species analyzed in this section

Common name	Status
Gray wolf (east of U.S. Route 395)	Sensitive
Townsend's big-eared bat	Sensitive
Pallid Bat	Sensitive
Fringed myotis	Sensitive
American peregrine falcon	Sensitive, federally delisted
Bald eagle	Sensitive, federally delisted
Lewis's woodpecker	Sensitive, management indicator species[1]
White-headed woodpecker	Sensitive, management indicator species[1]
Johnson's Hairstreak	Sensitive
Silver-bordered fritillary	Sensitive
Western bumblebee	Sensitive

1. Species will be analyzed in this section even though it is also a management indicator species.

[23] Based upon the National Lynx Survey, the Malheur National Forest falls under the designation of "Unoccupied Mapped Lynx Habitat" (USDI FWS 2009). Therefore, there is No Effect expected to Canada lynx.

Information Relevant to All Species

Methodology

National Forest Management Act regulations adopted in 1982, require that habitat be managed to support viable populations of native and desired non-native vertebrates within the planning area (36 Code of Federal Regulations 215). U.S. Departure of Agriculture regulation 9500-004 (USDA Forest Service 2008), reinforces the National Forest Management Act viability regulation by requiring that habitats on national forests be managed to support viable populations of native and desired non-native plants, fish, and wildlife.

Effects on wildlife species and habitat were assessed within national forest lands in the Ragged Ruby planning area, focusing on the implementation of actions described within each alternative. Some wildlife habitats require a detailed analysis and discussion to determine potential effects on a particular species. Other habitats may either not be impacted or are impacted at a level which does not influence the species or their occurrence.

Effects were analyzed within the context of the Ragged Ruby planning area, unless otherwise noted. The cumulative effects analysis area for wildlife species is variable depending on the extent and distribution of species and associated habitat that may be affected by activities proposed in the Ragged Ruby Project.

Species presence or absence determinations were based on one or a combination of the following: habitat presence; review of wildlife sightings recorded in District and Forest wildlife databases; the National Resources Information System wildlife database; non-Forest Service databases; Oregon Department of Fish and Wildlife reports; and any notes, maps, or summary reports of wildlife observations made during field reconnaissance.

There is a high confidence level that species discussed in this document are currently present, or their habitat is present, in the planning area. However, formal wildlife surveys were not conducted for most species and data gaps may include, but are not limited to: a lack of on-the-ground snag and dead and downed surveys (information for this analysis was based on DecAID), project scale northern goshawk surveys (not required), and survey data for areas difficult to access.

The 2015 Regional Forester's special status species list (USDA Forest Service 2015e) was used to determine sensitive wildlife species discussed in this document. Conservation status, trends, and source habitats for these and other species were obtained from the Oregon Biodiversity Information Center "Rare, Threatened and Endangered Species of Oregon" (August 2016), NatureServe Explorer (accessed 2016), U.S. Fish and Wildlife Service Birds of Conservation Concern (USDI FWS 2008a), and viability assessments for earlier efforts of the Blue Mountain Forest Plan Revision (Wales et al. 2011).

Unless otherwise noted, the duration of effects on the wildlife resource is described generally according to the following terms and definitions:

- Immediate: Approximately one growing season or less
- Short term: 0 to 5 years
- Mid term: 5 to 25 years
- Long term: Over 25 years

Direct, indirect, and cumulative effects of activities proposed in each alternative are identified and discussed.

Overview of Direct and Indirect Effects

Wildlife species may exhibit a variety of responses to the proposed management activities. These activities would potentially alter habitat conditions in the short, mid, and long term, resulting in either adverse or beneficial effects to terrestrial wildlife or their associated habitat, forage, or prey species. Intensity of effects may differ depending on context, location, extent, and timing of activities and the species or habitat involved.

Habitat is discussed in terms of existing and historical conditions. Historical range of variability is used as a reference condition; effects to habitats are discussed, with the assumption that if suitable habitat is available for a species, then that species occupies or could occupy that habitat. See Ragged Ruby Wildlife Report for further discussion on historical range of variability. Effects on species will be determined by assessing how each alternative would affect the structure and function of vegetation (habitat) relative to current, projected, and historical distributions.

The action alternatives have similar activities proposed, with similar levels of treatment. Differences between alternative 2 (proposed action) and alternative 3 are summarized in chapter 2. Throughout the wildlife sections, it is assumed that as proposed treatments intensify, the level of expected associated effects also intensify, which is why alternatives 2 and 3 are analyzed together.

Direct and indirect effects resulting from proposed activities will be discussed as they are expected to occur. All treatment activities will not be analyzed for every species if there would be no effect or no impact to that species in the short, mid, or long term. For example, it is not expected that installation of bat gates would affect Rocky Mountain elk habitat or populations and therefore is not analyzed in the Rocky Mountain elk section. It can be assumed that for each proposed activity, each proposed, endangered, threatened, and sensitive, management indicator, and featured species that could occur in the planning area could be temporarily displaced or exhibit avoidance behavior in the immediate areas of activity and during times and areas of increased traffic or activity. Displacement and avoidance would be expected to be short term throughout implementation and only in or near areas of direct activity. Otherwise, it is assumed that proposed treatments or activities not specifically discussed for a certain species would have no effects or no impacts on that species. Proposed activities with the potential to have further direct, indirect, or cumulative effects will be discussed by species.

Cumulative effects have been analyzed in respect to past, ongoing, and reasonably foreseeable actions that would overlap the planning area in time and space.

Alternative 1 (No Action)

No activities associated with this project would occur under alternative 1 (except some actions analyzed under cumulative effects associated with other decisions), and therefore there can be no direct or indirect effects as a result. However, a consideration of what may reasonably occur under this alternative as it applies to all addressed species and habitats will be discussed. For species or habitats with differing or additional potential effects there is additional verbiage in their respective sections.

For wildlife resources, two things are considered within the framework of alternative 1. The first is that the existing conditions and management direction would remain unchanged in the near term. Secondly, the current condition and susceptibility to a large, stand-replacing event, allows analysis of the effects of said event. This analysis will consider alternative 1 in terms of:

- The existing forest vegetative conditions continuing along current trajectories
- The likelihood of a stand-replacing wildfire of mixed to high severity, or an insect or disease outbreak occurring as a result of the current conditions (speculative).

In general, it is expected that early seral stands would continue to decrease in the planning area. Early seral forests are as important for wildlife as old growth forests (Swanson et al. 2014) and the decline in early seral habitat adversely affects early seral dependent bird species, many of which are migratory.

Large overstory ponderosa pine would continue to weaken due to moisture stress resulting from competition in overstocked stands. Western larch would continue to lose vigor due to dense stand conditions that reduce crown width and crown height. Both of these tree species and size classes are important to a wide variety of wildlife, particularly the majority of the sensitive species in the planning area. Susceptibility to insect and disease disturbances in excess of the historical range of variability would continue to increase. Large snags would likely increase due to tree mortality from the above causes, benefiting snag-dependent species in areas not accessible by roads (that provide access for firewood cutting).

Fire effects could result in higher stand loss, as discussed in the Fire and Fuels section. Disturbances would be of a higher severity (increasing mortality of larger trees) and over a larger area than under historical conditions. Severe fire affecting a large portion of the planning area would adversely impact a majority of species.

Alternatives 2 and 3

Upland Restoration Activities and Prescribed Burning

Implementation of upland restoration activities would transition stands towards species composition and stand structure reflective of historical conditions, which would facilitate an increase in the size of remaining trees, which in the long term could become large snags (see Forest Vegetation and Fire and Fuels sections). Wildlife dependent on open mature pine-dominated habitat would benefit from increased stand health. Conversely, wildlife dependent on denser forest conditions, post-fire habitat, or insect outbreaks may experience a mid- to long-term reduction in habitat within the planning area.

Either alternative would result in a large portion of the landscape being untreated due to expansive roadless areas, management area 13 (old growth) networks, extensive connectivity corridors, and steep slopes. Potential wildfire or continued insect events would provide some acres representing stand initiation and understory reinitiation forest structure, although effects would depend on severity and extent of such events.

Alternatives 2 and 3 would move old forest single stratum and old forest multi-strata towards historical levels. This increase in open, single story large tree habitat would improve foraging conditions for white-headed woodpeckers, and to a lesser extent Lewis’s woodpeckers. Large snag habitat for nesting would remain limited for most management indicator species woodpeckers, although white-headed woodpeckers do utilize managed stands where broken-topped and shorter snags may be used for nesting. While a loss of old forest multi-strata habitat could impact pileated woodpeckers and other dense forest-dependent species, old forest multi-strata would remain above the historical range of variability with the implementation of either action alternative. Consequently, habitat for old forest multi-strata species would likely be retained. Nesting habitat may remain a limiting factor due to lack of suitable large snags in mixed conifer stands. See the Ragged Ruby Wildlife Report for further discussion of historical range of variability and stand structure.

Prescribed burning can alter or remove vertical and horizontal stand structure including snags and downed wood. Prescriptions using only prescribed burning would exhibit the largest number of snags recruited from direct tree mortality, but burning activities have the potential to both consume existing snags and downed wood and to create new snags. Any snag creation as a result of fire would benefit post-fire-dependent species like the black-backed woodpecker. Although this pulse of snags would provide foraging for numerous woodpecker species, most snags would likely be too small to provide suitable nesting habitat.

Although proposed activities are likely to result in some loss of snags, future snags, and downed wood, all of which are important stand attributes of healthy forests and critical components of wildlife and invertebrate habitat (Pilliod et al. 2006), losses are expected to be minor across the landscape. Snag loss, especially of larger diameter snags, would be a long-term impact.

Design criteria that protect existing snag and downed wood habitat, recruit snags during prescribed burning, and protect snags via road closures that limit access (pending effectiveness) may offset losses. Variable-density thinning, prescriptions retaining higher densities, blocks of no treatment, skips within units, and a network of connectivity corridors (denser forest areas) are all designed to retain heterogeneity within the planning area and ultimately at the landscape level, provide for a diversity of habitat types across the landscape, and retain existing snags.

Road Activities

Use of closed and grown-in roads and construction of temporary roads, or re-opening of decommissioned roads for temporary use needed for project access and log haul converts forest habitat to roadway and linear edges. Disturbed roadbed and vehicle traffic has the potential to increase the spread of non-native invasive plant species. Linear edges into denser forest habitat can also alter the distribution of species composition (particularly in birds and small mammals), or introduce invasive species. Snag densities may be reduced along roads where dead trees are designated as hazards and felled for contractor and public safety. The larger of these trees provide important nest and roost sites for cavity-dependent wildlife and are not easily replaced, taking decades if not hundreds of years to develop. Traffic and activity along previously closed roads reduces wildlife security during project implementation. Species requiring remote areas and refuge from human activity could be detrimentally affected in the short term. If temporary roads or roads designated for closure are not effectively closed, this becomes a long-term impact.

Temporary roads and previously closed roads would be closed after activities are completed, although roads may become difficult to close effectively (functional barrier) after maintenance for project activities, especially with motorized cross-country travel authorized in the Forest. Effective road closures or decommissioning would secure potential habitat from vehicle access and disturbance. Scarifying roadbeds and seeding with native seed would rehabilitate bare ground to forage in the short term, and allow conifer recruitment in the mid to long term. Disturbances to wildlife would be expected to decrease the longer roads are effectively closed. Effectively closing or decommissioning roads would reduce road densities and move toward Malheur Forest Plan goals (USDA Forest Service 1990a, page III–15); secure habitat from the risks of additional firewood cutting, log harvest, and hazard tree removal; reduce habitat fragmentation; reduce potential for non-native invasive plant establishment; and increase security for wildlife.

Aspen Restoration

Aspen restoration would only be proposed for restoration objectives, and the total acreage within the planning area is minimal (approximately 10 acres), and therefore unlikely to result in any considerable effects.

Bat Gate Installation

Because of the remote locations of the proposed bat gates and localized area of affect (area immediately adjacent to mine shaft or adit), it is not expected that the installation of bat gates would result in any adverse direct impacts to most wildlife. There could be some temporary disturbance and displacement of wildlife from the area during implementation, though not for an extended period of time.

Recreation System Changes

Increased and improved recreation infrastructure (for example, hiking trails or trailhead developments) and potential subsequent increased recreational use would increase disturbance and displacement to wildlife. Displacement would occur during construction and implementation, and longer term as trails and facilities receive use and maintenance. Increasing recreation would also result in an increasing need for safety and trail maintenance, which could lead to a larger deficit of snags as more snags would be identified and removed hazards to recreationists.

Increased interactions between recreationists and wildlife such as elk, deer, nesting birds, and raptors could increase stress and potentially lower survival of affected species when interactions occur in critical habitats or during specific periods (for example, in winter range, or in nesting, roosting, or fawning seasons or habitat).

Overall, proposed increases and improvements to recreation infrastructure would be minimal across the planning area and expected to have little effect to species populations.

Cumulative Effects

The area considered for cumulative effects is the Ragged Ruby planning area and adjacent subwatersheds. All activities in Appendix E – Past, Ongoing, or Reasonably Foreseeable Actions have been considered for their cumulative effects on each species.

Past timber harvest, thinning, road construction, fire suppression, wildfire, prescribed fire, and grazing have combined to create the existing condition within the planning area. Existing forest structure compared with the historical range of variability reflects the effects of past management activities as well as large-scale disturbance events.

Timber harvest prior to the Malheur Forest Plan, as amended in 1995 by the Eastside Screens, targeted and removed many of the largest diameter trees reducing old forest structures (old forest multi-strata and old forest single stratum) in the Warm Dry biophysical environment. Large green replacement trees removed during this time reduced future snag potential and subsequent large snag densities throughout the planning area. These actions would have reduced potential habitat for some species. Timber sales planned since that time are intended to move stands towards historical structural stages and would not have contributed to loss of mature and old growth trees occurring in their historical biophysical environment.

The Malheur Forest Plan, as amended by the Eastside Screens, directs that timber sales be conducted to move stands towards old forest multi-strata and old forest single stratum structural stages; maintain all live trees greater than or equal to 21 inches diameter at breast height; and maintain connectivity by reducing fragmentation between late and old structure and dedicated old growth. Therefore, timber sales planned since that time within the planning area have not contributed to loss of late and old growth forest, although understory stocking may have been reduced.

Alternatives 2 and 3 allow for removal of trees within late and old structure including those 21 inches diameter at breast height or greater (as amended). This would require an amendment to the Malheur Forest Plan. Target trees for removal would generally be where grand fir affects the survivability of older pine and Douglas-fir trees or where grand fir affects the ecological sustainability of the stand. Removal of these larger grand fir trees could result in a potential loss of hollow trees useful for some species, which would be expected to be a short- to long-term effect depending on future entries. Conversely, moving stand structure towards the historical range of variability by restoring natural vegetation conditions and fire regimes would improve the sustainability of these habitats for associated wildlife species, and lower the risk of largescale insect infestation and higher-severity wildfire. In the long term, larger and older stand structure would provide snags valuable as habitat for some species.

Although ongoing prescribed fire could potentially consume a small number of smaller snags, it would also be expected to contribute small pulses of additional snags and potential habitat, benefiting some species.

Expanding and enhancing riparian habitats through ecological riparian treatments accomplished under the Aquatic Restoration Decision would benefit many species. However, habitat would remain below the historical range of variability over time as identified by Powell (1998).

There are several projects with similar scope and scale adjacent to the Ragged Ruby planning area including the Camp Lick Project (in the late planning stages), the Galena, Big Mosquito, and Magone projects (signed and being implemented), and the Austin Project (early planning stages). Cumulatively, the effects of these projects would likely benefit most species, as they would manage for a more resilient landscape, reduce hazardous fuels, and retain and develop future old trees of species appropriate to their respective biophysical environments over time. In the long term, these projects are expected to increase larger and older stand structure which would ultimately provide larger snags which are valuable habitat for some species. However, in the short term, species may be regularly displaced, and the cumulative loss of snags (from hazard trees, prescribed fire consumption, and captured mortality) may affect some species.

Current livestock grazing in the uplands and along streams is likely affecting foraging habitat for some species. Cattle may shift plant species composition and abundance through selection of more palatable forage species. Cattle reduce ground cover through trampling or consuming vegetation, decreasing insect availability. Past grazing in stream corridors has also reduced riparian shrub habitat.

The road network in the analysis area (largely a result of past harvest) has impacted snag densities by decreasing habitat from road construction and increasing accessibility of the area to firewood cutting and personal-use timber sales. Public firewood cutting is expected to continue along open roads and administratively closed roads that receive unauthorized use, and contribute to loss of snags in the planning area. Large snags lost to small timber sales further contribute to the loss of dead and defective habitat in the area. Based on the proposed Malheur National Forest Access Travel Management Plan, it is foreseeable that cross-country travel would be restricted for off-highway vehicle travel, with the exception of accessing dispersed camping sites adjacent to open roads, and potentially big game species retrieval. Road decommissioning and closure activities proposed with the Ragged Ruby Project, and subsequent reduction of road densities in the area, combined with the foreseeable changes in travel management, would have a beneficial cumulative effect on snag retention by reducing access for firewood cutting, thus increasing potential habitat for some species.

Invasive plant treatments, as authorized by the Malheur National Forest Site-Specific Invasive Plant Treatments Record of Decision, would be beneficial to the persistence of native vegetation.

Wildlife Issues Identified During Public Scoping

Table 55 addresses the significant issues for wildlife associated with the Ragged Ruby Project identified during public scoping. Significant issues are defined as those directly or indirectly caused by implementing the project and that represent a point of debate or concern that cannot be resolved without consideration of the trade-offs involved; however, the effects cannot be reduced by normal best management practices or project design criteria. Alternatives were developed to address these issues. Each issue has indicators to allow members of the public and the responsible official to determine how well issues are addressed by the alternatives.

Table 55. Significant issues for wildlife

Significant issue	Significant issue indicator(s)
Habitat for old growth management indicator species and goshawk – Proposed activities should retain old growth habitat for American marten and goshawk and other management indicator species.	• Activities in suitable American marten habitat (acres) • Activities in goshawk nest stands and post fledgling areas • Activities in late and old structure and dedicated old growth (acres) • Old growth management indicator species (qualitative effects discussion)
Removal of trees equal to and greater than 21 inches diameter at breast height no matter what the species or age. Large structure is generally lacking in the planning area.	• Removal of trees equal to and greater than 21 inches (acres by stand structure type) • Retention of tree species that may not have been historically present (qualitative effects discussion)
Reduction of wildlife connectivity corridors between late and old structure stands and impacts to wildlife movement.	• Connectivity corridors (acres retained) • Connectivity corridors (treatment acres by type) • Impacts to wildlife movement (qualitative discussion) • Marginal, satisfactory, and total cover (percent)

Gray Wolf

Affected Environment

Methodology

See Information Relevant to All Species section.

Existing Condition

The Northern Rocky Mountain distinct population segment of the gray wolf population includes a portion of eastern Oregon—east of the centerline of U.S. Route 395 and Oregon Route 78 north of Burns Junction and that portion of Oregon east of the centerline of U.S. Route 95 south of Burns Junction (USDI FWS 2008b). A final rule published by the U.S. Fish and Wildlife Service on May 5, 2011 (Federal Register Vol. 76, No. 87) delisted wolves in the Northern

Rocky Mountain distinct population segment). Wolves in this eastern third of Oregon (east of U.S. Route 395) were returned to Oregon Department of Fish and Wildlife management. The U.S. Forest Service designates the status of gray wolves as “sensitive.” Wolves west of U.S. Route 395 (outside of the Northern Rocky Mountain distinct population segment) remain protected by the Endangered Species Act with the U.S. Fish and Wildlife Service as the lead management agency for these populations. The planning area lies east of U.S. Route 395 and falls under Oregon Department of Fish and Wildlife management; therefore, the gray wolf will not be analyzed as an endangered species for this project.

Historically, wolves occupied all habitats of the Malheur National Forest (Wisdom et al. 2000), and although wolf presence (primarily transitory) has been documented on the Forest (in 1999, 2011, and 2014-2016), no wolf denning or rendezvous sites have been confirmed. However, the entire planning area would be potential foraging or dispersal habitat for gray wolves.

Environmental Consequences

Methodology

See Information Relevant to All Species section.

Alternatives 1, 2, and 3

Direct and Indirect Effects

Informal consultation with Oregon Department of Fish and Wildlife and the U.S. Fish and Wildlife Service was conducted for management activities on the Malheur National Forest. The two management agencies recommended that the Malheur National Forest follow guidelines described in The Reintroduction of Gray Wolves to Yellowstone National Park and Central Idaho Final Environmental Impact Statement (USDI FWS 1994) when considering effects to the gray wolf. See Ragged Ruby Wildlife Report for details.

Currently a no impact determination is recommended by Oregon Department of Fish and Wildlife for projects within the Malheur National Forest (east of U.S. Route 395). Therefore there would be no direct, indirect, or cumulative effects to wolves as a result of alternatives 1, 2, or 3. If a pack (or pair) is identified in the planning area, the only land use restriction would be limiting the operating period around den sites, which would be coordinated with Oregon Department of Fish and Wildlife.

Additionally, gray wolves are highly adaptable; therefore, management activities would be expected to have little effect on habitat use. Analysis for elk, a prey species for wolves, can be found in the Management Indicator Species – Rocky Mountain Elk section, and concludes that implementation of the Ragged Ruby Project may impact elk distribution at the local level but would not affect elk viability at the Forest level, therefore adequate prey would remain for gray wolves.

Cumulative Effects

Because no direct or indirect effects are anticipated as a result of the action alternatives, there would be no cumulative effects to gray wolf.

Determination for Gray Wolf

The determination for gray wolf is **no impact** for alternatives 2 and 3.

Townsend's Big-Eared Bat, Pallid Bat, and Fringed Myotis

Affected Environment

Methodology

See Information Relevant to All Species section.

Existing Condition

Although there are differences between these three bat species, threats in common include loss of roost habitat (snags) and degradation of foraging habitat. Therefore the effects for all three bat species are combined as one discussion below. For specific habitat ranges and threats for each bat species, please see Ragged Ruby Wildlife Report.

Townsend's big-eared bats are documented for the Malheur National Forest. Rock crevices, mines, large trees and snags, and foraging habitat occur within the planning area.

Within the planning area, roost habitat for pallid bat exists in small bridges, rock outcrops, hollow trees, and cavities within ponderosa pine. Foraging habitat within the planning area occurs in juniper woodlands, grassland scabs, and dry meadows.

Fringed myotis are documented for the Malheur National Forest. Within the planning area, mines, rock crevices, snags, and foraging habitat occur.

For all three bat species, the highest potential roost habitat within live trees would occur in old forest (old forest multi-strata and old forest single stratum). Areas of this tree roost habitat occur on approximately 12,500 acres (36.9) percent) within the planning area. For potential roost habitat within dead trees (snags), see the dead and defective habitat discussion, as part of the Wildlife – Management Indicator Species section.

The northern portions of the Ragged Ruby planning area have a rich mining history, which includes a number of historical shafts or adits that provide roosting and hibernacula habitat for bats.

Diversity of foraging habitat is also important for these three bat species. Unique habitats such as aspen stands increase the diversity of available forage habitat and attract insects that bats rely on. Healthy riparian vegetation also increases insect diversity and abundance, which is important for bats. Within the planning area there are approximately 10 acres of aspen and approximately 5,000 acres of riparian habitat conservation area considered potential foraging habitat for these bat species.

Environmental Consequences

Methodology

See Information Relevant to All Species section.

Alternative 1 – No Action

Direct and Indirect Effects

Under alternative 1, no management activities proposed as part of the Ragged Ruby Project would occur. In the short to mid-term, the various habitats that currently exist within the planning area would be maintained in the current condition and provide the species diversity, density, and distribution that currently exists. Fire hazard and risk of insect outbreaks would remain elevated for some stands. Conversely, in the absence of disturbance long term, open pine stands could continue to transition to multistory stands. Closed roads currently being used would remain open, resulting in loss of security for some species and potential loss of snags from firewood cutting.

Cumulative Effects

Because there would be no direct or indirect effects, there would be no cumulative effects.

Alternatives 2 and 3

Direct and Indirect Effects

Both action alternatives would move younger stands toward old forest structure at some level, ultimately developing either large snags or large green trees with potential for dead tops, and would provide roost habitat benefiting these bat species in the long term. Additionally, alternatives 2 and 3 propose installation of bat gates, and approximately 1,000 acres of upland shrub, scabland, and dry meadow enhancement treatments, which would enhance or even create foraging habitat. Both alternatives would likely benefit Townsend’s big-eared bat, pallid bat, and fringed myotis in the mid to long term. See Ragged Ruby Wildlife Report for details.

Cumulative Effects

Overall, the combined effects of the Ragged Ruby Project with the effects of past, ongoing, and reasonably foreseeable actions would not be expected to adversely affect populations of Townsend’s big-eared bat, pallid bat, and fringed myotis. See also the cumulative effects discussion in the Information Relevant to All Species section, and the Ragged Ruby Wildlife Report for more details.

Determination for Townsend’s Big-Eared Bat, Pallid Bat, and Fringed Myotis

With their ability to use a broad range of habitats, it is expected that habitat for bats would be affected through implementation of any of the action alternatives. However, habitat alteration in the planning area would not necessarily render that habitat unsuitable; it would likely only change the way the habitat would be used by bats.

The proposed alternatives **may impact individuals or habitat, but will not likely contribute to a trend toward federal listing or loss of viability to the population or species** because: there could be a degree of displacement or disturbance for bat species during project implementation; some live and dead trees providing habitat may be removed; enhancing foraging areas could benefit these species; and treatment could potentially change how affected habitat would be used by bat species. Additionally, other habitat such as rock outcrops, cliffs, and mine shafts and adits would not be affected by project activities, except in two locations where bat gates would be installed and therefore would protect roosting and hibernacula habitat. The installation of the bat gates would be a **beneficial impact** to localized bats using those locations.

American Peregrine Falcon

Affected Environment

Methodology

See Information Relevant to All Species section.

Existing Condition

American peregrine falcon typically nests on cliffs and man-made structures greater than 75 feet high and are normally found no farther than 1 mile from water sources (Marshall et al. 2006). The presence of prominent cliffs is the most common habitat characteristic of peregrine falcon nesting territories (Hayes and Buchanan 2002, Hays and Milner 1999). A source of water, such as a river, lake, marsh, or marine waters, is typically in close proximity to nest sites and likely is associated with an adequate prey base of small- to medium-sized birds (Cade 1982, Johnsgard 1990).

No known peregrine falcon nest sites have been verified on the Malheur National Forest; however, potential natural nesting habitat may exist in the planning area around Ragged Rocks. Observations of peregrine falcons in flight have also been reported near Ragged Rocks.

Environmental Consequences

Methodology

See Information Relevant to All Species section.

Alternatives 1, 2, and 3

Direct and Indirect Effects

No documented nest sites occur, or are expected to occur within the planning area. Further, activities are not proposed near any potentially suitable nesting habitat under any alternative. Biologists would continue to monitor the area annually for nesting peregrine falcons, and if discovered, appropriate mitigation would be implemented if any activities would be expected to cause concern. Therefore, no direct or indirect effects would be expected.

Cumulative Effects

Because there would be no direct or indirect effects, there would be no cumulative effects.

Determination for American Peregrine Falcon

The determination for American peregrine falcons is **no impact** for any of the alternatives because no activities are proposed in or adjacent to suitable nesting habitat under any alternative. Further, although potential nesting habitat exists in the planning area, no nests or incidental observations have been documented.

Bald Eagle

Affected Environment

Methodology

See Information Relevant to All Species section.

Existing Condition

Bald eagle populations are managed under the Pacific States Bald Eagle Recovery Plan (USDI FWS 1986), the Bald and Golden Eagle Protection Act, the Migratory Bird Treaty Act, and the National Bald Eagle Management Guidelines (USDI FWS 2007).

Bald eagles generally nest near rivers, large lakes, or streams that support an adequate food supply, which generally consists of fish, waterfowl, and carrion. Potential nesting habitat is generally located within 1 mile of water (Marshall et al. 2006) and nest trees are normally mature or old growth trees, with a large and open branch structure that can support the large nests. They shelter at winter roost sites, utilizing large trees with open branching patterns in the crown. The birds show a preference for the largest trees or snags in roosting areas (USDI FWS 1986).

Major threats to bald eagles continue to be habitat loss, environmental contaminants (especially lead shot or bullet fragments), excessive disturbance by humans, and illegal shooting (NatureServe 2016).

Incidental sightings of bald eagles are documented within the planning area. However, no known roosts or nests are documented at this time.

Bald eagles have been documented in the planning area outside of breeding season, likely utilizing the Middle Fork John Day River for general travel and/or foraging. There is a known bald eagle nest downstream from the planning area, analyzed during the Big Mosquito Project.

Environmental Consequences

Methodology

See Information Relevant to All Species section.

Alternative 1 – No Action

Direct and Indirect Effects

Under alternative 1, there would be no management activities. Existing cover and stand densities would remain the same. Within the dry forest types, stocking levels for some stands would remain elevated. Potential losses from insects, disease, or wildfire would remain elevated for some stands. Wildfire events or outbreaks of insects and disease could affect large overstory trees used by bald eagles for roost or nest habitat; however, location, extent, and severity would determine the level of disturbance. Current open road access and unauthorized use on administratively closed roads would remain the same, with potential loss of large snags along these roads from firewood cutting and small timber sales.

This alternative could lead to the decrease of the health and vigor of large-diameter ponderosa pine used for nesting and roosting. Trends in risk of loss due to insects, disease, and wildfire would not be altered. This action may result in loss of large ponderosa pine and other preferred nesting species and reduce or eliminate the use of the area for nesting.

Cumulative Effects

Because there would be no direct or indirect effects, there would be no cumulative effects.

Alternatives 2 and 3

Direct and Indirect Effects

No known bald eagle nests exist in the planning area. If nests are discovered before or during any stage of project implementation, buffers and timing restrictions would be incorporated into the project design criteria, as per National Bald Eagle Management Guidelines (USDI FWS 2007), which would aid in mitigating possible project impacts. Further, if additional impacts are determined, further mitigations and restrictions would apply.

If bald eagles are encountered during implementation of proposed activities, they might be displaced or avoid areas of activity or increased traffic from roads or trails.

Retention of existing large trees, and accelerating tree growth to move younger stands towards older forest structure with large trees, would benefit bald eagles in the long term by providing larger, older tree structure and additional potential roost trees. In the short term, project implementation could result in the potential loss of large green trees or snags; however, design elements would minimize some potential losses. See Ragged Ruby Wildlife Report for more details.

Road closure activities, if closed effectively, would result in retaining more snags as a result of less public firewood cutting and access to snags from small timber sales. Snag retention may increase winter roost sites or perch trees, although there would likely be no effect to nesting bald eagles, as Isaacs and Anthony (1987) report that 98.9 percent of eagle nests are built in live trees (Marshall et al. 2006).

Prey species would not be adversely affected. In the long term, activities that improve riparian conditions, such as shade or riparian hardwood diversity and vigor, or activities to enhance fish habitat, would result in beneficial effects for fish species, prey for bald eagles.

Cumulative Effects

The implementation of alternatives 2 or 3 proposed management of stands towards older, larger, and more resilient structure would ultimately result in diminishing some past negative cumulative impacts to large tree structure within the cumulative effects boundary. It is also expected that enough large snags would remain on the landscape (since none would be targeted) to provide adequate nesting and roosting opportunities. See also the cumulative effects discussion in the Information Relevant to All Species section, and the Ragged Ruby Wildlife Report for more details.

Determination for Bald Eagle

The determination for bald eagle is **may impact individuals or habitat, but will not likely contribute to a trend toward federal listing or loss of viability to the population or species**. In the long term, treatments would help retain and promote growth and longevity of large trees and would have a **beneficial impact** on bald eagles.

Lewis’s Woodpecker

Affected Environment

Methodology

See Information Relevant to All Species section.

Existing Condition

For purposes of analysis, primary source habitat is defined as post-fire habitat, and secondary source habitat is defined as old forest single stratum forest and riparian areas with large tree structure. See Ragged Ruby Wildlife Report for more information.

The Summit and Reed post fire areas within and adjacent to the planning area are currently providing suitable primary habitat. Proposed activities associated with this project would not affect post-fire habitat for Lewis's woodpeckers, thus suitable breeding habitat within the planning area would be maintained.

There are approximately 5,000 acres of riparian habitat conservation area within the planning area; however, most acres lack the cottonwood component desirable for Lewis's woodpecker.

Lewis's woodpeckers have been documented within the Summit and Reed post fire habitat in and adjacent to the planning area.

Environmental Consequences

Methodology

See Information Relevant to All Species section.

Alternative 1 – No Action

Direct and Indirect Effects

Habitat for Lewis's woodpecker would not be treated, and current trends in habitat condition would continue. Habitat would remain below the historical range of variability, and Lewis's woodpecker habitat would be expected to decline with the ingrowth of understory trees and subsequent reduction in the amount of open habitats. Trends in risk of habitat loss to insects, disease, and wildfire would not be altered. Refer the Forest Vegetation and Fire and Fuels sections for detailed discussions of the risk of loss to these disturbance agents. This alternative could ultimately lead to an elevated risk of high-intensity wildfire, which could provide an increase in habitat for the Lewis's woodpecker.

Cumulative Effects

Because there would be no direct or indirect effects, there would be no cumulative effects.

Alternatives 2 and 3

Direct and Indirect Effects

Because the action alternatives of Ragged Ruby Project would improve forest health and increase resilience to drought, fire, insects, diseases, and other disturbances, these would not promote primary source habitat for Lewis's woodpecker as compared to alternative 1.

Commercial and non-commercial thinning and prescribed fire designed to increase the abundance of more open stand structure with ponderosa pine would help restore Lewis's woodpecker secondary habitat and bring levels closer to the historical range of variability. Implementation of alternatives 2 and 3 would result in a 10 percent increase of secondary habitat (old forest single stratum) by 2059. The extent of proposed project activities and expected outcomes should provide for a net increase of secondary habitat acres for each action alternative.

Effects to snags are likely to result from prescribed fire, use of closed roads for log haul, construction of temporary roads, hazard tree removal along haul routes, and prescribed fire; see watershed-scale analysis of snags in the Management Indicator Species section under Dead and Defective Habitat for Cavity Excavating Birds, Including Black-Backed Woodpecker.

Any net reduction in usable road systems (proposed road decommissioning and closure activities) for the Ragged Ruby Project would have a beneficial effect to snag retention by reducing access for firewood cutting and small personal-use timber sales, thus increasing potential nesting and foraging habitat for Lewis's woodpecker.

During proposed project activity operations, a degree of disturbance and displacement of Lewis's woodpeckers would be possible, though unlikely given the lack of proposed treatment of primary habitat and minimal existing secondary habitat.

See also the Historical Range of Variability and Stand Structure section in the Information Relevant to All Species section.

Cumulative Effects

Cumulative effects of projects or activities that benefit primary or secondary habitat for Lewis's Woodpecker as discussed in the Information Relevant to All Species section would likely benefit this species. See Ragged Ruby Wildlife Report for specifics.

Determination for Lewis's Woodpecker

The determination of effect of the action alternatives on the Lewis's woodpecker is **may impact individuals or habitat, but will not likely contribute to a trend toward federal listing or loss of viability to the population or species.** In the long term, treatments would help retain and promote growth and longevity of large trees and would have a **beneficial impact** on Lewis's woodpecker, especially secondary habitat.

White-Headed Woodpecker

Affected Environment

Methodology

See Information Relevant to All Species section.

Existing Condition

The white-headed woodpecker occurs mainly in open ponderosa pine or mixed-conifer forests dominated by ponderosa pine (Marshall et al. 2006). Landscapes with a mosaic of open habitat for nesting in close proximity to closed-canopy forests that provide foraging habitat seem to be important for white-headed woodpeckers (Mellen-McLean et al. 2013). Large ponderosa pine snags with mean diameters ranging from 25 to 31 inches are utilized for nesting (Frenzel 2004 in Marshall et al. 2006). See Ragged Ruby Wildlife Report for more information.

Habitat degradation and loss of large diameter ponderosa pine stands continue to be the greatest threats to white-headed woodpeckers. Habitat for white-headed woodpeckers in Oregon and Washington is probably less than 10 percent of what existed prior to European-American settlement (Henjum et al. 1994, in Marshall et al. 2006). Historically, white-headed woodpeckers were well distributed throughout the Blue Mountains.

A conservation assessment for the white-headed woodpecker (Mellen-McLean et al. 2013) includes the following management considerations for restoration of habitat used by white-headed woodpeckers:

- Retaining and producing large, older ponderosa pine used for foraging
- Retaining and producing large snags used for nesting
- Reducing shrub cover and excess downed wood to reduce numbers of small mammals that prey on nests
- Reducing canopy density to provide interspersion of open and closed pine stands
- Maintaining within-stand heterogeneity

White-headed woodpeckers have been documented throughout their habitat in the planning area.

The majority of the planning area (approximately 18,500 acres or 55-percent) is the ponderosa pine/Douglas-fir habitat type. The majority of these stands in the planning area are in need of restoration to improve health and vigor and consequently restore primary white-headed woodpecker habitat.

Environmental Consequences

Methodology

See Information Relevant to All Species section.

Alternative 1 – No Action

Direct and Indirect Effects

Under alternative 1, habitat for the white-headed woodpecker would not be treated and current trends in habitat condition would continue. Habitat for the white-headed woodpecker would remain below the historical range of variability. Trends in risk of habitat loss to insects, disease, and wildfire would not be altered. See Ragged Ruby Wildlife Report for more information.

This alternative would have no direct or indirect effects on the white-headed woodpecker. One environmental outcome is an elevated level of risk of habitat loss in some areas. Lack of treatment in ponderosa pine habitats to reduce stand density and create single stratum habitats would maintain the current projection of reduced habitat suitability for the white-headed woodpecker.

Cumulative Effects

Because there would be no direct or indirect effects, there would be no cumulative effects.

Alternatives 2 and 3

Direct and Indirect Effects

The action alternatives would likely promote high quality habitat for white-headed woodpecker as compared to alternative 1.

Action alternatives would utilize commercial thinning, non-commercial thinning, and prescribed fire to reduce the understory fir component on acres dominated by ponderosa pine and western larch. Prescriptions are designed to increase the abundance of more open stand structure with ponderosa pine, contributing a relatively larger percentage of the species composition. This would help restore white-headed woodpecker habitat and bring levels closer to the historical range of variability. Implementation of alternatives 2 and 3 would result in a 10 percent increase of source habitat (old forest single stratum).

Effects to snags are discussed in the Management Indicator Species section under Dead and Defective Habitat for Cavity Excavating Birds, Including Black-Backed Woodpecker. See also Ragged Ruby Wildlife Report for specific effects to this species.

Other proposed activities would not be expected to have any effect to individual white-headed woodpeckers or habitat other than temporary disturbance and displacement during project activities.

See also Historical Range of Variability and Stand Structure section in the Information Relevant to All Species section.

Cumulative Effects

Cumulatively, the effects of projects or activities that retain and develop future old ponderosa pine stands or retain snags would ultimately likely benefit white-headed woodpeckers. See Information Relevant to All Species section, as well as Ragged Ruby Wildlife Report for specifics.

Determination for White-Headed Woodpecker

The determination of effect of the action alternatives on the white-headed woodpecker is **may impact individuals or habitat, but will not likely result in a trend toward federal listing or loss of viability to the population or species.** In the long term, treatments would help retain and promote growth and longevity of large trees and increase in old forest single stratum, which would have a **beneficial impact** on white-headed woodpeckers.

Johnson's Hairstreak

Affected Environment

Methodology

See Information Relevant to All Species section.

Existing Condition

In northeastern Oregon, Johnson's hairstreak larvae have been documented feeding on western dwarf mistletoe (*Arceuthobium campylopodum*) on ponderosa pine. Potential threats include the slow decline of dwarf mistletoe-infected ponderosa pine through the loss of much of the pine overstory, and the encroachment of shade-tolerant species into once pine-dominated stands (Spiegel 2014).

No documented occurrences of Johnson's hairstreak have been recorded within the planning area; however, suitable habitat does exist; approximately 18,500 acres. Nectar plants used by adult butterflies are generally widespread and common within the planning area. See Ragged Ruby Wildlife Report for more information.

Environmental Consequences

Methodology

See Information Relevant to All Species section.

Alternative 1 – No Action

Direct and Indirect Effects

Under alternative 1, no management activities proposed as part of the Ragged Ruby Project would occur. In the short to mid-term, the various habitats that currently exist within the planning area would be maintained in the current condition, and provide for the species diversity, density, and distribution that currently exists. Over the long term, increased stand densities and related stress would result in a greater incidence of insects and disease in the planning area. Dwarf mistletoe, one of the diseases that increases with increasing stand densities, would increase where present within the planning area. However, in the event of a wildfire, uncharacteristically intense burns could effectively sanitize stands of dwarf mistletoe. When all trees are killed, reestablishment of dwarf mistletoe in stands could take decades, as seeds are reintroduced by birds and the mistletoe slowly spreads (Spiegel 2014).

Cumulative Effects

Because there would be no direct or indirect effects, there would be no cumulative effects.

Alternatives 2 and 3

Direct and Indirect Effects

Maintaining, reestablishing, or enhancing ponderosa pine in areas where it was historically dominant would benefit Johnson's hairstreak in the long term. In ponderosa pine, and drier Douglas-fir and grand fir plant associations, commercial and non-commercial thinning would result in more open stands favoring ponderosa pine. Trees targeted for removal on drier, more southerly exposure sites would generally be grand fir. Consequently, host ponderosa pine and western dwarf mistletoe are anticipated to be retained on the landscape.

For all alternatives, harvest of some mistletoe-infected trees potentially providing habitat for Johnson's hairstreak would occur. This would result in a direct reduction of potential habitat, and may impact Johnson's hairstreak individuals, but would not impact the ability of the species to survive in the Blue Mountains (Spiegel 2014). Many larger, older trees (over 150 years old) would be retained. Skips within treatment units and non-treated areas would also retain ponderosa pine trees that could potentially host dwarf mistletoe. Further, project design criteria would leave an adequate number of "wolfy" mistletoe infested trees for wildlife habitat.

Because larvae feed on all exposed plant parts of dwarf mistletoe and can be found on host leaves April through October, prescribed burning may impact Johnson's hairstreak in the short term. Heat and smoke from underburning operations may affect larvae, depending on the intensity of the burn and if wind moves smoke and heat out of the canopy. The butterflies themselves would be mobile and able to shift from an area being underburned. Not all areas within the planning area would be burned at any given time. Burn blocks would not be contiguous, providing unburned refugia where butterflies and caterpillar larvae would be expected to persist. While short term impacts could occur, prescribed burning that reduces fuels, and thus future fire intensity, would maintain ponderosa pine on the landscape and benefit potential Johnson's hairstreak habitat in the long term.

Other proposed activities, such as changes in the road network or recreation activities, would not be expected to have any effect to Johnson's hairstreak other than temporary disturbance and displacement during project activities.

Cumulative Effects

Cumulatively, the effects of other projects and activities that reduce hazardous fuels and retain and develop open, single stratum pine stands would ultimately likely benefit Johnson's hairstreak, as discussed in the Cumulative Effects section under Information Relevant to All Species. See also the Ragged Ruby Wildlife Report for specifics.

Determination for Johnson's Hairstreak

The proposed alternatives **may impact individuals or habitat, but will not likely contribute to a trend toward federal listing or loss of viability to the population or species** in the short term because the harvest of some mistletoe-infected trees would occur and heat and smoke from underburning could affect larvae and adult individuals. In the long term, alternatives 2 and 3 would maintain healthy levels of large ponderosa pine and mistletoe and therefore have a **beneficial impact** on the Johnson's hairstreak.

Silver-Bordered Fritillary

Affected Environment

Methodology

See Information Relevant to All Species section.

Existing Condition

Habitat for this butterfly species consists of open wet meadows, bogs, and marshes. Caterpillar host plants consist of violets, including pioneer violet (*Viola glabella*) and northern bog violet (*V. nephrophylla*). Adult nectar plants are composite flowers including goldenrod (*Solidago* spp.) and black-eyed Susan (*Rudbeckia* spp.). Threats include downcutting of creeks and subsequent draining and drying out of meadow habitat, loss of native plant species due to overgrazing or trampling by domestic cattle, and invasion of non-native grasses and other invasive plant species remain the dominant threats to habitat. See Ragged Ruby Wildlife Report.

Two primary colonies occur in Oregon; one at Big Summit Prairie on the Ochoco National Forest and one in the Strawberry Mountains on the Malheur National Forest (Miller and Hammond 2007). Other potential habitat on the Forest exists as moist and wet meadows. Within the planning area, about 5,000 acres of riparian or moist meadow habitat is present. Although, no silver-bordered fritillaries have been documented within the planning area, no formal surveys for the butterfly have been conducted.

Environmental Consequences

Methodology

See Information Relevant to All Species section.

Alternative 1 – No Action

Direct and Indirect Effects

Under alternative 1, no management activities proposed for the Ragged Ruby Project would occur. In the short to mid-term, the various habitats that currently exist within the planning area would be maintained in the current condition, and provide for the species diversity, density, and distribution that currently exists. Meadow habitat potentially used by silver-bordered fritillary would not change; effects would be primarily from ongoing cattle grazing. Open road densities would remain about the same, potentially resulting in invasive plant establishment from seeds brought in by vehicles. Drying of moist to wet meadows may result in conifer succession and loss of habitat in the long term. Alternative 1 would not alter habitat for this species. In the short term, meadow habitats would remain in their current state. However, in the long term, drying of moist wet meadows may result in loss of habitat.

Cumulative Effects

Because there would be no direct or indirect effects, there would be no cumulative effects.

Alternatives 2 and 3

Direct and Indirect Effects

The effects of alternatives 2 and 3 for silver-bordered fritillary are similar and expected to be limited. Treatments in and adjacent to meadows would be designed to restore and enhance meadow habitat. Increased water storage and plant diversity would benefit silver-bordered fritillaries. Burn blocks may encompass moist to wet meadow habitat for all alternatives; however, no direct lighting of meadow habitat is scheduled.

Spring burns would have limited potential for burning in wet meadows. Fall burns would generally occur late enough in the season to avoid affecting nectar plants important to adult butterflies. Riparian restoration could influence adjacent meadow habitat and would likely benefit silver-bordered fritillary.

Open roads have the potential to introduce invasive plants to meadow habitats, degrading native plant communities. Road closures after project implementation and project design criteria to reduce the spread of invasive plant species would offset effects. Meadow areas are protected from authorized vehicle traffic and road construction (see project design criteria). However, wet meadow habitat is commonly utilized by motorized cross-country travelers, which can degrade habitat. Effectively closing or decommissioning roads, particularly adjacent to riparian or wet meadows, could limit habitat loss from motorized recreation in these sensitive areas.

Other proposed activities would not be expected to have any effect to silver-bordered fritillary other than potential temporary disturbance and displacement during project activities.

Cumulative Effects

Overall, the combined effects of the Ragged Ruby Project with the effects of past, ongoing, and reasonably foreseeable actions would not be expected to adversely affect populations of silver-bordered fritillary. Activities or projects the restore meadow habitat or reduce the spread or introduction on invasive plants would likely benefit the silver-bordered fritillary. See Ragged Ruby Wildlife Report for more information.

Determination for Silver-Bordered Fritillary

The determination for silver-bordered fritillary and its habitat would be **no impact**. The silver-bordered fritillary is not known to occur within the planning area, although habitat is present. Action alternatives would have negligible effects to moist and wet meadow habitat because of project design criteria.

Western Bumblebee

Affected Environment

Methodology

See Information Relevant to All Species section.

Existing Condition

Bumblebees inhabit a wide variety of natural, agricultural, urban, and rural habitats, although species richness tends to peak in flower-rich meadows of forests and subalpine zones. Threats to this species includes habitat loss and fragmentation, overgrazing, climate change, pesticide use, competition with honey bees, and the introduction of non-native pathogens.

Surveys have not been conducted for this species on the Malheur National Forest; however, the presence of meadows indicates potential habitat. See Ragged Ruby Wildlife Report for more information.

Environmental Consequences

Methodology

See Information Relevant to All Species section.

Alternative 1 – No Action

Direct and Indirect Effects

Under alternative 1, no management activities proposed for the Ragged Ruby Project would occur. In the short to mid-term, the suitable meadow habitat that currently exists within the planning area would be expected to persist in its current condition. Effects would be primarily from ongoing cattle grazing. Open road densities would remain about the same, potentially resulting in invasive plant establishment from seeds brought in by vehicles. The continued use of off-highway vehicles has the potential to degrade meadow habitat both from compaction and rutting as well as introduction of invasive plants.

Under this alternative, the risk of uncharacteristic wildfire, disease, or insect outbreaks would continue to increase over time because there would be no changes to stand stocking levels or fuel loads from active management. Large stand-replacing fires do have the potential to reduce available habitat in the short term for this species, though fire has been shown to be beneficial for pollinators (Panzer 2002). The impact to habitat would depend on the size and severity of the disturbance. Without active management, conifer encroachment into meadows would reduce the amount of habitat for bumblebees.

Cumulative Effects

Because there would be no direct or indirect effects, there would be no cumulative effects.

Alternatives 2 and 3

Direct and Indirect Effects

The effects of alternatives 2 and 3 for western bumblebee are expected to be beneficial in the long term. Meadow habitat restoration in the form of conifer removal and prescribed burning would restore these habitats in the mid to long term, though project activities could result in short-term disturbance of habitat during implementation.

Open roads have the potential to introduce invasive plants to meadow habitat, degrading native plant communities. Road closures after project implementation and project design criteria to reduce the spread of invasive plant species would offset some road effects. Meadow areas would be protected from vehicle traffic and road construction during project implementation.

Spring prescribed burning would have limited potential for burning in wet meadows. Fall prescribed burning would generally occur late enough in the season to avoid affecting nectar plants important to adult bumblebees. Riparian and upland watershed restoration treatments that would influence adjacent forest meadow habitat would likely benefit western bumblebees.

Invasive plant species that affect native vegetation may be spread by vehicles. Project design criteria requiring cleaning of equipment would limit potential additive invasive plant establishment within units or along haul routes during project work.

Fuels treatments would reduce the risk of stand-replacing fire and encourage the return of low-severity fire that can enhance meadow habitat and forb species.

Cumulative Effects

Overall, the combined effects of either action alternative considered with the effects of past, ongoing, and reasonably foreseeable actions would not be expected to adversely affect populations of western bumblebee and would likely have a beneficial impact. See cumulative effects discussion in the Information Relevant to All Species, and the Ragged Ruby Wildlife Report for more information.

Determination for Western Bumblebee

Alternatives 2 and 3 **may impact individuals or habitat, but will not likely contribute to a trend toward federal listing or loss of viability to the population or species** in the short term because of physical disturbance during conifer removal and riparian treatments which could disturb individuals and trample native plant species. Prescribed burning occurring in the spring or fall would not likely affect nectar plants for adult bumblebees. In the long term, both alternatives would restore riparian and associated meadow habitat and therefore have a **beneficial impact** on the western bumblebee.

The determination for western bumblebee and its habitat would be **beneficial impact**. The western bumblebee is not known to occur within the planning area, although habitat is present. The action alternatives would have beneficial effects to meadow habitat because of improvement and increase in acres of associated riparian habitat.

Summary for Proposed, Endangered, Threatened, and Sensitive Species

Table 56 summarizes the effects determinations for threatened, endangered, and sensitive species as they relate to proposed activities.

Table 56. Effects to proposed, endangered, threatened, and sensitive species

Common name	Alternative 1[1]	Alternative 2[1]	Alternative 3[1]
Gray wolf (east of U.S. Route 395)	NI	NI	NI
Pallid Bat	NI	MIIH/BI	MIIH/BI
Townsend's big-eared bat	NI	MIIH/BI	MIIH/BI
Fringed myotis	NI	MIIH/BI	MIIH/BI
American peregrine falcon	NI	NI	NI
Bald eagle	NI	MIIH/BI	MIIH/BI
Lewis's woodpecker	NI	MIIH/BI	MIIH/BI
White-headed woodpecker	NI	MIIH/BI	MIIH/BI
Johnson's Hairstreak	NI	MIIH/BI	MIIH/BI
Silver-bordered fritillary	NI	NI	NI
Western bumblebee	NI	MIIH/BI	MIIH/BI

1. NI = no impact, MIIH = may impact individuals or habitat but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species, BI = beneficial impact.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

This analysis used the 2015 Regional Forester's special status species list, U.S. Fish and Wildlife Service listing information, and Malheur Forest Plan standards (USDA Forest Service 1990a, Forest-wide standards 62-67, pages IV-32 to IV-33).

Anticipated changes in habitat and the associated communities were predicted under the activities considered and associated effects to wildlife and wildlife habitat evaluated. Site-specific data was used to assess specific project level changes in habitat and ensure that unique vegetative and physical habitat conditions were maintained and protected.

Based on the analysis methods described above, the proposed action is consistent with the Endangered Species Act.

The Endangered Species Act addresses actions taken and by definition the no action alternative would not directly modify habitat. No designated or proposed critical habitat occurs in the affected subwatersheds and thus the no action alternative would be consistent with the Endangered Species Act.

Wildlife – Management Indicator Species

Regulatory Framework

Regulatory framework for this section includes the Malheur Forest Plan, including Forest-wide standard 61, which directs land managers to "…provide habitat requirements for its selected management indicator species" (USDA Forest Service 1990a, page IV–32). The Eastside Screens amendment is also applicable, as are periodically distributed letters from the Regional Forester clarifying direction in the Eastside Screens (Regional Forester, October 2, 1997; October 23, 1997; June 11, 2003). Additionally, the National Forest Management Act of 1976 applies, where it requires viable populations of existing native and desired nonnative vertebrate species fish and their habitat to be maintained (36 Code of Federal Regulations 219.19). See Ragged Ruby Wildlife Report for more details.

See also each habitat subsection for Malheur Forest Plan guidelines specific to each management indicator species or habitat type.

Resource Indicators

Management indicator species are defined in the Malheur Forest Plan (USDA-Forest Service 1990a), either to represent specific habitats or because they are of high public interest or value. Resource elements, indicators, and measures for assessing the effects to wildlife – management indicator species are presented in Table 57.

Table 57. Resource elements, indicators, and measures for assessing effects to wildlife management indicator species

Resource element	Resource indicator	Measure	Source
Dead and defective wood habitat	Dead and defective wood habitat availability	Decayed wood advisor (DecAID) analysis	Malheur Forest Plan (USDA Forest Service 1990a, fish and wildlife objectives, page IV-18; Forest-wide standard 61, page IV-32); decayed wood advisor (DecAID) analysis; snag exams
Species commonly hunted (Rocky Mountain elk)	Cover quality, cover spacing, forage, and open road densities	Habitat effectiveness index results for percent of satisfactory and marginal cover	Malheur Forest Plan (USDA Forest Service 1990a, Forest-wide standards 28-37, pages IV-27 to IV-29; Forest-wide standard 61, page IV-32; management area 4A standards 4-13, pages IV-69 to IV-71)
Old growth habitat and old growth dependent species	Old growth habitat extent and condition	Management area 13 stand type, size, and distribution criteria	Malheur Forest Plan (USDA Forest Service 1990a, Forest-wide standard 61, page IV-32; management area 13 standards 3-8, pages IV-105 to IV-106); Eastside Screens standard #6 (d and e)

Species Analyzed in This Section

Table 58 lists the terrestrial species selected as management indicator species in the Malheur Forest Plan. All 12 species have potential habitat present or have been documented in the planning area, and effects of the project on these management indicator species will be assessed.

Table 58. Management indicator species identified in the Malheur Forest Plan

Species	Representing	Habitat description	Habitat present in analysis area	Species present in analysis area
Lewis's woodpecker[1]	Dead and defective wood habitat	Open, late-seral ponderosa pine forest, post-fire habitat, cottonwood	Yes (secondary)	Suspected
Red-naped sapsucker[2]	Dead and defective wood habitat	Riparian habitat with aspen, cottonwood	Yes	Suspected
Williamson's sapsucker	Dead and defective wood habitat	Open, late-seral ponderosa pine and mixed-conifer forest, aspen and cottonwood	Yes	Documented
Downy woodpecker	Dead and defective wood habitat	Riparian habitat with aspen, cottonwood	Yes	Documented
Hairy woodpecker	Dead and defective wood habitat	Coniferous forests from low to mid elevation, post-fire habitat	Yes	Documented

Species	Representing	Habitat description	Habitat present in analysis area	Species present in analysis area
Black-backed woodpecker	Dead and defective wood habitat	Post-fire habitat, beetle killed forest, conifer forests from subalpine to low elevations	Yes (secondary)	Suspected
Northern flicker	Dead and defective wood habitat	Forest habitat generalist	Yes	Documented
Rocky Mountain elk	Species commonly hunted	Forested mountains and meadows with suitable forage (grasses and forbs)	Yes	Documented
Pileated woodpecker	Old growth; dead and defective wood habitat	Closed canopy, late-seral subalpine, montane and lower montane forests	Yes	Documented
Pacific (pine) marten	Old growth	Closed canopy, late-seral subalpine and montane forests	Yes	Suspected
Three-toed woodpecker	Old growth lodgepole; dead and defective wood habitat	Subalpine and montane forests, lodgepole pine, post-fire habitat	Yes	Suspected
White-headed woodpecker[1]	Dead and defective wood habitat, old forest single stratum	Open, late-seral forests with ponderosa pine, post-fire habitat	Yes	Documented

1. Species also on the Regional Forester's sensitive species list and analyzed in the Wildlife – Proposed, Endangered, Threatened, and Sensitive Species section.

2. Current taxonomy – replaces yellow-bellied and red-breasted sapsucker listed in the Malheur Forest Plan.

Viability of management indicator species is being assessed using the historical range of variability concept comparing current amounts and distribution of habitat to historical conditions (Wisdom et al. 2000, Suring et al. 2011). Scientists assume that species are more likely to persist into the future under the conditions that remain most similar to the conditions they persisted in during the past (Landres et al. 1999, Samson et al. 2003). By managing habitat within the historical range of variability, it is assumed that adequate habitat would be provided because species survived at those habitat levels in the past. Thus, if we manage current habitats within the historical range of variability, we are likely to do an adequate job of maintaining population viability for those species that remain, by providing quality habitat. The further current habitat conditions are from the historical range of variability, the more likely it is that population viability would be compromised.

The historical range of variability for dead wood is from DecAID unharvested vegetation plots for the Blue Mountains only (Malheur, Ochoco, Umatilla, and Wallowa-Whitman national forests; see BlueMtsSnags2014.xlsx and BlueMtsDW2014.xlsx, in the project record). Current conditions are from gradient nearest neighbor data (LEMMA; based on 2012 Landsat imagery).

For general methodology, an overview of direct and indirect effects from the alternatives, wildlife issues identified during public scoping, and compliance with forest plan and other relevant laws, regulations, and policies, see Information Relevant to All Species section within the Wildlife – Proposed, Endangered, Threatened, and Sensitive species section.

Dead and Defective Habitat for Cavity Excavating Birds, Including Black-Backed Woodpecker

Affected Environment

Methodology and Overview

Field surveys were completed throughout the planning area during the 2015 through 2017 field seasons. Dedicated old growth and proposed replacement old growth stands were surveyed for old-growth characteristics. Detections of management indicator species were recorded, and existing dedicated old growth, proposed replacement old growth, and potential pine marten habitat were surveyed more intensively than surrounding habitat.

Because these management indicator species were selected to represent dead and defective wood habitat, this analysis and discussion focuses primarily on that habitat component. Additional information on cavity-excavating birds' habitat associations, distribution, and life history requirements is summarized in Mellen-McLean (2012b).

A few management indicator species woodpeckers are discussed in more detail due to conservation concerns. Black-backed woodpecker are ranked as vulnerable (S3) by NatureServe (Table 59) and are discussed in more detail below. The pileated woodpecker and three-toed woodpecker are also management indicator species for old growth habitats and they are further discussed in the Old Growth Network, Late and Old Structure, and Old Growth-Dependent Species resource element section. Detailed discussion of the white-headed woodpecker and Lewis's woodpecker can be found in the Wildlife – Proposed, Endangered, Threatened, and Sensitive Species section.

Table 59. Conservation status of cavity-nesting management indicator species

Species	U.S. Forest Service sensitive	NatureServe ranks[1] (global)	NatureServe ranks [1] (Oregon)
Black-backed woodpecker	No	G5	S3
Downy woodpecker	No	G5	S4
Hairy woodpecker	No	G5	S4
Lewis's woodpecker	Yes	G4	S2 S3
Northern flicker	No	G5	S5
Three-toed woodpecker	No	G5	S3
Red-naped sapsucker	No	G5	S4
White-headed woodpecker	Yes	G4	S2 S3
Williamson's sapsucker	No	G5	S4 S3

1. Rankings based on NatureServe (2010): G5 or S5 = widespread, abundant, secure; G4 or S4 = apparently secure; G3 or S3 = vulnerable; G2 or S2 = imperiled

In general, populations of cavity-nesting birds have declined across the Blue Mountains compared to historical conditions, primarily due to reductions in the numbers of large snags (Wisdom et al. 2000). Of the cavity-excavating management indicator species, breeding bird surveys in Oregon have detected a statistically significant decrease in populations of the northern flicker between 1966 and 2010 (Sauer et al. 2011).

Current Malheur Forest Plan direction, as amended by the Eastside Screens, is to maintain snags at 100 percent of biological potential for all woodpecker species that occur in the Forest. See Ragged Ruby Wildlife Report for specifics, as well as for a discussion of emerging science, which has been incorporated into this analysis using DecAID Advisor (version 2.2) (Mellen-McLean et al. 2012).

Data from unharvested plots are assessed separately and these data can be used as a reference condition to approximate the historical range of variability of dead wood. Even with the caveat discussed in the Ragged Ruby Wildlife Report, these reference condition data are used in this analysis because they are some of the best data available to assess the historical range of variability of dead wood, even in eastside dry forests; they are the only available data showing distribution and variation in snag and downed wood amounts across the landscape; and the data from unharvested stands are in the range of other published data on the historical range of variability of dead wood, even in the drier vegetation types[24] (Mellen-McLean 2011).

A distribution analysis[25] was used to determine how close current conditions for dead wood on the landscape match reference conditions. Existing conditions for downed wood were derived by using gradient nearest neighbor data (LEMMA), which are used to develop the distribution histograms for DecAID.[26] See Ragged Ruby Wildlife Report for more information.

The analysis area for the distribution analysis is larger than the planning area and encompasses the Camp Creek – Middle Fork John Day River watershed. The larger analysis area was needed because the planning area is split by the two watersheds, and to meet the minimum analysis area size of 12,800 acres per wildlife habitat type recommended by the authors of DecAID (Mellen-McLean et al. 2012).

The distribution analysis results were compared to the needs of woodpecker species using tolerance levels and intervals (range between two tolerance levels) from DecAID. See Ragged Ruby Wildlife Report for more information.

Black-Backed Woodpecker

Black-backed woodpeckers are associated with coniferous forests across northern portions of North America, in particular, unsalvaged recently-burned conifer forests. They also occur in dense, undisturbed forests in low densities, which may maintain the birds between disturbance events (Hanson et al. 2012). Snags provide nesting, roosting, and foraging habitat for black-backed woodpeckers. See Ragged Ruby Wildlife Report for more information.

Black-backed woodpeckers are considered vulnerable in the state by Oregon Department of Fish and Wildlife and NatureServe, due to the following threats and risks: salvage of dead trees, fire suppression, and treatments to reduce stand densities.

Existing Condition – Dead and Defective Habitat

In 2014 and 2015, a review of a portion of the Camp Creek – Middle Fork John Day River watershed area was made by the Blue Mountain Pest Management Service Center which

[24] For a full discussion please see http://www.fs.fed.us/r6/nr/wildlife/decaid-guide/hrv-dead-wood-comparison.shtml.
[25] Please see http://www.fs.fed.us/r6/nr/wildlife/decaid-guide/distribution-analysis-green-tree.shtml.
[26] For more information see Ohmann and Gregory (2002), and go to the website: http://www.fsl.orst.edu/lemma/main.php?project=imap&id=home.

evaluates for both insect and disease presence and potential. These findings are relevant to the future creation of dead wood discussed in alternative 1 (no action).

Findings include:

- Western pine beetle and mountain pine beetle attacks in ponderosa pine.
- Outbreaks of mountain pine beetle in lodgepole pine occur in several places and will likely continue to increase for the next several years.
- Fire suppression has allowed fire-intolerant firs to become more widespread, providing habitat for defoliators that were not previously active in pine-dominated stands, as pine is not a host species. The grand fir/white fir habitat is very susceptible to root diseases and defoliators. Outbreaks of western spruce budworm and Douglas-fir tussock moth have become active in areas not previously impacted due to the expansion of grand fir/white fir habitat.
- Many overstory western white pine have dead tops caused by white pine blister rust, and most of the abundant understory seedlings and saplings support high levels of infection.
- Large overstory ponderosa pines are presently in a weakened condition resulting from moisture stress due to competition. They are at elevated risk of tree mortality from mountain pine beetle and western pine beetle attack.
- Western larch trees have lost vigor resulting from dense stand conditions that reduce crown width and crown length.

The two wildlife habitat types discussed are the ponderosa pine/Douglas-fir wildlife habitat type and the eastside mixed-conifer wildlife habitat type. See Ragged Ruby Wildlife Report for descriptions and specific snag densities across diameter at breast height sizes and habitat types.

Most woodpecker species using the ponderosa pine/Douglas-fir wildlife habitat type should currently have an adequate amount of snag habitat on the landscape. Large snag habitat for pileated woodpecker and Williamson's sapsucker is rare in this wildlife habitat type, both currently and with reference conditions.

Large snag habitat for cavity-nesting birds, except for white-headed woodpeckers, may be limiting in the eastside mixed conifer wildlife habitat type. Pileated woodpeckers and Williamson's sapsuckers may be limited to more productive sites in this wildlife habitat type where snag densities are expected to be higher (Bull et al. 2007, Ohmann and Waddell 2002), or using higher density areas of smaller snags.

Existing Condition – Black-Backed Woodpecker

The number of acres burned by wildfire across the western United States in recent years has reached levels that occurred in the early 1900s prior to fire suppression (Littell et al. 2009). Climate change is also expected to increase fire frequency in the future (McKenzie et al. 2004, Westerling et al. 2006) and thus should provide a continual supply of habitat for the black-backed woodpecker. See Ragged Ruby Wildlife Report for more information.

Warm Dry Sites—In drier areas, mid- and late-seral forests that provide secondary habitat are well above the historical range of variability across the Forest (Wales et al. 2011). In the ponderosa pine/Douglas-fir wildlife habitat type, snag densities are above the historical range of variability in unburned stands at the 50 percent black-backed woodpecker tolerance levels for snags greater than 10 inches, and near the historical range of variability at the 80 percent tolerance levels.

In the eastside mixed-conifer wildlife habitat type, large snag densities are below the historical range of variability in unburned stands at the 30 and 50 percent black-backed woodpecker tolerance levels; however, small snag densities are well above the historical range of variability (about three times higher) for 80 percent black-backed woodpecker tolerance levels. See Ragged Ruby Wildlife Report for specifics.

Due to the limited extent of recent fire and unsalvaged post-disturbance habitat in the planning area, adequate high snag densities in this wildlife habitat type do not exist. The high densities of snags provided by stand-replacing disturbances are transitory and only provide habitat for black-backed woodpeckers for about 5 years post-disturbance.

Cool and Cold Sites—Mid- and late-seral forests that provide secondary habitat are within or above the historical range of variability across the Forest but well below the historical range of variability for Cold Dry forests (Wales et al. 2011). These forests are susceptible to stand-replacing fire and insect outbreaks and thus are likely to provide some primary habitat in the future; however, the amount of Cold Dry forest is too low to solely provide an adequate, continual supply of habitat for the black-backed woodpecker. There is approximately 9,500 acres of this habitat type scattered throughout the watershed.

Currently, in the eastside mixed-conifer wildlife habitat type, snag habitat in the watershed is below the historical range of variability in most density classes, although much higher in the 24 to 36 snags per acres class. Conversely, in the ponderosa pine/Douglas-fir wildlife habitat type, the watershed is near or exceeding the historical range of variability values for snag density. See Ragged Ruby Wildlife Report for more information.

Environmental Consequences

Methodology

See the Methodology and Overview section for affected environment, as well as Information Relevant to All Species section, under Wildlife – Proposed, Endangered, Threatened, and Sensitive Species.

Alternative 1 – No Action

Direct and Indirect Effects – Dead and Defective Habitat

Refer to the Forest Vegetation section for the expected future vegetation conditions under alternative 1.

Under alternative 1, existing levels of snags and downed wood and tree mortality would remain fairly constant in the area in the short to mid term. In the short to mid term, large diameter snags would continue to exist at their current levels, except for snags lost to firewood cutting and log harvest. In the long term, forest vegetation spatial data analyzer modeling shows a decrease in snag densities over time. Mortality of pine and larch due to moisture stress and overcrowding, as well as insect and disease infestation, could potentially increase snag densities over time. Downed wood densities would be expected to increase as existing snags fall. Insect infestations would increase foraging habitat for primary cavity excavating birds and other insectivorous species, such as three-toed woodpeckers (if present) and black-backed woodpeckers; however, conditions expected under alternative 1 could result in high fuel loads and a landscape vulnerable to large-scale, stand-replacing wildfire.

Fire effects would result in higher stand loss and larger patch sizes of high severity. Large-scale crown fire and stand replacement events would dramatically affect snag and downed wood densities. Since black-backed woodpeckers, three-toed woodpeckers, hairy woodpeckers, Lewis's woodpeckers, and northern flickers are strongly associated with post-fire environments, these species would benefit from increased insect populations and nesting habitats created by fire events. White-headed woodpeckers and Williamson's sapsuckers prefer mixed-fire tree mortality associated with light- to moderate-intensity burns. These species would benefit in the long term from smaller patch size fires that create some snags, especially those in larger size classes required for nest trees. Pileated woodpeckers, downy woodpeckers, and red-naped sapsuckers have much weaker associations with high-intensity post-burn habitats and would not likely benefit from those events (Hutto 1995, Saab et al. 2007).

In some portions of the planning area, continued increases in canopy could result in beneficial effects (security and big game cover) to pileated woodpeckers, and adverse effects (lack of mature pine for foraging) to white-headed woodpeckers.

Riparian habitat, including aspen and hardwood shrub communities required by some species, would continue to be impacted by wild and domestic ungulate grazing or browsing and competition by conifers. Red-naped sapsucker and downy woodpecker could be adversely impacted by habitat loss due to continued decline in riparian habitat, hardwood shrub communities, and aspen stand quality and quantity.

The assumption is that snag creation due to endemic levels of insects, disease, and stress-caused tree mortality generally equals the loss of snags through natural processes. However, due to the increased number of dense stands in the planning area, wildfire risk is increased, which could lead to increased snags in larger areas than with active management. Alternative 1 has the greatest potential for the development of high-density snag patches.

Although alternative 1 could result in snag creation due to endemic levels of insects, disease, and stress-caused tree mortality, and result in a higher proportion of dense, fire-prone multi-strata habitat across the landscape, the event of an insect infestation or large wildfire is speculative.

See also Information Relevant to All Species section, and Ragged Ruby Wildlife Report for more information.

Direct and Indirect Effects – Black-Backed Woodpecker

Under alternative 1, no management activities are proposed. Tree mortality in some lodgepole pine stands, as well as grand fir and other plant association groups within the planning area is occurring from insects and disease, which is exacerbated by high stand densities. Most of this tree mortality is occurring in the less than 20 inch diameter at breast height size classes, although some larger trees are also being affected. Under alternative 1, this trend would continue and tree mortality would likely increase into the future.

Smaller-scale disturbances similar to historical fire events or insect outbreaks would benefit black-backed woodpeckers. Large-scale events outside of the historical range of variability would also benefit black-backed woodpeckers in the short to mid term, for about 5 years post-disturbance, but then may be detrimental in the long term since replacement trees that ultimately provide future snags could take a long time to develop.

Based on Forest-wide modeling, mid- and late-seral forests that provide secondary habitat are well above the historical range of variability across the Forest (Wales et al. 2011). These forests are susceptible to stand-replacing fire and insect outbreaks and thus are likely to provide more primary habitat in the future. Climate change is also expected to increase fire frequency in the future (McKenzie et al. 2004, Westerling et al. 2006) and thus should provide a continual supply of habitat for the black-backed woodpecker. See Ragged Ruby Wildlife Report for more information.

Cumulative Effects

Because there would be no direct or indirect effects, there would be no cumulative effects.

Alternatives 2 and 3

Direct and Indirect Effects – Dead and Defective Habitat

Please refer to chapter 2 to review the differences in intensity (acres or miles) of proposed treatments under each alternative. It is assumed that as the intensity of the proposed treatments change, the level of expected effects discussed below would also change accordingly.

According to the DecAID analysis, the Ragged Ruby planning area is at or above the historical range of variability in small (greater than 10 inch diameter at breast height) and large (greater than 20 inch diameter at breast height) snags in the ponderosa pine/Douglas-fir wildlife habitat type. Conversely, snag habitat is generally deficit in the eastside mixed-conifer wildlife habitat type. In the short to mid term, the upland restoration and fire-related activities proposed would likely maintain or slightly add to the snag deficit due to removal of hazard trees and any direct loss from fire in those wildlife habitat types. Snags would continue to be lost to firewood cutting and log harvest.

In the ponderosa pine/Douglas-fir wildlife habitat type where snag levels are above the historical range of variability, the incidental snag loss from project activities would not be expected to create levels below the historical range of variability.

It is not expected that a substantial direct increase in the deficit would occur in the eastside mixed-conifer wildlife habitat type; losses from activities would be expected to be minor because no project activities would target snags, and only hazard trees would be intentionally removed. In the long term, snag deficits would still be expected compared to the historical range of variability values used in DecAID in the eastside mixed-conifer wildlife habitat type, even in untreated areas. However, increased snag quantity, larger snags, and higher quality snags would be expected to be distributed across the landscape in the long term (50 plus years). This would be due to: expected increased growth rates in treated stands, protection of snags and older trees (see project design criteria), additional tree mortality from prescribed and potential wildfire, incidental damage of trees from equipment in treatment units, retention of late and old structure and connectivity corridors, and expansion of the management area 13 old growth network.

Upland Restoration Activities and Prescribed Burning

The Ragged Ruby Project proposes thinning and prescribed fire to reduce fuel loads and restore forested stands towards the historical range of variability, where stands are considered at risk. The effects of proposed treatments to primary cavity excavator management indicator species vary by species and the intensity of treatments. Some species have mixed effects, both good and bad.

In the short term, implementation of thinning could result in some direct loss (consumption by fire) of snags, future snags, and downed wood that are important stand attributes of healthy forests, and critical components of wildlife and invertebrate habitat.

Wildlife and invertebrate species that depend on downed wood, snags, dwarf mistletoe brooms, dense forest with abundant saplings and small poles, and closed-canopy forests for survival and reproduction, are likely to be detrimentally affected by thinning activities that alter these habitat elements due to the short-term loss in downed wood. In particular, treatments involving tree removal may affect species dependent on high canopy cover and structure, such as the Williamson's sapsucker. However, due to connectivity corridors and other untreated areas (71 percent in alternatives 2 and 75 percent in alternative 3; in addition to inventoried roadless areas), current snags levels and rates of recruitment and retention would likely remain at similar levels in the short term, assuming the absence of large-scale disturbance. This would provide habitat nearby for these species to occupy. In addition, areas proposed for treatment would not all be treated at the same time, or even in the same year, allowing regeneration of treated areas in somewhat of a phased timeline. See Old Growth Network, Late and Old Structure, and Old Growth-Dependent Species section and Ragged Ruby Wildlife Report for more information.

Thinning is likely to result in the loss of snags, future snags, and downed wood as a result of increasing forest health and through the felling of hazard trees. However, loss of snags to hazard tree felling is expected to be low, since generally only new access would be affected. Furthermore, neither of the action alternatives would target snags, and project design criteria would retain snags and downed wood habitat for primary cavity excavators. Some new snags may be created during implementation where equipment could damage live trees. Where only harvest and thinning occurs, treatment methods may provide more control over tree mortality and snag creation as opposed to burning.

Silvicultural management practices, such as the proposed variable-density thinning prescriptions, would be expected to decrease project impacts to primary cavity excavator species such as Williamson's sapsucker and northern flicker due to the expected mosaic they would create, and the potential to retain "clusters" of snags as part of the leave patches.

Prescribed burning can alter or remove vertical and horizontal stand structure including snags and downed wood, as well as create new snags, which would affect various species in different ways. The season selected for implementation of prescribed fire activities also has important consequences for wildlife and invertebrates (King et al. 1998). Design features are included to minimize consumption of existing habitat, maintain habitat diversity and create a mosaic of fire conditions, or mitigate other potential adverse effects of prescribed burning; see Ragged Ruby Wildlife Report and Appendix C – Project Design Criteria for more information.

In the short to mid-term (1 to 25 years), treatments involving tree removal may affect old growth species dependent on high canopy cover and structure. However, treatments are considered beneficial to old growth dependent species in the long term (25 plus years) as treated stands would better mimic historical, more resilient conditions. See Ragged Ruby Wildlife Report for more information.

Road Activities

The effective closing or decommissioning of roads would secure potential habitat from the risks of firewood cutting, log harvest, and hazard tree removal. However, temporary road construction and road maintenance for haul would affect potential dead and defective wood habitat, as snags could be removed during building or maintaining the road, firewood cutting and log harvest (if road is left open), and hazard tree removal. Continued unauthorized use on closed roads without effective barriers is likely to result in negligible changes in effects, since activities like firewood cutting and log harvest are currently ongoing.

Aspen Restoration

Although there may be some disruption of nesting activities during implementation, species preferring riparian habitats and hardwoods would benefit as a result of activities associated with the proposed aspen and riparian treatments. Only 10 acres of aspen restoration are proposed in alternatives 2 and 3. See Ragged Ruby Wildlife Report for more information.

Recreation System Changes

Each action alternative proposes the same level of new hiking or bicycle trail construction, designating hiking/biking trails on existing roads, trailhead development or improvement, or interpretive sign installation. However, alternative 3 would not authorize bicycle use of the trail system in the northern part of the planning area associated with the Vinegar Hill-Indian Rock Scenic Area.

As new trails, trailheads, and parking areas are developed and maintained, a subsequent number of dead and defective trees in those areas would likely be identified as ‘hazard’ or ‘danger’ trees. For the safety of the construction and maintenance crews, as well as trail users, these trees would be removed. It is currently not practical to try to determine the number snags that would be removed under each alternative; however, it is expected that dead or dying trees would be removed; this potential increases with proposed recreation developments. Further, future trees becoming decadent in these areas would also likely be removed as hazard trees, potentially resulting in a substantial or even total loss of all current and future snags in areas immediately adjacent to the proposed recreation areas.

In areas where trails would be designated on existing roads, the snag loss would not be beyond current levels, as hazard trees are currently removed from roadways. Snags are also lost to firewood cutting and personal-use log harvest along roads.

Direct and Indirect Effects – Black-Backed Woodpecker

Generally, thinning and fuel reduction treatments combined would render treated stands unsuitable for black-backed woodpeckers. Although some tree mortality would be expected in burn units, thereby providing small pockets of nesting or foraging habitat for black-backed woodpeckers; thinning and burning would have overall negative effects to black-backed woodpecker by reducing stand density and cover, thus reducing overall nesting and foraging habitat.

Rendering stands less susceptible to fire and insect outbreaks would reduce the likelihood of any moderate to high-intensity future fires or natural disturbances, reducing potential black-backed woodpecker habitat. However, the extensive dedicated old growth, replacement old growth, and pileated woodpecker feeding area network (see Old Growth Network, Late and Old Structure, and Old Growth-Dependent Species section) and connectivity corridors being left untreated would leave those stands and habitats in their current condition and becoming increasingly decadent and susceptible to insect infestations and wildfires over time. The planning area has historically experienced a frequent, mixed-severity fire history, so it would be expected some of these untreated areas would eventually burn and provide habitat (see Forest Vegetation and Fire and Fuels sections).

Alternatives 2 and 3 would create a slightly higher proportion of open forest; however, dense, old multi-strata forest would remain near current levels in the short- to mid-term (1 to 20 years). In the long term (2059 modeled stand structure; see Forest Vegetation section), older multi-strata forest would increase from current levels and exceed the historical range of variability under each action alternative. Young forest multi-strata would decrease in the short and long term under all action alternatives.

Cumulative Effects

Under the action alternatives, changes in dead wood habitats from the Ragged Ruby Project alone would be considered minor on a Forest scale. However, when considered cumulatively with similar projects, and the amount of dead wood lost from projects implemented or analyzed across the Forest (including firewood cutting and log harvest), these actions would contribute cumulatively to the loss of snags and downed wood habitat, and to a potential decrease in green tree mortality rates (increased health of residual trees from silvicultural treatments).

Cumulative effects for this section are largely the same as discussed in the Information Relevant to all Species section related to snag loss or creation. A few activities specific to dead and defective habitat are added below.

Riparian vegetation treatments and large wood placement authorized under the Aquatic Restoration Decision, where large woody debris would be tipped and added into streams, could reduce future large snag densities, although no snags would be targeted.

Livestock fence construction proposed under the Aquatic Restoration Decision may also affect dead and defective habitat in the planning area and adjacent areas, as construction of this fence could result in the loss of snags through hazard tree felling along the path of the fence during construction, as well as with maintenance through time. This is of particular concern where fences would cross through late and old structure stands and proposed connectivity corridors, since these fallen trees and snags would otherwise have contributed to large, intact pieces of downed wood. See Ragged Ruby Wildlife Report for more information.

Firewood cutting is having a negative effect on species requiring snags and downed wood, such as raptors, pine marten, and cavity-nesting species, due to high numbers of firewood permits sold on the Forest. Cumulatively with the fencing effects described above, high road densities, and hazard tree removal across the Forest, this could be substantially contributing the current snag deficit, particularly in the eastside mixed-conifer wildlife habitat type. See Ragged Ruby Wildlife Report for more information.

Large-scale thinning and underburning treatments, large fires, and fire suppression also contribute to the cumulative loss or creation of snags; see Ragged Ruby Wildlife Report. However, when the past, ongoing, and reasonably foreseeable actions are considered in combination with the action alternatives, there is not expected to be a significant change in snag densities across the watershed. The proposed project and associated action alternatives would not move snag density and distribution towards historical conditions as reported in DecAID, rather it would likely add to current deficits where they exist. Returning fire to the watershed has the potential to create small snag patches within the watershed but is not expected to move overall snag densities in the high-density category towards the historical range of variability.

Together with fire suppression and other landscape objectives that limit or discourage large beetle outbreaks, the project would contribute to a small negative trend in black-backed woodpecker habitat across the Forest. While some additive cumulative effects may be anticipated, projects are consistent with Malheur Forest Plan objectives because the project is consistent with the standards and guidelines relating to management indicator species – primary cavity excavator species.

Further, it is not anticipated that the cumulative effects of snag loss in these areas in the short term would threaten the viability of any dead and defective habitat-dependent species at the Forest scale. However, even repeated small amounts of snag loss at such a scale (past, ongoing, and reasonably foreseeable actions) could potentially result in the decreased populations of some cavity excavators along the Middle Fork John Day River corridor. Further, as habitat changes at this scale to better reflect conditions expected under the historical range of variability, a shift in species composition favoring those species preferring more open stands (such as white-headed woodpeckers) could also be expected.

Conclusion for Dead and Defective Habitat for Cavity Excavating Birds

Alternative 1 would likely continue to increase dead and defective wood habitat and therefore would not contribute to a negative trend in viability for management indicator species dead and defective wood habitat dependent species, such as primary cavity excavators, on the Malheur National Forest.

For alternatives 2 or 3, in the short term there could be some adverse effects to cavity excavating species from disturbance and direct loss of snags during implementation, through hazard tree removal and consumption from prescribed fire. However, snags would not be targeted with thinning treatments and true hazard trees needing removal are expected to be rarely encountered during vegetation actions. Project design criteria are in place to decrease or prevent loss from prescribed fire, and fire would likely add snags from direct tree mortality. Thinning over-stocked stands could eventually help move multi-strata habitat towards older, single-strata habitat, benefitting the hairy woodpecker, Lewis's woodpecker, and northern flicker. Williamson's sapsucker would benefit as all other thinning would accelerate younger structural stage stands to develop large-diameter trees and restore resilient old forest structure. However, more resilient stands would be less susceptible to tree mortality due to stress, insects, or fire, and could potentially produce even fewer snags than current conditions in the mid-term, resulting in further snag density departures from the historical range of variability.

In the long term (50 plus years), stand structure would better mimic historical conditions, become comprised of larger, older trees, and eventually become more decadent. At this point (assuming absence of future activities or disturbances in that timeframe), these stands would likely start producing higher quantities of larger, better quality snags of more desirable species, and therefore would ultimately be beneficial to cavity excavating species.

The net change in road densities is negligible under all action alternatives and is not expected to have a substantial effect on snag or downed wood loss. Although some additional loss would occur in the short term, decommissioning and effectively closing roads would likely eliminate some future loss of snags from firewood collectors, log harvest, and hazard tree removal. Effectively reclosing roads used for haul and temporary roads (constructed for haul) would be critical to mitigate potential additional losses from firewood cutting.

Aspen stand and riparian area treatments would benefit the downy woodpecker and red-naped sapsucker, and likely have negligible effects to other primary cavity excavators. Only 10 acres of aspen restoration are proposed under each action alternative.

Recent and reasonably foreseeable projects authorized under the Aquatic Restoration Decision, including fence construction and riparian restoration-related activities, would result in the additional loss of current or future snags. The riparian treatment activities would not treat large, contiguous blocks of habitat and therefore may have negligible effects to cavity excavators. At this time, the extent of future fence construction is not understood well enough to provide accurate analysis.

Under the action alternatives**, a slight decrease in Forest-wide dead, downed, and defective habitat or population trends for primary cavity excavators would be expected as a result of implementation in the short term**. In the mid to long term, habitat would be expected to better mimic the historical range of variability. Alternatives 2 and 3 would provide more resilient stands leading to larger, older age class trees eventually becoming decadent and producing higher quality dead and defective habitat. Therefore, no Forest-wide threats to any primary cavity excavator population viability would be expected from implementation of either action alternative in this planning area. However, when considered cumulatively with other projects discussed above, populations of species of cavity excavators preferring dense habitat and higher densities of snags may decrease.

Conclusion for Black-Backed Woodpecker

In the short term, alternative 1 may benefit black-backed woodpeckers as a result of the higher likelihood of bug kill and fire-caused tree mortality. In the long term, large-scale events within the planning area may render the area unsuitable until future snags develop. Alternative 1 would not contribute to a negative trend in viability on the Malheur National Forest for black-backed woodpeckers.

The action alternatives would impact suitable black-backed woodpecker habitat in the planning area. However, current conditions greatly exceed the historical range of variability for black-backed woodpeckers. The overall direct, indirect, and cumulative effects would result in a small negative trend of habitat. The loss of habitat would be insignificant at the scale of the Forest. Wildfire events are possible, or likely, at the Forest-level, which could create more suitable habitat and partially mitigate any negative effects of the project. Further, recent wildfires including the 2014 South Fork Complex, the 2014 Bald Sisters Fire, and the 2015 Canyon Creek Complex are likely providing extensive post-fire habitat that black-backed woodpeckers prefer. The Ragged Ruby Project is consistent with the Malheur Forest Plan, and thus continued viability of the black-backed woodpecker is expected on the Malheur National Forest.

Rocky Mountain Elk

Affected Environment

Methodology

Rocky Mountain elk were selected as a management indicator species for the Malheur National Forest due to their economic and social value, and for their documented response to changes in forest cover, forage quality, and open road densities.

Thomas et al. (1988) developed the habitat effectiveness index model for estimating elk habitat effectiveness on the landscape. The existing condition and the effects analysis by alternative for elk habitat effectiveness were evaluated using the habitat effectiveness index model, marginal and satisfactory cover percentages, and open road densities. Existing big game cover was designated using stand exams, most similar neighbor analysis using geographic information system layer files, aerial photographs, and ground reconnaissance. Open road densities were calculated using the District access and travel management database. Values were estimated by winter range and summer range in Balance Creek and Granite Boulder Creek subwatersheds.

The Malheur Forest Plan establishes minimum standards for habitat effectiveness index for both summer range (USDA Forest Service 1990a, pages IV-27 to IV-29) and winter range (USDA Forest Service 1990a, pages IV-69 to IV-73). In addition, the Malheur Forest Plan identifies minimum standards for retention of satisfactory cover, marginal cover, and total cover. The Malheur Forest Plan also establishes standards for open road density. See Ragged Ruby Wildlife Report for more information.

See also Information Relevant to All Species section, under Wildlife – Proposed, Endangered, Threatened, and Sensitive Species.

For analysis, the planning area was divided into winter range and summer range in the Balance Creek and Granite Boulder Creek subwatersheds. Winter range is primarily at lower elevations where forested areas are interwoven with non-forested grasslands and shrublands, primarily along the Middle Fork John Day River. For the purpose of habitat effectiveness index, portions of the subwatersheds not classified as winter range were considered summer range. Further, 2,128 acres of the Dixie Butte Wildlife Emphasis Area (management area 21) is included in the planning area. Although there are different habitat effectiveness index standards for this management area in the current Malheur Forest Plan (USDA Forest Service 1990a, pages IV-131) the wildlife emphasis area is entirely within the Granite Boulder Creek subwatershed, and entirely in summer range. The wildlife emphasis area was not analyzed independently for habitat effectiveness index as part of this project as only scabland restoration treatments and western white pine treatments are proposed within the wildlife emphasis area, which are not expected to substantially change habitat effectiveness index values.

Malheur Forest Plan standards are different for summer range and winter range. See Ragged Ruby Wildlife Report for specifics.

Existing Condition

There are approximately 9,080 acres of winter range and 2,103 acres of summer range in the Balance Creek subwatershed portion of the planning area, and about 7,120 acres of winter range and 15,314 acres of summer range in the Granite Boulder Creek subwatershed portion of the planning area.

In summer range, all values meet or exceed Malheur Forest Plan standards. Both subwatersheds meet the standard for open road density (less than 3.2 miles of open road per square mile) for summer range. However, the actual number of "used" roads would be expected to be higher as many administratively closed roads and roads to be decommissioned from previous projects on the Malheur National Forest do not have effective barriers and regularly experience unauthorized use. Satisfactory cover, marginal cover, and total cover all exceed the Malheur Forest Plan standards.

Winter range occurs in both subwatersheds. In all winter range in the planning area, the overall habitat effectiveness index (HEcsfr) values meet Malheur Forest Plan standards. However, habitat effectiveness values for open road densities (HEr) are below plan standards, and open road densities exceed Malheur Forest Plan standards in both subwatersheds.

Although habitat effectiveness index and cover requirements are meeting or exceeding Malheur Forest Plan standards, cover requirements are not always compatible with the historical range of variability. Tree thinning, the treatment that most effectively reduces beetle and fire risk, also reduces the effectiveness of a stand as big game cover and makes habitat more vulnerable to higher open road densities. See Ragged Ruby Wildlife Report for more information.

Elk Populations

Big game management on the Malheur National Forest is a cooperative effort between the Forest Service and the Oregon Department of Fish and Wildlife. The Forest Service manages habitat while Oregon Department of Fish and Wildlife manages big game populations. The Ragged Ruby planning area is split by the Northside and Desolation wildlife management units, which are currently about 700 elk and 200 elk above management objective, respectively (ODFW 2016e).

Environmental Consequences

Methodology

See Information Relevant to All Species section, under Wildlife – Proposed, Endangered, Threatened, and Sensitive Species.

Alternative 1 – No Action

Direct and Indirect Effects

With no activities proposed, values utilized to evaluate habitat effectiveness for elk, such as big game cover percentages, quantity and quality of forage, and open road densities, would remain in their current condition in the short term. Total percent, satisfactory, and marginal cover would remain in excess of Malheur Forest Plan standards in the planning area. Cover and forage would remain well distributed.

In the mid to long term (with continued fire suppression), development of late and old structure or multi-strata stands could create additional satisfactory and marginal cover stands. Long-term changes could increase big game cover over time, although with improved cover or potentially larger homogenous stands of big game cover, there could be less forage, which could conceivably reduce habitat effectiveness index values. In the mid to long term, forage would decrease as tree canopies close and shade the ground.

With no thinning or prescribed fire, increased tree stocking could increase the frequency and intensity of high-severity wildfire events. A wildfire of moderate to intense magnitude and severity could convert late and old structure or multi-strata big game cover habitat to stand initiation forage habitat in the short and mid-term, therefore changing forage to cover ratios and distribution across the planning area. With proportionate changes in ratios, habitat effectiveness index values would not be expected to fall below Malheur Forest Plan standards.

Under alternative 1, open road densities would be maintained at their current levels as described above. Disturbances to elk as a result of high open road densities would continue (Rowland et al. 2004, Rumble et al. 2005). See Ragged Ruby Wildlife Report.

Aspen stands would remain in their current condition in the short to mid-term. Aspen would continue to decline and stands would slowly disappear over the mid to long term.

Under this alternative and mahogany and bitterbrush communities would continue to be encroached and could ultimately be lost in the long term, which could result in a substantial loss of quality habitat for elk and mule deer. See Ragged Ruby Wildlife Report.

No additional recreation developments would occur under this alternative and therefore disturbance to big game species from human interaction would be expected to remain at current levels, which are relatively low outside of spring (including shed antler hunting) and fall hunting seasons.

Cumulative Effects

Because there would be no direct or indirect effects, there would be no cumulative effects.

Alternative 2

Direct and Indirect Effects

Please refer to chapter 2 to review the differences in treatments and intensity (acres or miles) of proposed treatments under each action alternative. The effect of each activity type is assumed to be the same across alternatives unless otherwise noted. Further, it is also assumed that as the intensity of the proposed treatments change, the level of expected effects discussed below would change accordingly.

Upland Restoration Activities and Prescribed Burning

Non-commercial thinning of small trees and understory removal would have the greatest impact on hiding cover in the short term. Through dry pine and mixed conifer restoration, the potential adverse effects of removing understory trees would be reduced in many areas by retaining unthinned patches of dense trees throughout the planning area. Unthinned patches would comprise 10 to 25 percent of areas treated with mixed conifer restoration prescriptions (see the Ragged Ruby Silviculture Report for percent of project areas treated) and range from 1 to 10 acres in size depending on the location on the landscape and moisture gradient. Leave patches may be even larger if they connect through the unit. Unthinned patches would remain at high risk of bark beetle attack and would likely not provide big game cover if tree mortality were high; these patches would potentially be lost over the next 25 years. Further, the designation of connectivity corridors and retention and expansion of the management area 13 old growth network proposed in the planning area would provide elk cover and permeability across the landscape. Both action alternatives propose to expand the management area 13 old growth network.

Areas where thinning would occur would be expected to transition back into at least marginal cover in approximately 25 to 50 years depending on the residual stand density, species composition, and site quality following treatment. Many areas would be expected to recover to marginal or satisfactory cover much sooner than the 25 to 50 years because of accelerated growth rates and understory response.

Disturbance from logging operations and associated traffic from log haul may cause animals to move to undisturbed security areas (such as non-treatment areas or wildlife connectivity corridors) where they exist. In big-game winter range (management area 4A), timber management activities could be restricted when and where appropriate (see Appendix C – Project Design Criteria) to minimize disturbance to wintering deer and elk. See Ragged Ruby Wildlife Report for more information.

Analysis assumes that the greater the reduction in big game cover, the greater the increase in forage. Although, this may not necessarily be the case in the Cool Moist biophysical environments where woody understory recovery would be expected with little value as forage. Juxtaposition of big game cover and forage patches is also important, because big game species' use of openings decreases with increased distance from cover or forage edge areas, and increased size and spacing of cover and forage patches.

Prescribed fires are expected to burn with low severity in a mosaic of burned and unburned patches. Ground vegetation would be reduced in the short term, impacting forage opportunities, but burning would eventually improve forage conditions as more open canopies allow more light to reach the forest floor. Direct fire-caused mortality of elk would be unlikely, disturbance would be short term, and design criteria would limit or mitigate other adverse effects. See Ragged Ruby Wildlife Report for more information. In areas where mechanical treatments preceded prescribed fire, hiding cover would likely be reduced to the point that prescribed fire would have minimal additional effects.

The negative impact of understory removal is compounded near roads where sight distance is increased, thereby raising the potential for disturbance, poaching, and harvest vulnerability of elk and deer. Burning might increase the possibility of insect activity, particularly bark beetles. If beetle activity intensifies, there would be some risk of additional losses of hiding cover.

Roads Activities

Road densities after implementation of either alternative would remain at or near current levels across the planning area, as described above.

Ultimately, project areas typically provide more motorized access and use (temporary road construction and maintenance of previously closed roads), less hiding cover, less security, and fewer effective barriers during and after implementation of project activities. See Ragged Ruby Wildlife Report for more information.

Seasonal restrictions in winter range would minimize effects from proposed activities during the most sensitive season, although disturbance from shed antler hunters and turkey hunters could increase from increased access. Disturbance is less of a concern to summer range where more of the land base is available for use.

Aspen Restoration

Fencing would only be constructed where needed and until objectives were met, then fencing would be removed. Elk in the immediate area could be displaced during aspen restoration. During the first several years post treatment, many of these trees would be essentially off-limits to elk, but as new regeneration becomes established and protective fences deteriorate or are removed, available browse should increase. Aspen groves would be larger and healthier and more likely to remain a viable component of the landscape. See Ragged Ruby Wildlife Report for more information.

Enhancing deciduous shrubs, trees, and riparian vegetation in applicable areas could potentially increase forage and cover for elk and deer in the short term, and potentially provide additional vertical structure for big game cover. Healthy and functioning riparian areas and aspen stands are preferred fawning habitat for mule deer.

Recreation System Changes

Wisdom et al. (2005) found that mountain bikes caused flight responses (disturbance and displacement) in elk and mule deer. Allowing mountain bike use on new trails, or trails that were previously only used by pedestrians and equestrians could increase disturbance to big game species. Further, allowing mountain bike use on trails that extend into the Vinegar Hill-Indian Rock Scenic Area and connect to trails in the North Fork John Day Wilderness could encourage illegal use of mountain bikes in wilderness areas, further impacting elk and deer. See Ragged Ruby Wildlife Report for more information.

Habitat Effectiveness Index

Either of the action alternatives would maintain the overall habitat effectiveness for each subwatershed in summer and winter range at or above Malheur Forest Plan standards.

The primary effect from the action alternatives is the reduction in satisfactory and marginal cover and the change in cover/forage distribution. Following treatment, satisfactory cover and marginal cover would continue to exceed Malheur Forest Plan standards. Cover distribution would likely be better than the model can predict due to the leave patches and design of the variable-density thinning practice, leaving numerous patches providing cover distribution. While satisfactory, marginal, and total cover, and size and spacing (distribution) would be reduced in some areas, habitat effectiveness index values would remain at or above Malheur Forest Plan standards. Further, habitat effectiveness index values would generally be maintained or increased under each action alternative.

Following the completion of implementation of vegetation treatments proposed in alternatives 2 and 3 (mid to long term), it would be expected that overall habitat for elk would substantially improve from current conditions. Mechanical treatments combined with prescribed fire would open the forest canopy, promote regeneration, promote vigor and expansion of grass and many browse species. Most lost vertical big game cover would be recovered quickly and both forage and cover quality and quantity would be expected to increase substantially. Satisfactory cover would be expected to continue to meet standards in the short- to mid-term, and increase as marginal cover moves to satisfactory and additional cover through regeneration and increased vigor would be added. Forage would increase under all alternatives. See Ragged Ruby Wildlife Report for specifics.

Cumulative Effects

Cumulative effects are similar as described in the Information Relevant to All Species section, with the differences specific to this section described below.

Past timber harvest activities in the analysis area have decreased hiding cover and increased forage and understory development; conversely, fire suppression has rendered much of the planning area outside of the historical range of variability and has likely created higher big game cover values. Road construction associated with timber activities has increased the accessibility of the area, and ultimately increased pressure and disturbance to elk across most seasons. Continued high open road densities in this and other adjacent project areas may offset benefits to Rocky Mountain elk from increasing forage and reducing big game cover. Post-fire areas in the vicinity are currently providing increased forage and thick, vertical cover from regeneration to elk and other big game species in and around the planning area where motorized access is limited. Big game species would continue to benefit from the effects of these fires in the short to mid-term. See Ragged Ruby Wildlife Report.

Cumulative impacts to big game habitat related to alternatives 2 and 3 could include a decrease in habitat effectiveness resulting from changes in amount and juxtaposition of big game cover and forage. This would cumulatively add to the reduction of cover from other large-scale projects being implemented on National Forest System lands. However, with the implementation of appropriate project design criteria, treatment prescriptions, connectivity corridors, and best management practices, the combined effects from current and future timber projects would be expected to maintain overall habitat effectiveness index within Malheur Forest Plan standards at the Forest level. See Ragged Ruby Wildlife Report.

Connectivity corridors established during the design of past and concurrent projects connect the landscape, potentially providing elk and other wildlife secure travel corridors through expansive areas with reduced big game cover. Retaining these connectivity corridors in a high-quality condition would be paramount for landscape permeability. However, construction of fences would change the way the area is grazed, cut across proposed connectivity corridors and portions of winter range (especially construction of the Butte Pasture fence), and could result in entanglement and direct mortality. Typically, fences built with wildlife safety in mind are adequate to reduce these risks; however, this fence is proposed to cross winter range and steep slopes, making it more hazardous to elk and deer to navigate. Maintenance of the fence through time would likely not maintain any wildlife-friendly design criteria and become even more hazardous to wildlife. If livestock grazing is increased and concentrated (from Butte fence) in lower elevations (winter range), winter range and especially riparian areas grazed through the hot season would not have time to recover from livestock use and would likely leave unsuitable or less desirable conditions on winter range, specifically on the south side of the Middle Fork John Day River. Similar effects would be expected for proposed fences under the Aquatic Restoration Decision in other areas of the Ragged Ruby planning area. See Ragged Ruby Wildlife Report for more information.

Off-highway vehicles are often used in fence construction to deliver materials, aid construction, and maintain the fence lines; typically, a 6-foot corridor is kept open on either side of the fence for maintenance. This could conceivably contribute to increased off-highway vehicle use, or encourage off-highway vehicle use along maintained fence corridors.

Livestock grazing may reduce available forage for big game species and continue to limit riparian vegetation critical for calving, fawning, and late season browse; but with the increase in forage availability for both wild and domestic ungulates there are no detrimental cumulative impacts from livestock grazing expected.

The development of at least 10 springs into water troughs for livestock would likely have slightly beneficial effects to elk by providing more reliable and readily available surface water (at the trough) during hotter, drier times, although concentrations of livestock at the troughs could discourage or eliminate elk use of these springs when livestock are present. However, fencing of spring sources currently providing surface water, with healthy riparian vegetation, or being used by elk for wallowing, could adversely impact elk. Further adverse impacts to areas immediately surrounding proposed developments would include increased trampling of vegetation, increased competition for water, and increased disturbance if new access is needed to construct the developments. Any motorized access created during the construction or maintenance of these developments would be expected to further increase and encourage off-road motorized use.

Maintenance needs of livestock fencing and water developments also make it difficult to effectively manage road closures, and therefore elk security, as more access is needed to maintain range improvements. Roads and routes leading to range improvements often cannot be efficiently or effectively closed because livestock operators need to maintain access to those improvements. See Ragged Ruby Wildlife Report for more information.

The cumulative effects of adding these trails to the current trail system would have negligible effects on elk other than disturbance and displacement during times of use, and to overall elk distribution. Allowing and encouraging mountain bike use of existing trails in the scenic area and potentially connecting to wilderness areas under alternative 2 could have adverse impacts to elk distribution if mountain bike use became frequent in those areas.

Conclusion for Rocky Mountain Elk

For alternative 1, elk habitat would remain the same in the short term. In the mid to long term, forage would likely decrease as a result of increasing big game cover, and important habitats such as upland shrub areas and aspen could be degraded and eventually lost. However, because of elk and other big game species' high mobility, extensive distribution, and ability to find and use a variety of suitable habitats, there would be no negative trend in viability on the Malheur National Forest for Rocky Mountain elk.

For alternatives 2 and 3, because elk are a widespread species throughout the Blue Mountains, including the Malheur National Forest. Because both Northside and Desolation wildlife management units are slightly over population objective, implementing either action alternative would not threaten the viability of elk.

However, the Ragged Ruby Project could have a significant adverse effect on elk distribution when considered cumulatively with: (1) the past, ongoing, and future landscape level projects resulting in cumulative decreases in big game cover; (2) the potential for increased motorized access as explained above; (3) high open road densities in winter range; (4) challenges from extensive pasture and riparian fencing across the landscape (Forest-wide) and an increase in expected development and maintenance of range improvements (Forest-wide); (5) increased recreation and recreation infrastructure; and (6) the extent of the Forest concurrently being treated. Ultimately, fewer elk would remain on National Forest System lands and therefore fewer elk would be available for hunting, viewing, or general public enjoyment.

Habitat effectiveness would be maintained under each alternative; however, alternatives 2 and 3 generally increase habitat effectiveness index values (see Ragged Ruby Wildlife Report). Overall, with achievement of expected results of treatments in the mid to long term, it is expected that all action alternatives would improve elk habitat according to habitat effectiveness index in the planning area. However, alternative 3 would most improve elk habitat throughout the planning area due to higher residual big game cover values as opposed to alternative 2. Forage would be increased under each alternative. Any negative or adverse impacts would be short term, and would ultimately result in a beneficial impact to elk habitat and therefore elk populations.

Old Growth Network, Late and Old Structure, and Old Growth-Dependent Species

The Malheur Forest Plan identifies three management indicator species for old growth (primarily old forest multi-strata structured stands): pileated woodpecker, pine marten, and three-toed woodpecker. In addition, the white-headed woodpecker is a good indicator of the health of old forest single stratum habitat. By providing old growth habitat for these species, it is assumed that habitat for other old growth obligate species would be provided as well.

Affected Environment

Methodology

To provide for pileated woodpecker and pine marten habitat viability, the Malheur Forest Plan management area 13 provides for the management of old growth habitat through a system of dedicated old growth areas and replacement old growth areas. Dedicated old growth areas were delineated Forest-wide to provide an even distribution of habitat; one dedicated old growth area for roughly every 12,000 acres, or approximately 5 miles apart. Replacement old growth areas are established to counter possible catastrophic damage or deterioration. Although replacement areas may not have all the characteristics of old growth, they are managed to achieve old forest structure over time. Thus, when a dedicated old growth area no longer meets the needed habitat requirements, the associated replacement old growth area has already been established to replace it. To ensure species viability for three-toed woodpeckers, Malheur Forest Plan standard 59 gives direction to identify potential or existing old growth lodgepole pine forests. There are currently no old growth lodgepole pine forests in the planning area.

The Malheur Forest Plan directs that pileated woodpecker areas be 600 acres, comprising a 300-acre dedicated old growth (reproductive area) and a 300-acre pileated woodpecker feeding area. In addition, the Malheur Forest Plan and its corresponding final environmental impact statement identifies requirements and guidelines for identifying replacement old growth and pileated woodpecker feeding areas for each dedicated old growth area. Replacement old growth areas are intended to be half the size of dedicated old growth areas (150 acres for replacement of pileated woodpecker dedicated old growth areas). In addition, replacement old growth areas may overlap with feeding areas. Pine marten units are to be 240 total acres, comprising a 160-acre dedicated old growth area and an 80-acre replacement old growth area. Dedicated old growth areas managed for both species should be managed at least at the 600-acre minimum recommended size for pileated woodpeckers.

The Malheur Forest Plan directs continued review of dedicated and replacement old growth acreages, with adjustments to boundaries as appropriate, to ensure that suitable levels of old growth habitat are provided for species dependent upon them and to ensure that those areas meet Malheur Forest Plan standards and guidelines. Management area 13 direction permits exchanging the status of dedicated and replacement old growth areas in the event a dedicated old growth area is destroyed by wildfire or is otherwise no longer providing old growth habitat. Management area 13 is typically adjusted during development of a project's proposed actions.

See also Information Relevant to All Species section, under Wildlife – Proposed, Endangered, Threatened, and Sensitive Species, including the Historical Range of Variability and Stand Structure section.

Existing Conditions – Old Growth Network

All or part of six management area 13 areas are located within the Ragged Ruby planning area. Most of the designated dedicated old growth areas provide highly suitable habitat for pileated woodpeckers, and occupancy has been documented in those dedicated old growth areas. Intensive remote camera surveys for pine marten were conducted in many of the dedicated old growth areas and other suitable old-forest habitat, and pine marten occurrence was documented, primarily associated with riparian areas or late and old structure stands adjacent to riparian areas.

Dedicated and replacement old growth acreages, Malheur Forest Plan requirements, replacement old growth areas, pileated woodpecker feeding areas, and species management designations for dedicated and replacement old growth areas within the Ragged Ruby planning area are described further in the Ragged Ruby Wildlife Report.

Existing Conditions – Late and Old Structure

The Eastside Screens amended the Malheur Forest Plan to manage late and old structure stands within the historical range of variability, including areas inside and outside of the dedicated old growth, replacement old growth, and pileated woodpecker feeding area network. There are approximately 12,500 acres of late and old structure in the planning area (roughly 37-percent), with approximately 95 percent of that being old forest multi-strata and 5 percent being old forest single stratum. Late and old structure within the planning area provides suitable habitat for pileated woodpeckers, and some late and old structure stands are currently providing ideal or adequately connected habitat for pine marten. Pine marten presence in late and old structure was documented multiple times in the Ragged Ruby planning area, including females with kits.

Interior Columbia Basin habitat evaluations for white-headed woodpeckers—a species that shows a strong preference for mature, single stratum ponderosa pine dominated habitats—indicated that roughly 70 percent of the watersheds in the Blue Mountains showed a decreasing trend in the preferred habitat type, while 30 percent showed a static or increasing trend (Wisdom et al. 2000). Results from the evaluation also indicated declines in large trees (equal to or greater than 20 inches diameter at breast height) and open-canopied forest types (less than 40 percent crown closure) in the dry biophysical environment. Habitats for species closely associated with these mature open-canopied forest types, such as white-headed woodpecker, pygmy nuthatch, and western bluebird, have likely declined across the landscape from historical levels. Although the Ragged Ruby planning area only has approximately 610 acres of old forest single stratum in the upland portions of the planning area, these species have been documented throughout the old forest single stratum habitat as well as old forest multi-strata and younger forests. White-headed woodpeckers were commonly encountered during field reconnaissance of the planning area throughout the warm dry environments.

Existing Conditions – Old Growth Dependent Species

Existing Condition and Status of Pileated Woodpecker

The pileated woodpecker is a management indicator species for both dead and defective wood habitat and old growth habitats, and is considered a keystone habitat modifier in the Pacific Northwest.

Pileated woodpeckers prefer late successional stages of coniferous or deciduous forest, but also use younger forests that have scattered, large, dead trees (Bull and Jackson 2011, Bull et al. 2007). In northeastern Oregon, these large woodpeckers tend to select unlogged stands of old growth grand fir with closed canopies and, in some cases, open stands with high densities of large snags and logs (Bull and Holthausen 1993, Bull et al. 2007). They are rarely found in stands of pure ponderosa pine (Bull and Holthausen 1993). Because they nest in large-diameter snags, roost in large-diameter hollow trees, and use large logs and snags for foraging, pileated woodpeckers are associated primarily with late and old structure stands (Bull et al. 2007). Approximately 80 percent of pileated woodpecker foraging in northeastern Oregon occurs in dead trees and dead and downed logs.

Pileated woodpecker nest cavities are quite large, with a mean diameter of 8 inches (21 centimeters) and a cavity depth of 22 inches (57 centimeters). In eastern Oregon, nest trees are predominantly ponderosa pine, with a smaller proportion in western larch (Bull 1987). Roosts are typically found in live and dead grand fir with a mean diameter at breast height of 28 inches. Timber harvest has had a negative effect on habitat for this woodpecker (Bull 2003, Bull et al. 2007). Removal of live and dead large-diameter trees, downed woody material, and canopy eliminates 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).

Wildlife use data from DecAID was used in conjunction with snag estimates to determine acres of potential habitat for forest types across the Forest. DecAID values for existing conditions on the Malheur National Forest, as they relate to pileated woodpecker habitat requirements, are available in the Ragged Ruby Wildlife Report. Snag habitat is likely to be a limiting factor for pileated woodpeckers in the eastside mixed-conifer habitat type throughout the Ragged Ruby planning area.

However, due to an increase in dense, multi-canopy stands caused by fire suppression, structural conditions used by pileated woodpeckers have increased on drier ponderosa pine sites, and habitat for pileated woodpeckers is increasing across the Blue Mountains (Wisdom et al. 2000). However, this habitat type does not produce large-diameter snags (greater than 21 inches diameter at breast height) in densities used by pileated woodpeckers and densities of large-diameter snags have declined from historical to current levels (Korol et al. 2002, Wisdom et al. 2000).

Existing Condition for White-Headed Woodpecker

Information regarding white-headed woodpeckers and associated expected effects are discussed in the Wildlife – Proposed, Endangered, Threatened, and Sensitive Species section.

Existing Condition for Pine Marten

The American pine marten is a management indicator species for old growth habitats. Below is a summary of pine marten ecology important to providing information pertinent to assessing the impacts of the project on this species. For additional detail see Mellen-McLean (2012a) and the body of work led by Evelyn Bull (Bull 2000, Bull and Blumton 1999, Bull et al. 2005, Bull and Heater 2000, 2001a, and 2001b).

Pine marten are associated with old multi- and single-story, and unmanaged young multistory structural stages in subalpine and montane forests. Large snags and downed logs provide rest and den sites for marten (Wisdom et al. 2000).

In the Blue Mountains, marten selected unharvested, closed canopy (50 to 75 percent), old-structure stands in subalpine fir and spruce forests (Bull et al. 2005). Stands used by martens had higher densities of large snags (greater than 20 inches diameter at breast height), averaging 4.0 snags per acre. Snags used as resting and denning sites average from 26 to 38 inches diameter at breast height in eastern Oregon, depending on habitat type (Bull and Heater 2000, Raphael and Jones 1997).

In addition to providing rest and den sites, downed wood is an important component of marten habitat because the primary prey of martens is small mammals associated with downed wood. These small mammals include voles (*Microtus* species) red-backed voles (*Clethrionomys gapperi*), snowshoe hares (*Lepus americanus*) and squirrels in northeast Oregon (Bull and Blumton 1999, Bull 2000). Subnivean (under snow) spaces created by logs provide marten with access to prey during the winter (Bull and Blumton 1999). Downed wood used as rest and den sites in the Blue Mountains averaged 26 inches diameter at breast height (Bull and Heater 2000).

As discussed in the Management Indicator Species section of this section under Dead and Defective Habitat for Cavity Excavating Birds, Including Black-Backed Woodpecker, densities of large snags (greater than 20 inches diameter at breast height) in the eastside mixed-conifer wildlife habitat type are well below reference conditions except in the 26 to 36 density class. Snag habitat is likely to be a limiting factor for marten in the eastside mixed-conifer wildlife habitat type. Montane mixed-conifer wildlife habitat type, which is the only habitat type for which DecAid shows wildlife tolerance levels for marten, is not present in sufficient acres to allow analysis. It is not expected that any areas in the ponderosa pine/Douglas-fir wildlife habitat type are currently providing suitable habitat for pine marten.

Downed wood is not likely to be limiting for pine marten across the Forest. Large wood used by marten is near reference conditions in the eastside mixed-conifer wildlife habitat type. Downed wood is also near or above historical conditions in the Camp Creek – Middle Fork John Day River.

Pine marten are considered vulnerable in the Blue Mountains by Oregon Department of Fish and Wildlife[27]; however, they are also a furbearer species (legally trapped and harvested). They are considered "vulnerable" to "apparently secure" in Oregon by NatureServe[28]. Reduction in amount of late-seral forest and associated large snags and logs, and associated fragmentation of habitat are the main reasons marten are considered vulnerable (Hargis et al. 1999, Wisdom et al. 2000).

Pine marten populations appear to be sensitive to changes in their environment, particularly a reduction in fuels and forest complexity (Moriarty et al. 2016).

Wisdom et al. (2000) found that because of an increase in dense, multi-canopy stands due to fire suppression, habitat for pine marten is increasing across the Blue Mountains. However, densities of large-diameter snags (greater than 21 inches diameter at breast height) have declined from historical to current levels (Korol et al. 2002, Wisdom et al. 2000). Further, a viability assessment completed for the 2014 Blue Mountains Forest Plan Revision effort indicates concern for the pine marten on the Malheur National Forest (as opposed to the Blue Mountains). According to this analysis, habitat was historically of moderate to low abundance with gaps in distribution, but compared to historical conditions habitat abundance has been reduced to "very low" and habitat patches are frequently isolated from other habitat patches (Wales et al. 2011).

Approximately 37 percent of the Ragged Ruby planning area comprises the late and old structure forest type. Many of the late and old structure stands are providing suitable habitat for pine marten, especially stands associated with higher elevations and riparian areas with adequate shrub cover.

Approximately 822 acres of management area 13 designated for pine marten (or combined pine marten and pileated woodpecker designation) exists in the planning area. Intensive survey efforts through deployment of remote camera traps and extensive habitat assessments were completed throughout potential marten habitat in the planning area. Multiple marten observations were documented during this effort, particularly associated with the Butte Creek and Ruby Creek drainages, including an adult female with kits (indicating suitable breeding habitat). Historically-documented martens also occur in association with Granite Boulder Creek. None were encountered within current or proposed management area 13 boundaries.

Since pine marten are designated a management indicator species for old growth (management area 13), analysis will focus primarily on proposed activities associated with the management area 13 network with an included discussion of late and old structure and connectivity. See the Ragged Ruby Wildlife Report for a comparison of the reference condition to current condition for downed wood in the eastside mixed-conifer wildlife habitat type.

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[27] Please see http://www.dfw.state.or.us/wildlife/diversity/species/docs/SSL_by_taxon.pdf.
[28] Please see http://www.natureserve.org/explorer/servlet/NatureServe.

Existing Condition for Three-Toed Woodpecker

The three-toed woodpecker is a circumboreal species (occurs throughout the boreal regions), inhabiting mixed-conifer and pine forests, and favoring high-elevation subalpine fir and Engelmann spruce forests in the west. Oregon distribution is rare and local, particularly near and west of the Cascade summit, often near high-elevation lakes or beetle outbreaks. In eastern Oregon, this species is known to inhabit lodgepole pine, Blue Mountain mixed conifer, and Douglas-fir/mixed-conifer habitat types, generally above 4,500 feet in elevation. Forest type may not be as important as the presence of bark beetles (Marshall et al. 2006).

Three-toed woodpeckers appear to opportunistically shift habitats to exploit short-term abundances of insects. Multiple studies (Steeger and Dulisse 1997, Imbeau and Desrochers 2002, Hutto 1995, Baldwin 1968) indicate that three-toed woodpeckers focus their foraging efforts on trees that are susceptible to (or damaged as a result of) beetle infestation (trees that are undergoing some form of decay, or trees that have been damaged by fire, wind, or some other form of stress).

Nesting habitat in the western part of its range trends toward mature unlogged conifer forests as well as conifer forests that have undergone some form of disturbance (such as a burn, flood, or windthrow).

Three-toed woodpeckers are a management indicator species on the Malheur National Forest for both dead and defective wood habitat and old growth lodgepole pine habitats. In northeastern Oregon, the three-toed woodpecker prefers stands where lodgepole pine is either dominant or co-dominant, and mostly uses trees 9 inches diameter at breast height and greater for both nesting and foraging (Bull et al. 1980, Goggans et al. 1988). Suitable habitat is tied to existing levels of diseased and decaying trees with heart rot for nesting and roosting, as well as decaying substrate to provide a prey base for wood-boring insects (Goggans et al. 1988). In particular, three-toed woodpeckers are attracted to areas with high concentrations of bark beetles, such as habitats created by stand-replacing burns or blowdown. Three-toed woodpeckers are associated with locally abundant insect outbreaks, and their populations are erratic as they follow beetle outbreaks across the landscape. They have been linked with infestations of the spruce beetle and other bark beetles, as well as burned forests where they take advantage of insect outbreaks and plentiful nest sites (Hutto 1995, Murphy and Lehnhausen 1998, Hejl et al. 2000).

Three-toed woodpeckers are considered vulnerable in the state by Oregon Department of Fish and Wildlife and NatureServe.

In a study in northeast Oregon by Bull et al. (1986), three-toed woodpeckers were found to feed exclusively in lodgepole pine stands. Three-toed woodpeckers acquired food exclusively by scaling, and 78 percent of the feeding sites were in dead trees. All characteristics of foraging sites except bark condition were significantly different than if the sites had been selected at random from available dead trees. Forest type and percent of needles remaining were the best discriminators between habitat used and not used. Three-toed woodpeckers scaled dead trees that averaged 9.5 inches diameter at breast height and 59 feet tall, and that retained most of their bark (93 percent), limbs (76 percent), and a portion of the needles (21 percent). These conditions describe trees that had been dead less than 3 years. Koplin (1969) also observed this species feeding on insects in the bark of freshly killed trees. All feeding occurred on the trunk at an average height of 23 feet. All feeding activity took place on lodgepole pine trees and on flat terrain. Birds occurred only in grand fir forest types that contained lodgepole pine.

There are no documented sightings of three-toed woodpeckers in the planning area nor in adjacent areas. However, old-growth lodgepole stands meeting the 75-acre criteria (Forest-wide standard 59, IV-31) occur in the Greenhorn Mountain Inventoried Roadless Area but would not be proposed for treatment. Generally, lodgepole pine is dying across the planning area due to mountain pine beetle and seldom achieves the diameter (9 plus inches) preferred by the three-toed woodpecker.

On the Forest, large-scale wildfires have recently occurred (2015 Canyon Creek Complex, 2014 Murderer's South Complex, and 2014 Bald Sisters) which have created abundant foraging habitat for three-toed woodpeckers on the Malheur National Forest. Severe burns represent potentially critical, but ephemeral, habitat for this species.

Based on analysis of current conditions, mid- and late-seral forests that provide potential habitat are well below the historical range of variability across the Malheur National Forest and in Cold Dry forests. These forests are susceptible to stand-replacing fire and insect outbreaks and thus are likely to provide some primary habitat in the future; however, the amount of these forests is currently too low to provide an adequate, continual supply of habitat for the three-toed woodpecker.

Estimates of available potential habitat compared to the historical range of variability estimates were derived using vegetation and historical range of variability data from the Blue Mountains Forest Plan Revision (Wales et al. 2011).

Snags are also important habitat components for the three-toed woodpecker. They are associated with areas of high snag density that result from beetle kill or other disturbances. Currently, the lodgepole pine and moist mixed-conifer wildlife habitat types are limited within the planning area and on the landscape. Snag habitat within these wildlife habitat types was not analyzed because the analysis area and surrounding watersheds did not meet the minimum acre requirement for sound DecAID analysis.

In the eastside mixed-conifer wildlife habitat type, densities of snags greater than 10 inches diameter at breast height are well below reference condition except in snag density classes between 24 to 36 snags per acre. Due to lack of recent fire within the analysis area, there are not adequate amounts of habitat with high snag densities in this wildlife habitat type.

Environmental Consequences

Methodology

See Methodology section under affected environment above. See also methodology in the Information Relevant to All Species section, under Wildlife – Proposed, Endangered, Threatened, and Sensitive Species.

Alternative 1 – No Action

Direct and Indirect Effects – Old Growth Network and Late and Old Structure

Under alternative 1, there would be no changes to the management area 13 network. No replacement old growth or pileated woodpecker feeding areas would be designated, no late and old structure stands would be treated, and no connectivity corridors would be designated. Malheur Forest Plan standards regarding the management area 13 network would not be met. No change from the existing condition would be expected.

Direct and Indirect Effects – Pileated Woodpecker

Under alternative 1, no management activities are proposed; woodpeckers would not be displaced, harassed, or injured by project activities. Habitat would remain as described in the existing condition section.

Due to an increase in dense, multi-canopy stands due to fire suppression, habitat for pileated woodpeckers is increasing across the Blue Mountains (Wisdom et al. 2000). However, densities of large-diameter snags (greater than 21 inches diameter at breast height) have declined from historical to current levels (Korol et al. 2002, Wisdom et al. 2000). These trends would continue into the future under alternative 1.

With alternative 1 there is an elevated risk of insect activity and high-severity wildfire. Mortality to large pine from insect activity could result in snags for pileated woodpecker nesting habitat. However, depending on extent and severity, insect activity or wildfire effects would possibly set back the structural stage development, resulting in areas of young trees and longer time spans to develop old forest structures. Smaller fires of low intensity could create snag habitat for pileated woodpeckers. Larger, more intense fire events would reduce suitable pileated woodpecker habitat.

In the ponderosa pine/Douglas-fir wildlife habitat type the landscape is near or above reference conditions for snag densities of both large (greater than 20 inches diameter at breast height) and small (greater than 10 inches diameter at breast height) snags. However, large snag habitat for pileated woodpecker is generally rare in this wildlife habitat type, both currently and within historical reference conditions.

In the eastside mixed-conifer wildlife habitat type, the landscape is deficit in snag density classes above 2 snags per acre for small (greater than 10 inches diameter at breast height) snags, and is deficit in large snags (greater than 20 inches diameter at breast height) except in the 24 to 36 snags per acre density class, as compared to reference conditions. The snag density classes at the 30 percent tolerance level for pileated woodpecker are low in this wildlife habitat type and large snag habitat for pileated woodpecker species may be limiting, although snag densities at the 50 percent tolerance level are nearly three times higher than historically expected. Some pileated woodpeckers may be limited to the more productive sites in this wildlife habitat type, where snag densities are expected to be higher (Bull et al. 2007, Ohmann and Waddell 2002).

Alternative 1 would not affect pileated woodpecker habitat and therefore would not contribute to a negative trend in viability on the Malheur National Forest for this species.

Direct and Indirect Effects – Pine Marten

In alternative 1, no upland restoration activities, road activities, fuels reduction, recreation improvements, or prescribed burning would occur within the planning area. There would be no direct effects to pine marten; animals would not be displaced, harassed, or injured by the project. Habitat would remain as described in the existing condition section.

In the absence of disturbance, stands would further develop old growth characteristics and move towards climax conifer species. In the long term, some stands could potentially lose canopy cover as some larger trees would die and become snags. Insect activity and fire hazard would remain elevated in the planning area.

Disturbances due to wildfire or insects could have beneficial or detrimental effects for pine marten habitat, depending on the plant community affected, and the severity or extent of such events. Large-scale events outside of the historical range of variability may result in loss of cover, and the overall gap in snag recruitment or large downed wood over extensive areas could be detrimental in the long term, since replacement trees that ultimately provide future snags or large downed wood could take decades to develop.

Direct and Indirect Effects – Three-toed Woodpecker

Under alternative 1, no management activities proposed for the Ragged Ruby Project would occur. There would be no direct, indirect, or cumulative effects to three-toed woodpecker or its habitat as a result of management activities.

Tree mortality in some lodgepole pine stands, as well as grand fir and other plant association groups within the planning area, is occurring from insects and disease that is exacerbated by high stand densities. Most of this tree mortality is occurring in the size class less than 20 inches diameter at breast height, although some larger trees are also being affected. Under alternative 1, this trend would continue and tree mortality would likely increase into the future.

Disturbances due to wildfire or insects could have beneficial or detrimental effects for woodpecker habitat, depending on the plant community affected and the severity or extent of such events.

Smaller-scale disturbances similar to historical fire events or insect outbreaks would benefit most primary cavity nesters dependent on snags and downed wood. Large-scale events outside the historical range of variability would benefit some species in the short to mid term, but the overall gap in snag recruitment or large downed wood over extensive areas could be detrimental in the long term, since replacement trees that ultimately provide future snags could take decades to develop.

Fires of various size and intensity occur annually on the Malheur National Forest, providing some new post-fire habitat every year. This trend is expected to continue under alternative 1.

Alternative 1 would not affect three-toed woodpecker habitat and therefore would not contribute to a negative trend in viability on the Malheur National Forest.

Cumulative Effects

Because there would be no direct or indirect effects, there would be no cumulative effects.

Alternative 2

Direct and Indirect Effects – Old Growth Network and Late and Old Structure

Alternatives 2 and 3 propose to alter stand boundaries of dedicated old growth areas in order to expand the current management area 13 network to include replacement old growth and pileated woodpecker feeding areas to meet Malheur Forest Plan standards. Ultimately, there would be a net gain of approximately 867 acres of the management area 13 network including dedicated old growth, replacement old growth, and pileated woodpecker feeding areas. The following descriptions provide an explanation of the proposed changes to the management area 13 network under all action alternatives.

Explanation of Proposed Old Growth Changes

Dedicated old growth area 03332PP – Designation of 81 additional acres of dedicated old growth, and designation of 316 combined acres of replacement old growth and pileated woodpecker feeding area.

Dedicated old growth area 03244MM – There would be no change in the original dedicated old growth acres or boundary for this stand. The currently designated dedicated old growth area is divided by the Ragged Ruby planning area boundary and is almost entirely post-fire habitat altered by the Summit and Reed fires.

Dedicated old growth area 03245MM – Designation of a 170-acre replacement old growth area.

Dedicated old growth area 03122PW – Adequate, no changes proposed.

Dedicated old growth area 03128PW – Addition of a 185-acre pileated woodpecker feeding area. Dedicated old growth area consists of three stands of different sizes, but replacement old growth acres are within one stand. Rather than dividing and re-designating at least 29 acres of a stand currently designated as replacement old growth to dedicated old growth, stands would be managed as old growth at their natural boundary. Designations would be left unchanged as overall acreage to be managed, as management area 13 is adequate for the species.

Connectivity Corridors

Connectivity corridors were designed during project planning and are proposed under each action alternative to serve as connectivity between late and old structure stands to allow for movement of old growth and big game species. The goal of creating “connectivity” is to manage stands in corridors at higher-canopy densities when compared to more intensively managed stands located outside of corridors. Corridors established for old growth species in the planning area would also allow for big game species’ migratory and dispersal movements, and retain cover. Ragged Ruby connectivity corridors would link late and old structure stands, including dedicated and replacement old growth stands, to late and old structure areas throughout the planning area. The designated connectivity corridors are approximately 2,200 acres in alternative 2 and 3,260 acres in alternative 3 (approximately 7 percent and 10 percent of the planning area, respectively), not including proposed acreages from dedicated old growth, replacement old growth, or pileated woodpecker feeding areas.

See also Historical Range of Variability and Stand Structure section in the Information Relevant to All Species section.

Direct and Indirect Effects – Pileated Woodpecker

Chapter 2 describes the differences in intensity (acres or miles) of proposed treatments under each alternative. It is assumed that as the intensity of the proposed treatments change, the level of expected effects discussed below would change accordingly.

Refer to the Ragged Ruby Silviculture Report for a more detailed description of expected future vegetation conditions. In the 20-year modeling period, vegetation structure would move toward alignment with historical range of variability for old forest single stratum. Under the 40-year modeling scenario, both action alternatives would result in moving towards the historical range of variability in old forest single stratum; and would also result in old forest multi-strata exceeding existing conditions.

The reduction of habitat (outside the management area 13 network; treated late and old structure) would result from commercial and non-commercial thinning activities. Prescribed burning could have varying effects on habitat suitability as well. Commercial treatment and some levels of non-commercial treatment would reduce the suitability of some stands for nesting and foraging immediately after treatment. With time, canopy closure would be expected to recover to some extent, as the retained trees expand their crowns in diameter and depth in response to the release from competition that results from the thinning. Non-commercial and commercial thinning where old trees are deferred would help to promote the development of larger trees in the stand. Thus, these treatments could facilitate the development of higher quality foraging and nesting habitat in the long term. However, foraging habitat in primarily grand fir stands may be slightly reduced because thinning would select against grand fir species, which is a desirable forage species for pileated woodpeckers.

Prescribed burning may reduce habitat suitability by reducing downed wood and canopy closure, and by altering the timing of tree mortality in grand fir and Douglas-fir. Fire is likely to result in an increase of fire-killed fir trees soon after the treatment, providing a flush of foraging substrate, but later within-stand tree mortality is expected to decline and thus foraging opportunities would also decline. The level of impact to suitability for pileated woodpeckers with this treatment is dependent on fuel loading and burn conditions initially, as well as the frequency of maintenance burning. It is assumed that across the majority of the proposed prescribed fire areas, forested stands are expected to retain sufficient tree densities.

Each action alternative proposes an approximate 867-acre expansion of the management area 13 network, as well as the designated connectivity corridor (2,200 acres in alternative 2 and 3,260 acres in alternative 3). The management area 13 network and proposed connectivity corridors would continue to provide nesting and foraging habitat at existing levels. Activities within designated connectivity corridors would be designed to manage stands within the top third of site potential so that stand structure would not be lost. These areas would also be expected to continue to provide suitable nesting habitat for pileated woodpeckers.

Further, approximately 4,600 acres (approximately 23 percent) of the planning area is within the Greenhorn Mountain (2,040 acres) and Dixie Butte (3,100 acres) inventoried roadless areas. Habitats within the inventoried roadless areas are currently providing suitable nesting and foraging habitat (most of timbered portions and riparian habitat conservation areas) and inventoried roadless areas would continue to provide habitat at current levels.

Effects from road activities and proposed recreation improvements (trail construction, trail maintenance, trailhead development, etc.) would be consistent with those analyzed in the expected effects of proposed activities to dead and defective habitat (see the Management Indicator Species section of this section under Dead and Defective Habitat for Cavity Excavating Birds, Including Black-Backed Woodpecker). Other activities would not be expected to have any adverse effects to pileated woodpecker habitat other than temporary disturbance and displacement during project activities.

Direct and Indirect Effect – Pine Marten

Chapter 2 describes the differences in intensity (acres treated or miles proposed) of proposed treatments under each alternative. It is assumed that as the intensity of the proposed treatments change, the level of expected effects discussed below would change accordingly.

Due to the extent of late and old structure and suitable marten habitat in the planning area, management activities under both alternatives would occur within suitable marten habitat. Upland restoration activities were designed to avoid known occupied habitat and the most suitable habitat, and proposed connectivity corridors were designed to ensure these critical habitat patches would be connected to other optimal habitat and the management area 13 network (and proposed expansions) across the landscape. Even so, other areas of suitable marten habitat would be treated. Many stands determined to be occupied or providing optimum habitat are either associated with riparian areas, or are located in the higher elevations of the planning area.

Suitable habitat also exists in the Dixie Butte and Greenhorn Mountain inventoried roadless areas, which would be very lightly treated under either action alternative. Proposed treatments in these areas would be specifically designed to enhance western white pine, whitebark pine, or dry meadow and scabland habitat (which martens would not be expected to use). See the Ragged Ruby Silviculture Report for the extent and description of these treatments. In the short term, these treatments could create small openings that would likely be avoided by martens; however, it would not be expected to affect the overall suitability of that habitat.

Proposed upland restoration and fuel activities in more isolated stands that lack the desired structure for adequate connectivity to other marten habitat would not affect pine marten to the extent of more suitable and connected habitat, if at all.

Commercial and non-commercial thinning in suitable marten habitat would result in impacts to the density of ground level vegetation and its effectiveness as cover for pine martens. Denser understory development is important to the security of the species from predation, as well as its ability to successfully hunt and find prey (Ruggiero et al. 1994).

Both action alternatives would allow for removal of grand fir and Douglas-fir 21 inches or greater diameter at breast height (as amended). Removal of larger grand fir has some potential for affecting denning or resting sites, if present. However, it is estimated the number of trees removed would be one tree or less per acre in most areas. This could result in short- to long-term effects to habitat depending on location and plant association group where grand fir would be removed. Large grand fir removed from the Cool Moist plant association group would have the most impacts to marten, as Cool Moist typically provides better habitat.

While dead wood habitats would remain relatively unchanged, and continue to provide habitats for marten, the loss of vegetation cover may be enough to limit or prevent use of treated habitats in the short to mid term. Treatments were designed to move stands towards older age classes and alignment with the historical range of variability, which could be beneficial to pine marten in the long term, where historical habitat was present, without repeated entries for thinning activities.

Prescribed underburning can alter or remove vertical and horizontal stand structure including snags and downed wood. Studies by Hardy and Reinhardt (1998) document both loss of existing snags during prescribed burning and recruitment of new snags through fire-caused tree mortality. The level of loss and replacement is dependent on fire intensity, time of year, local weather conditions, and fuel load. Generally, smaller-diameter trees would be killed by fire, resulting in the recruitment of small-diameter snags. Large-diameter snags could be consumed by fire depending on the time of year burned and the fuel moisture content. Underburning could result in a loss of downed wood, and reduce prey availability and subnivean access (Bull and Blumton 1999). The entire planning area is included for potential planned ignition areas under alternative 2. Alternative 3 would not propose direct ignition within connectivity corridors.

Spring burning would not be expected to significantly affect pine marten habitat, as fuel moisture is generally higher, resulting in minimal loss of the critical downed wood component of marten habitat. Further, project design criteria would require coordination with district wildlife staff prior to any planned ignitions, to eliminate or minimize effects to this habitat.

Fall burning would be expected to have more substantial impacts to marten habitat. With fuel moisture generally lower in the fall and the inherent density of dead and downed wood that constitutes primary marten habitat (ladder fuels), fall burning could consume a larger amount of downed wood resulting in unsuitable habitat for pine marten. Depending on the size and intensity of fall burns, alternatives 2 or 3 could remove a substantial amount of suitable marten habitat in the planning area.

The recreation-related activities proposed under alternatives 2 and 3 could result in increased recreation in the area. Although the distance affected is unknown, depending on levels of recreation, some areas immediately adjacent to these trails could become entirely unsuitable for pine marten due to routine disturbance and displacement. See the Management Indicator Species section of this document under Dead and Defective Habitat for Cavity Excavating Birds, Including Black-Backed Woodpecker for the expected effects to snags from the proposed trail systems. Loss of snags and downed wood from regular trail clearing and maintenance ultimately would remove these critical components of marten habitat and could render habitat adjacent to trails unsuitable for pine marten. However, these effects cannot be quantified, as the levels of recreation and use of these trails are impossible to predict. At the current use levels, there would be little to no effect to pine marten as individuals are likely adapted to areas with little use, and displaced from areas with higher use.

Effects from road activities would be consistent with those analyzed in the expected effects of proposed activities to dead and defective habitat; see the Management Indicator Species section of this section under Dead and Defective Habitat for Cavity Excavating Birds, Including Black-Backed Woodpecker.

Aspen and riparian restoration would enhance habitat diversity and benefit prey species of pine marten as long as diverse understory and shrub components were developed and maintained. In the long term, improved cover within riparian areas would increase overhead security for pine marten.

The Forest's network of dedicated and replacement old growth, combined with the proposed expansion under the action alternatives in the Ragged Ruby planning area, would continue to be managed to retain or develop habitat for pine marten and pileated woodpecker. The expansion of this management area would ultimately be beneficial for pine marten populations, assuming the absence of stand-replacing disturbance.

Direct and Indirect Effects – Three-toed Woodpecker

A variety of treatments are proposed under each action alternative, including commercial and non-commercial thinning and prescribed fire, with the intent to reduce susceptibility to fire and insect and disease activity by reducing stand density and moving species composition more toward the ecologically desired mix (ponderosa pine and western larch) in Warm Dry forest types.

Thinning would occur in potential three-toed woodpecker habitat within the Cold Dry forest type and Cool Moist habitat (see Ragged Ruby Silviculture Report for percentages), although no thinning would occur in dedicated old growth in either forest type. However, Cool Moist and

Cold Dry plant association groups are currently within or above the historical range of variability across the planning area. Further, the management area 13 complex would be expanded and connectivity corridors would be designated. Old-growth lodgepole stands that meet the criteria for primary habitat occur only in the Greenhorn Mountain Inventoried Roadless Area and would not be proposed for treatment.

Proposed treatment prescriptions in Cool Moist habitat are designed to mimic historical, mixed-severity fire conditions with the goal of creating more resilient, healthier Cool Moist habitats. Further, the Malheur National Forest is within the historical range of variability for Cool Moist three-toed woodpecker habitat. In the short term, three-toed woodpecker habitat would be expected to decrease in the planning area; however, sustainable Cool Moist/Cold Dry lodgepole pine habitat would help ensure habitat retention in the long term.

Both action alternatives propose aspen restoration. However, these activities would have negligible benefits to the three-toed woodpecker.

Effects from road activities and proposed recreation trail construction and maintenance would be consistent with those analyzed in the expected effects of proposed activities to dead and defective habitat; see the Management Indicator Species section of this section under Dead and Defective Habitat for Cavity Excavating Birds, Including Black-Backed Woodpecker.

Because of the small amount and location of suitable secondary habitat, and the expansion of the management area 13 network and designation of connectivity corridors under the action alternatives, it is not expected the Ragged Ruby Project would result in any viability concerns to three-toed woodpeckers.

Cumulative Effects – Old Growth Network, Late and Old Structure, and Old Growth Dependent Species

The area considered for cumulative effects is the Camp Creek – Middle Fork John Day River watershed and associated Middle Fork John Day River corridor. All of the activities in Appendix E – Past, Ongoing, and Reasonably Foreseeable Actions have been considered for their cumulative effects on old growth, connectivity habitat, and associated species. The following discussion focuses on those past, ongoing, and reasonably foreseeable actions that may contribute beneficial or adverse effects. Past activities such as timber harvest, road construction, fire suppression, and wildfire have combined to create the current old growth condition in the analysis area. The historical range of variability of forest vegetation in the planning area (see Ragged Ruby Silviculture Report) reflects the effects of past activities on structural stage.

Continued livestock grazing and active mining would not reduce old growth habitat, important snag habitat, or downed wood, nor decrease connectivity for old growth dependent species. However, wildlife use riparian areas with adequate vegetation (deciduous hardwoods or shrubs) to provide cover as travel corridors. Many of the major drainages in the Ragged Ruby planning area are not providing this cover as a result of historical and current livestock grazing. So even though the connectivity would not be decreased from livestock grazing, the effectiveness of some of that connectivity may be.

Although alternatives 2 and 3 would reduce old forest multi-strata throughout the planning area in the short term, old forest multi-strata would not be altered within the proposed management area 13 network. In dry forest types, stands would be managed towards the old forest single stratum structural stage (where the historical range of variability indicates). There would not be a loss of old growth habitat as a result of any action alternative, although structural stages could change. The action alternatives would retain old growth habitat and expand and manage a system of dedicated old growth, replacement old growth, and pileated woodpecker feeding areas. There would be no net loss of dedicated old growth, but an expansion of approximately 867 acres in the management area 13 network. Furthermore, old growth habitats would be connected by connectivity corridors under each alternative, reducing landscape fragmentation (other than intermittent disruptions from roads and fences) as a result of management activities.

Proposed projects may require new and temporary road construction, road decommissioning, and road closures. During harvest operations, it is expected that habitat would be lost through the felling of snags that pose a hazard to workers and equipment, not only within units but along haul routes as well. New road construction would allow more access to snags, which could be removed as firewood, reducing habitat for pileated woodpeckers, martens, white-headed woodpeckers, three toed woodpeckers, and other species that use dead wood habitats. The Malheur National Forest sold permits for 8,144 cords of firewood in 2016, and 8,594 cords in 2017. Firewood and log harvest would be expected to continue at similar levels. Although spread out across the Malheur National Forest, this level of firewood cutting, when combined with the removal of hazard trees from roads, landings, recreation trails, and facilities from numerous landscape-level projects across the Forest, could result in a significant loss of snag habitat. Post-fire areas across the Forest are likely providing adequate habitat for species that prefer post-fire areas, but species that prefer old growth habitat may be forced to use less suitable habitat, or become more concentrated in less disturbed areas. This would increase competition for resources in those areas and could result in a negative population trend for some species, although sustained viability of those species would be expected to continue. Effects resulting from the proposed activities would be mitigated by effective road closures after implementation of an action alternative and project design criteria for snag retention.

Changes in dead wood habitats as a result of the Ragged Ruby Project could be detrimental to old growth habitat under alternatives 2 and 3, particularly with hot fall burning; although interdepartmental communication and project design criteria would provide an opportunity to design and schedule prescribed fire to have minimal effects to old growth habitat. Intermittent fragmentation of old growth habitat as a result of ineffective road closures and new fence corridors would be expected under alternatives 2 and 3.

In the short term, the action alternatives would not contribute to cumulative losses of old growth habitat because late and old structure stands would be treated to maintain or enhance old growth attributes. In the long term, the action alternatives would contribute beneficially to the development of old forest single stratum, retention of old forest multi-strata within or above the historical range of variability, and maintenance of connectivity habitat between the highest quality late and old structure habitats.

Cumulative Effects Specific to Pileated Woodpecker

Cumulative effects to pileated woodpecker would be expected to be similar to those discussed under the cumulative effects section of dead and defective wood habitat for primary cavity excavators, above.

Cumulative effects, specifically regarding the management of management area 13 across the Forest, would be beneficial to pileated woodpeckers, as management area 13 has continually been expanded.

While additive cumulative effects to overall habitat may be anticipated, projects are consistent with Malheur Forest Plan objectives because the project is consistent with the standards and guidelines relating to pileated woodpecker (USDA Forest Service 1990a, Forest-wide standard 1, page V-30) and habitat would remain above the historical range of variability within the planning area.

Cumulative Effects Specific to Pine Marten

Cumulative effects discussed under the dead and defective habitat for primary cavity excavators are similar to those for pine marten habitat.

Past timber harvest targeted and removed many of the largest diameter trees, reducing old forest structure. Within mixed-conifer stands, even large-diameter grand fir (important nesting and denning habitat for pine marten), were often removed and piled in cull decks to be disposed of by burning or chipping. Large green replacement trees removed during this period reduced future snag potential and subsequent large-snag densities throughout the planning area. Past harvest activities that included overstory removal, shelterwood, and regeneration harvest, reduced the quantity and quality of connectivity between late and old structure and management area 13 habitat in some areas. Restoration prescriptions (thinning) under each action alternative would add to cumulative impacts from past timber harvest and fuels reduction projects.

Together with other landscape objectives that limit or discourage large fires and insect outbreaks, the Ragged Ruby Project would help protect the highest quality existing old growth habitat from these disturbances. However, these same treatments would contribute to a negative trend in dead wood and structural complexity, important components of marten habitat, across the Forest. These treatments, added to the needs for hazard tree felling along roads and enhanced recreation infrastructure (trails, trailheads, etc.) either from new or ongoing projects, firewood cutting, road activities, and new fence corridors (from construction and maintenance), would further alter this component of marten habitat.

Fire suppression has allowed shade-tolerant tree species to increase, shifting many stands to denser, multistory structure. Fire suppression also removes snags as hazards. Prescribed fire would open some stands, removing some of the smaller ingrowth. Low-intensity prescribed fire would be expected to burn in a mosaic, creating a diversity of habitat at various scales. Small patches of tree mortality could provide snags or create downed wood from fallen trees, important habitat features for pine marten and their associated prey species. Higher-severity fall burning in pine marten habitat could reduce suitable habitat significantly in the short to mid term if high levels of dead and downed wood are consumed.

Roads and other linear features (fences and trails) create openings and fragment blocks of contiguous forest habitat. Vehicle and recreationist traffic, and the resulting disturbance, reduces security. Roads also provide access for firewood cutting. Public firewood cutting is expected to continue along open roads and closed roads with ineffective barriers and could have an additive negative effect on snag retention. In 2016 and 2017, the Malheur National Forest sold permits for 8,144 cords and 8,594 cords of firewood, respectively. Based on the proposed Access Travel Management Plan, it is foreseeable that cross-country travel would be restricted for off-highway vehicle travel, with the exception of accessing dispersed camping sites from open roads, and potentially game retrieval. Proposed road decommissioning and closure activities for the Ragged Ruby Project, combined with the foreseeable changes in travel management, would have a beneficial cumulative effect on snag retention, by reducing access for firewood cutting. However, higher levels of recreation could be encouraged with improved infrastructure and could be expected to cumulatively add to snag loss through hazard tree felling, and could conceivably cumulatively add to fragmentation of old growth and late and old structure habitat. As fences are constructed through connectivity corridors and late and old structure habitats, large snags that fall across fence would be bucked into smaller pieces, and increased access (along the fences or administratively closed roads) may be needed to haul materials, for future road maintenance, or both. This could ultimately encourage more motorized use along access routes, further adding to disturbance and potential removal of habitat components.

Because this planning area contains occupied and extensive suitable habitat for pine martens, the overall direct, indirect, and cumulative effects could result in a negative population trend. Combined with other similar projects, particularly in the Middle Fork John Day River corridor, the loss or alteration of habitat could be significant at the scale of the Forest. However, the expansion of management area 13 and connectivity proposed would cumulatively add to old growth (management area 13) and retain the highest quality late and old structure habitat. Other projects across the Forest have also expanded management area 13 and retained late and old structure stands through the designation of connectivity corridors. Ultimately, not enough information is known about pine marten populations or distribution across the Forest to accurately determine continued viability. However, due to the reasons discussed in the Conclusion for Pine Marten section below, it is expected that pine marten would continue to occur on the Forest, although localized populations (Middle Fork John Day River corridor martens) could see considerable declines in suitable habitat or populations.

Cumulative Effects Specific to Three-Toed Woodpeckers

Review Cumulative Effects to Dead and Defective Habitat for Cavity Excavating Birds, Including Black-Backed Woodpecker section above for a relevant cumulative discussion of dead and defective habitat.

Conclusion for Old Growth Network and Late and Old Structure

Proposed activities, combined with the management area 13 expansion proposed in other projects Forest-wide, would contribute beneficially toward the viability of species that use old forest single stratum habitats, and would maintain viability of species that use old forest multi-strata habitats.

Conclusion for Pileated Woodpecker

In the 20-year modeling period (see the Ragged Ruby Silviculture Report), vegetation structure would move toward alignment with the historical range of variability for old forest single stratum and old-forest multi-strata under both action alternatives. Under the 40-year modeling scenario, both action alternatives would result in attaining the historical range of variability in old forest single stratum; however, old forest multi-strata would continue to exceed the historical range of variability. Therefore, alternatives 2 and 3 could reduce existing pileated woodpecker habitat in the short term (short-term decrease in old forest multi-strata). However, with old forest multi-strata expected to increase and exceed the historical range of variability under each alternative in the long term, habitat for pileated woodpecker would eventually be expected to increase.

The expansion of the management area 13 network and designation of connectivity corridors would retain portions of the planning area in their existing condition. Most of these areas currently provide suitable nesting and/or foraging habitat for pileated woodpeckers, and would be expected to continue to do so.

Due to the expected shifts in forest structure, expansion of the management area 13 network, and designation of connectivity, the overall direct and indirect effects could result in a small negative trend of habitat in the short to mid term (short-term decrease in existing old forest multi-strata). However, old forest multi-strata habitat would remain within or above the historical range of variability in the short and long term under each action alternative. Therefore, population viability for pileated woodpecker is expected on the Malheur National Forest under each alternative.

Conclusion for Pine Marten

Alternative 1 would not affect pine marten habitat and therefore would not contribute to a negative trend in viability on the Malheur National Forest.

Alternatives 2 and 3 could have considerable effects to pine marten habitat from the proposed prescribed fall burning and upland restoration activities in late and old structure habitat. Continued viability of the pine marten populations is expected on the Malheur National Forest under all action alternatives for the following reasons:

- The Ragged Ruby planning area and adjacent Middle Fork John Day River corridor contain extensive habitat for pine marten (relative to other areas of the Forest). Further, much of the Middle Fork John Day River corridor is currently being planned or implemented with similar landscape-level projects.
- Most treatment prescriptions in late and old structure or suitable marten habitat would retain late and old structure characteristics and would only be expected to be unsuitable in the short to mid term.
- Management area 13 expansion and designation of connectivity corridors throughout the planning area and the Middle Fork John Day River corridor would retain and connect the highest quality late and old structure habitat, including all patches known to be occupied.
- Connectivity corridors are directly connected to designated corridors in adjacent planning areas, and would be expected to connect late and old structure in reasonably foreseeable future planning areas. Corridors would ultimately connect late and old structure across watersheds, or even larger areas, as planning and implementation of projects continues across the Forest.
- Large areas of untreated habitat would be retained throughout the Middle Fork John Day River corridor and Camp Creek watershed, including management area 13 expansions, extensive connectivity corridors, steeper terrain and inventoried roadless areas (Dixie Butte and Greenhorn Mountain), and mostly roadless scenic areas (Vinegar Hill-Indian Rock).
- Even with numerous linear interruptions (roads, trails, fences), the cumulative management area 13 expansions and designation of connectivity would provide, retain, and connect adequate habitat for pine marten denning, foraging, and dispersal.
- Current downed wood levels are near or above the historical range of variability in all size and density classes.
- Project design criteria would minimize the loss of snags and downed wood from project activities where possible. These would not apply to hazard tree removal or firewood cutting.
- Assuming that by moving towards historical conditions, pine marten populations would remain viable, as they maintained their viability through those historical conditions.
- Although pine marten populations are considered vulnerable (S3; NatureServe 2016) in eastern Oregon, they are also an unprotected furbearer with an open season (trapping and

hunting) from November 1 to January 31, indicating a sustainable, viable population across Grant County and the greater Blue Mountains.

Conclusion for Three-Toed Woodpeckers

Because this project impacts little if any suitable habitat for the species, and there is no documentation of the species in the area, the overall direct, indirect, and cumulative effects could result in a small negative trend of habitat, but any loss of habitat would be insignificant at the scale of the Forest. While additive cumulative effects may be anticipated throughout the Camp Creek watershed and associated Middle Fork John Day River corridor, continued viability of the three-toed woodpecker is expected on the Malheur National Forest because much of their habitat is not targeted for treatments, and conditions would be more in line with the historical range of variability.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Alternatives 2 and 3 comply with the regulatory framework, except where forest plan amendments are proposed.

Wildlife – Featured Species

Regulatory Framework

Featured species are identified in the Malheur Forest Plan as species that require special protections. The Malheur Forest Plan (USDA Forest Service 1990a, pages IV-30 and IV-31) provides direction (Forest-wide standards 50 through 55) for the protection of habitat for these species. Eastside Screens contains additional direction for northern goshawks.

Resource Indicators

Resource element, indicator, and measure for assessing the effects to wildlife – featured species are presented in Table 60.

Table 60. Resource elements, indicators, and measures for assessing effects to wildlife featured species

Resource element	Resource indicator	Measure	Source
Featured species	Habitat for blue (dusky) grouse, osprey and northern goshawk	Retention and maintenance and improvement of habitat	Malheur Forest Plan (USDA Forest Service 1990a, Forest-wide standard 61, page IV-30

Species Analyzed in this Section

Only species with habitat in the planning area are discussed in detail in this section; see Table 61. Other featured species currently on the Malheur National Forest include sage grouse (*Centrocercus urophasianus*), pronghorn antelope (*Antilocapra americana*), California bighorn sheep (*Ovis canadensis*), and upland sandpiper (*Bartramia longicauda*), but these will not be discussed further due to lack of confirmed or suitable habitat in the planning area. See Ragged Ruby Wildlife Report for more information.

Table 61. Featured species of the Malheur National Forest – habitat requirements and presence within the Ragged Ruby planning area

Featured species	Habitat requirements	Habitat present in planning area?
Northern goshawk (*Accipiter gentilis*)	A mosaic of mature, mixed-conifer stands, with closed canopies and interspersed openings suitable of supporting a wide array of prey	Yes, although no known nest areas
Blue (dusky) grouse (*Dendragapus obscurus*)	Coniferous forests (Douglas-fir, grand fir, and subalpine fir) with a mixture of deciduous trees and shrubs near edges and openings with clumps of mistletoe infected Douglas-fir on ridgetops or upper slopes of ridges	Yes
Osprey (*Pandion haliaetus*)	Large, old growth trees with dead tops or large snags suitable for nesting (30 inches diameter at breast height and greater than 60 feet high) adjacent to large rivers or lakes	Yes, suspected foraging habitat along the Middle Fork John Day River

For general methodology, an overview of direct and indirect effects from the alternatives, wildlife issues identified during public scoping, and compliance with forest plan and other relevant laws, regulations, and policies, see Information Relevant to All Species section within the Wildlife – Proposed, Endangered, Threatened, and Sensitive species section.

Northern Goshawk

Affected Environment

Methodology

The northern goshawk is a raptor and the Malheur Forest Plan provides guidance for the protection of nests, the protection of habitat surrounding nests, and the minimization of disturbance to nesting individuals.

The Eastside Screens established minimum standards for protection of the northern goshawk, stating that “until further information is known and management plans approved to ensure species viability, the following standards are to be met as a minimum.” The minimum standards which are still in effect are:

- Protect every known active and historically used goshawk nest site from disturbance. “Historical” refers to known nesting activity occurring at the site in the last 5 years. Seasonal restrictions on activities near nest sites will be required for activities that may disturb or harass a pair while bonding and nesting.
- Thirty acres of the most suitable nesting habitat surrounding all active and historical active nest tree(s) will be deferred from harvest.
- A 400-acre “post fledging area” will be established around every known active nest site. While harvest activities can occur within this area, retain late and old structure stands and enhance younger stands toward late and old structure condition, as possible.

See also Information Relevant to All Species section, under Wildlife – Proposed, Endangered, Threatened, and Sensitive Species.

Existing Condition

In the Pacific Northwest, northern goshawks prefer to nest in mature, unlogged, or lightly managed forested habitats. These areas include sites with closed canopies (greater than 60 percent), northerly exposures, gentle slopes, and close proximity to water (Reynolds et al. 1992). Canopy closure is an important factor in nest site selection and, in the desired percentages, provides security from avian predators and decreases impacts from human disturbance. Nest trees are typically dominant trees in the canopy (10 to 58 inches diameter at breast height) and are usually in Douglas-fir, ponderosa pine, and western larch (McGrath et al. 2003).

Peer-reviewed research suggests that goshawks forage in a variety of forested and non-forested environments (Brewer et al. 2007). Small openings and forest edges in mixed-conifer and ponderosa pine forests in particular appear to be important for foraging. These foraging habitats support higher plant diversities and, in turn, support a higher number of desirable prey species such as rabbits, squirrels, and grouse. Threats include timber harvest methods that create large areas of reduced canopy cover, or increased human presence that displace the northern goshawk during nesting.

There are no known nesting territories within the planning area. If discovered prior to or during implementation, a 400 plus acre post-fledging area would be mapped for this territory. A nest stand would be delineated for the territory, meeting the 30-acre requirement established by the Eastside Screens.

Extensive suitable habitat exists within the planning area. Although surveys were conducted and no nests were discovered, goshawk nests likely exist throughout the planning area.

Environmental Consequences

Methodology

See Methodology section in affected environment. See also Information Relevant to All Species section, under Wildlife – Proposed, Endangered, Threatened, and Sensitive Species.

Alternative 1 – No Action

Direct and Indirect Effects

Under alternative 1, no management activities proposed for the planning area would occur. In the short to mid term, the northern goshawk habitat within the planning area would be maintained in the current condition. In the absence of disturbance, open pine stands would continue to transition to multistory stands. In the long term, habitat for northern goshawk could increase in some areas as stand density and canopy cover increases. Availability of habitat would depend on physical characteristics of the site as well, as nests are generally located near water in drainages or swales, and areas of gentle topography. Stand composition may deteriorate, as overstocking may actually retard the development of mature forests and larger trees, or reduce the mosaic of structural stages required for diversity of prey species.

In the absence of disturbance, within all of the northern goshawk territories, there would be a continued accumulation of surface fuels (litter and duff) and ladder fuels (small trees growing in and around larger trees). Fire hazard and risk of insect outbreaks would remain elevated for some stands.

Open road density would remain the same, as would the loss of snags due to firewood cutting. This loss of snags may reduce goshawk prey habitat, perch sites, and plucking posts.

Cumulative Effects

Because there would be no direct or indirect effects, there would be no cumulative effects.

Alternatives 2 and 3

Direct and Indirect Effects

Habitat alteration, such as management activities, or human disturbances, can affect nest occupancy and productivity, decrease availability of appropriate nesting habitat, and cause nest failure or abandonment ; see Ragged Ruby Wildlife Report. Reductions in cover may cause existing territories may be abandoned due to a lack of preferred nesting and foraging habitat structure. However, the connectivity and overall amount of old forest multi-strata not being treated across the planning area would likely mitigate effects. Further, goshawks have been observed across the Malheur National Forest successfully nesting in non-traditional nest-type habitat, including young forest multi-strata, single stratum stands, and even plantation-like stands in one case. These activities may impact individuals or habitat, but overall, should not adversely impact northern goshawk populations.

Thinning could also alter foraging habitat by reducing canopy cover and, consequently, prey assemblages. Generally, a diverse and complex post-fledging area would support a more diverse prey base, resulting in more prey availability. See Ragged Ruby Wildlife Report for more details.

Prescribed fire could enhance goshawk prey conditions and is expected to help advance stands toward late or old structural conditions, although likely old forest single stratum. Individuals may be temporarily displaced, may have to travel farther for foraging opportunities, and hunting skills may be temporarily hindered by smoke during implementation of prescribed fire. However, underburning and prescribed fire are expected to enhance goshawk prey habitat, therefore would have a beneficial effect to goshawks.

Proposed recreation activities would not be expected to have any effect to northern goshawks other than temporary disturbance and displacement during implementation. If recreation increases in the area as a result of the project, higher levels of disturbance may occur until individuals acclimate to or are displaced from affected areas. Project design criteria and timing restrictions would mitigate disturbance to nesting goshawks near project activities if nests are discovered.

Road construction would reduce habitat for goshawk prey species, and construction of temporary roads would fragment existing mature stands. However, open road densities would not substantially increase as a result of project implementation. As currently closed roads with unauthorized use are effectively closed, overall disturbance from vehicles is expected to decrease. Temporary road construction would not dissect any known nest stands or post-fledging areas, further limiting disturbance from roads.

Aspen restoration and protection would change overstory composition of aspen stands. Understory grass and forb cover could increase, potentially increasing prey species for goshawk. Small openings in riparian areas, particularly with enhanced deciduous vegetation, could conceivably increase prey diversity, potentially increasing prey availability and abundance for goshawks. However, it is expected that the 10 acres of proposed aspen restoration would have negligible direct or indirect effects to goshawk individuals.

Cumulative Effects

Cumulative effects are similar as described in the Information Relevant to All Species section. Differences are specified below.

Changes in forest structure related to fire suppression tend to increase cover and structure within source habitat for goshawk. However, due to a thicker understory component, some of the denser unburned forest stands may not be optimal goshawk habitat (Wisdom et al. 2000), particularly for foraging. These denser stands are more vulnerable to stand-replacing wildfires. Stand-replacing fires would represent total loss of forest structure and would subsequently greatly reduce goshawk nesting and foraging habitat.

Invasive plants lead to habitat degradation by competing with native vegetation. Project design criteria in the planning area would help minimize the establishment or spread of non-native invasive plants. Further, the Malheur National Forest Site-Specific Invasive Plants Treatments Record of Decision (USDA Forest Service 2015a) authorizes herbicide, manual, mechanical, biological, or cultural treatments of invasive plants on the Forest. Future treatment of this infestation would cumulatively increase native plants, and thus improve goshawk prey habitat.

Past grazing practices may have impacted herbaceous and shrubby vegetation that provides important food for goshawk prey species. However, current livestock grazing practices, including Malheur Forest Plan standards, provide for a sustained production of palatable forage for grazing by livestock and wildlife species dependent on herbaceous and shrubby vegetation cover. Overall forage is not considered a factor limiting goshawk population viability, and consequently cumulative changes to foraging habitat, whether beneficial or adverse, may not contribute to a measurable change in goshawk populations.

Northern goshawks are considered highly sensitive to disturbance during the breeding season; hence, design incorporates seasonal restrictions for activities on National Forest System lands located near known nest sites.

Road development, associated with logging activities, has also contributed to habitat loss and has fragmented habitat important for prey species. The Ragged Ruby Project proposes temporary road construction, road decommissioning, road closures, and conversion of a road to trail. In the short term, road use and on-site work would increase human presence in the area and increase noise and overall disturbance associated with activities. After project implementation, road closures and decommissioning would reduce effects to breeding and nesting goshawks.

Construction of the Butte Pasture fence, especially where it crosses old forest multi-strata habitat, could conceivably result in direct mortality of northern goshawks and other forest raptors from direct fence strikes (raptors flying into fence).

In the short term, implementation of any of the action alternatives would contribute to habitat loss and fragmentation for prey species. In the long term, alternatives 2 and 3 would contribute to possible acceleration of old forest single stratum and old forest multi-strata structure in some areas, and reduce catastrophic fire risk in treatment areas.

Conclusion for Northern Goshawk

Alternative 1 would maintain the suitability of all existing habitat. Additionally, this alternative would not result in displacement of goshawks.

For alternatives 2 and 3, habitat would remain above the historical range of variability for old forest multi-strata and approach the historical range of variability for old forest single stratum; both forest types may have sufficient canopy cover to be reproductive habitat. However, some treated stands would be structurally less complex following treatment and, though still suitable, may have reduced habitat quality immediately following treatment. Over time, stand complexity is expected to improve and may in the long term result in higher quality habitat than what may develop in some untreated stands.

There would be an adequate amount of nesting habitat available to goshawks displaced by project activities. There could be increased nest abandonment and failure, which could lead to decreased recruitment in the short term, primarily during implementation. However, no loss of individuals would be expected from project activities under any alternative. Therefore, no effects to goshawk viability would be expected from the implementation of any of the alternatives.

Blue (Dusky) Grouse

Affected Environment

Methodology

The blue grouse (also known as the dusky grouse) prefer coniferous forest (Douglas-fir, grand fir, and subalpine fir) with a mixture of deciduous trees and shrubs near edges and openings.

Blue grouse nest in a variety of forest and shrub vegetation types, from foothills to timberline. Dense coniferous thickets of small trees, stumps, and downed logs are used by blue grouse for resting and drumming, and as escape cover. Grouse also utilize dense deciduous areas in riparian corridors.

The Malheur Forest Plan standard for the protection of grouse habitat (USDA Forest Service 1990a, Forest-wide standard 50, page IV-30) states that projects “maintain grouse winter roost habitat.” Winter range typically includes conifer forests from lower elevations to subalpine, and they generally utilize large, mistletoe-infected Douglas-fir trees as winter roosts, often located within the upper one-third of slopes.

See also Information Relevant to All Species section, under Wildlife – Proposed, Endangered, Threatened, and Sensitive Species.

Existing Condition

Past fire suppression in parts of the planning area allowed for the encroachment of shade-tolerant conifer species, including Douglas-fir. Subsequently, increased stand densities have resulted in an increase in insect damage, disease, and parasitism, including dwarf mistletoe in mixed-conifer stands.

Formal surveys for blue grouse have not been conducted in the planning area, but individuals have been documented across seasons in the area. Winter roost habitat is present across the planning area.

Environmental Consequences

Methodology

See Methodology section under affected environment above. See also Information Relevant to All Species section, under Wildlife – Proposed, Endangered, Threatened, and Sensitive Species.

Alternative 1 – No Action

Direct and Indirect Effects

Under alternative 1, no management activities proposed for the Ragged Ruby Project would occur. Habitat conditions would remain unchanged in the short and mid-term. Over the long term, increased stand densities and related stress would result in a greater incidence of insects and disease in the planning area. Dwarf mistletoe, one of the diseases that increases with increasing stand densities, would increase where present within the planning area. Winter roost habitat would also increase given an increase in mistletoe-infected Douglas-fir. Heavy gnarled limbs and dense foliage ("witches brooms") created by dwarf mistletoe would create ideal roosting habitat for blue grouse. However, in the event of a wildfire, uncharacteristically intense burns could effectively sanitize stands of dwarf mistletoe. When all trees are killed, reestablishment of dwarf mistletoe in stands could take decades, as seeds are reintroduced by birds and the mistletoe slowly spreads (Spiegel 2014).

Cumulative Effects

Because there would be no direct or indirect effects, there would be no cumulative effects.

Alternatives 2 and 3

Direct and Indirect Effects

Harvest of mistletoe-infected trees potentially providing winter roost habitat for blue grouse would occur from commercial and non-commercial thinning under each action alternative. Activities that remove Douglas-fir trees with mistletoe would reduce roost habitat and preferred forest structure. Since blue grouse depend on needles and buds of Douglas-fir and ponderosa pine during the winter, thinning of mature Douglas-fir and ponderosa pine would also impact winter food supplies. Larger, older trees over 150 years old would be retained. Younger trees less than 150 years, regardless of size, could be removed. As directed by the Malheur Forest Plan, design elements would be incorporated into harvest prescriptions to maintain winter roost habitat (see chapter 2 and the Ragged Ruby Draft Silviculture Prescription). Skips within units and no treatment areas would also retain trees that could potentially host dwarf mistletoe. Consequently, dwarf mistletoe is anticipated to be retained on the landscape.

Silviculture prescriptions include practices to provide blue grouse winter roosts by retaining large mistletoe infested or wolfy Douglas-fir trees, where available along ridgetops and large scab openings. Overall, forest health is expected to increase from implementing thinning treatments, resulting in a decrease in dwarf mistletoe.

Prescribed burning would directly remove nesting habitat and, if implemented during the primary nesting season, could cause direct mortality of blue grouse adults and offspring. However, grasses and forbs suitable for blue grouse nesting cover would be expected to establish and become denser and more vigorous within several years (2 to 5) after ignition events, resulting in enhanced habitat. Herbaceous vegetation conceals the broods and contains insects, an important food source for blue grouse (Mussehl 1963). In eastern Oregon, prescribed burning and additional methods that maintain park-like stands may benefit this species. Prescribed burning project design criteria would mitigate some expected direct impacts to blue grouse.

Implementation of proposed activities and potentially increased recreational use would result in some level of disturbance and displacement of wildlife in the short term. The level of disturbance and displacement would depend on the time of year, extent, and the tolerance of the species and individuals involved. Not all areas of blue grouse habitat would be impacted at any given time; most large mistletoe-infected trees would be retained, and habitat where no treatment was occurring would be available for blue grouse.

Roads used (temporary construction or maintenance of currently closed roads) during project implementation may allow increased access for personal-use firewood cutting. Personal-use firewood cutting reduces the number of snags adjacent to open forest roads. This activity does not affect live trees with a potential to be used by grouse; however, recently dead mistletoe-infected trees may be removed. Woodcutting generally occurs where topography is gentle, providing easy access; not all areas with roosting habitat are accessible to woodcutters.

Project design criteria state that clumps of mistletoe-infected Douglas-fir would be maintained at the top or upper slopes of ridges for winter roost habitat and therefore meet Malheur Forest Plan standards (USDA Forest Service 1990a, Forest-wide standard 50, page IV-30).

Aspen restoration and protection would change overstory composition of aspen stands. Understory grass, forb, shrub, and downed wood cover could increase in aspen areas selected for treatments. This would be anticipated to increase potential nesting, feeding, hiding, and loafing cover for blue grouse, as well as insects, an important food source.

Cumulative Effects

All past, ongoing, and reasonably foreseeable actions (see Appendix E – Past, Ongoing, and Reasonably Foreseeable Actions) that may contribute to adverse cumulative effects to blue grouse or their habitat were considered. The area considered for cumulative effects is the Camp Creek – Middle Fork John Day watershed.

Active mining claims are not likely to affect foraging and nesting habitat for blue grouse. Therefore, mining claims are not likely to contribute to cumulative effects to blue grouse.

Invasive plants lead to habitat degradation by competing with native vegetation. Project design criteria in the planning area would help with the establishment or spread of non-native invasive plants. Further, the Malheur National Forest Site-Specific Invasive Plants Treatments Record of Decision (USDA Forest Service 2015a) authorizes herbicide, manual, mechanical, biological, or cultural treatments of invasive plants on the Forest. Future treatment of this infestation would cumulatively increase native plants, and thus improve blue grouse nesting and foraging habitat.

Cumulatively, where livestock grazing coincides with nesting and foraging, grazing would likely reduce the height of ground vegetation and possibly degrade habitat.

Prescribed burning would benefit blue grouse habitat in the long term by encouraging reintroduction of native grasses and forbs.

Restoration of the historical range of variability in the dry forest types is expected to improve the health of the forest; reducing dwarf mistletoe-infested Douglas-fir, as well as reducing cover structure important to blue grouse. Wildlife and silviculture incorporated project design criteria into each action alternative to retain mistletoe-infested Douglas-fir; this would aid in mitigating potential impacts to blue grouse individuals and their associated habitat as a result of timber harvest. Additional implementation criteria regarding shrub retention in prescribed burn units, as well as riparian areas, would further aid in mitigating potential impacts to blue grouse and their associated habitat.

Alternative 1 would not contribute to adverse cumulative effects to blue grouse populations. The combined effects of the Ragged Ruby Project action alternatives and past, ongoing, and reasonably foreseeable actions would not be expected to adversely affect populations or viability of blue grouse within the analysis area.

Conclusion for Blue (Dusky) Grouse

Each alternative contains project design criteria that follow the Eastside Screens standards for retaining blue grouse winter roost habitat. Action alternatives may affect grouse habitat; however, habitat would remain above the historical range of variability and no adverse effects would be expected to blue grouse habitat or populations from implementation of any of the action alternatives.

Osprey

Affected Environment

Methodology

Osprey build nests in large old growth trees with dead tops, or in the tops of large snags, usually within the vicinity of streams, rivers, or lakes with adequate fish populations. Osprey nests generally occur within 2 miles of fish-bearing streams and rivers (Marshall et al. 2006). On the Malheur National Forest, nests are large and bulky and placed at the top of what is usually a broken-off ponderosa pine snag. These trees are often larger in comparison and visible above the tops of the surrounding timber.

The Malheur Forest Plan standard for the protection of osprey nesting habitat states that projects: “Maintain or create large nesting snags and green replacement trees for osprey within ½ mile of streams, lakes, or reservoirs that are currently used for feeding by osprey. Preference will be given to large ponderosa pine (30 inches or greater in diameter, 60 foot minimum height) with broken tops and large limbs, at a density of one per ¼ mile of linear stream length …” (USDA Forest Service 1990a, page IV-31).

See also Information Relevant to All Species section, under Wildlife – Proposed, Endangered, Threatened, and Sensitive Species.

Existing Condition

Large ponderosa pine within the Middle Fork John Day River corridor provide the best potential nesting habitat for osprey within the Ragged Ruby planning area.

Environmental Consequences

Methodology

See Methodology section in affected environment above. See also Information Relevant to All Species section, under Wildlife – Proposed, Endangered, Threatened, and Sensitive Species.

Alternative 1 – No Action

Direct and Indirect Effects

Due to the highly migratory nature of osprey and limited foraging opportunities in the planning area, no direct and indirect adverse effects to osprey or their existing habitat are anticipated from alternative 1.

Cumulative Effects

Because there would be no direct or indirect effects, there would be no cumulative effects.

Alternatives 2 and 3

Direct and Indirect Effects

Activities (such as thinning) that would remove potential or existing nest sites such as large trees and snags within close proximity 1.25 miles (2 kilometers) to rivers and lakes could impact this species.

Under the action alternatives, suitable nesting trees and high quality snags would be protected. However, it is likely that some number of snags would be identified as hazard trees within potential habitat and would be removed as a result of the proposed activities. Since ospreys are known to nest in areas adjacent to suitable foraging habitat (such as fish-bearing waterways), proposed thinning could adversely impact ospreys utilizing the area by direct removal of existing and potential nest sites. In the long term, accelerated growth by trees remaining in units after treatment activities would ultimately provide large mature trees and potential osprey nest snags in the future. Further, foraging opportunities in the planning area are likely exclusive to the Middle Fork John Day River, which provides foraging opportunities well beyond the planning area boundaries.

Harvesting, thinning, and prescribed fire activities may temporarily displace or deter osprey from using the immediate area during project implementation. No long-term effects would be anticipated.

Other activities, such as changes in the road network and recreation activities (trail development, trailhead improvement, and interpretive sign placement) would not be expected to have any effect to osprey other than potential temporary disturbance and displacement during project activities if osprey were present.

With implementation measures in place, it is expected that any suitable or potential osprey nest trees would be maintained, and disturbance to nesting birds (if discovered) would be minimized.

Cumulative Effects

All past, ongoing, and reasonably foreseeable actions (see Appendix E – Past, Ongoing, and Reasonably Foreseeable Actions) that may contribute to adverse cumulative effects to osprey or their habitat were considered. The area considered for cumulative effects is the Camp Creek – Middle Fork John Day watershed.

Active mining claims are not likely to affect foraging and nesting habitat for osprey. Therefore, mining claims are not likely to contribute cumulative effects to osprey.

Grazing and past timber harvest and thinning have affected the quality and quantity of nesting and foraging habitat in the planning area.

Cumulatively, where livestock grazing occurs, water quality may become diminished and osprey foraging habitat and opportunity (lack of fish) may be impacted. Watershed improvements geared toward protecting native fish populations and better livestock distribution may mitigate some of these impacts.

Historical timber harvest within and adjacent to the planning area was largely related to area settlement and mining activities during the late 1800s. The highest percentage of timber harvest included clearcutting of old growth and was not geared toward retention of mature forest structure. The Malheur Forest Plan, as amended, has directed the Forest to conduct timber harvest in a manner that moves stands towards old forest multi-strata and old forest single stratum structural stages. Standards and guidelines including snag retention and green tree replacement, as well as implementation criteria for mitigating disturbances to osprey, are incorporated in the project design.

Project design criteria would be included to protect potential or newly discovered osprey nest sites, therefore cumulative adverse effects would not be expected to reduce population viability of osprey as a result of implementing any alternative.

Conclusion for Osprey

Nesting and foraging habitat within the planning area is limited, and therefore there are no impacts expected to osprey as a result of any of the action alternatives that would result in a change in the number of individuals, populations, or prey species.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Alternatives 2 and 3 comply with the regulatory framework.

Wildlife – Migratory and Resident Birds

This section covers Forest Service and Bureau of Land Management authorities related to bird management.

Regulatory Framework

The Migratory Bird Treaty Act of 1918

The Migratory Bird Treaty Act implements various treaties and conventions between the United States, Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. Under the act, it is unlawful to pursue, hunt, take, capture (or kill) a migratory bird except as permitted by regulation (16 U.S.C. 703-704). The regulations at 50 Code of Federal Regulations 21.11 prohibit the take, possession, import, export, transport, sale, purchase, barter, or offering of these activities, or possessing migratory birds, including nests and eggs, except under a valid permit or as permitted in the implementing regulations (Director's Order Number 131). A migratory bird is any species or family of birds that live, reproduce, or migrate within or across international borders at some point during their annual life cycle.

The U.S. Fish and Wildlife Service is the lead federal agency for managing and conserving migratory birds in the United States; however, under Executive Order 13186, all other federal agencies are charged with the conservation and protection of migratory birds and the habitats on which they depend. In response to this order, the Forest Service and Bureau of Land Management have implemented management guidelines that direct migratory birds to be addressed in the National Environmental Policy Act process when actions have the potential to adversely or beneficially affect migratory bird species of concern.

Executive Order 13186

Executive Order 13186 (66 Federal Register 3853, January 17, 2001) “Responsibilities of Federal Agencies to Protect Migratory Birds” directs federal agencies to avoid or minimize the negative impact of their actions on migratory birds, and to take active steps to protect birds and their habitat. This Executive Order also requires federal agencies to develop memorandums of understanding with the U.S. Fish and Wildlife Service to conserve birds, including taking steps to restore and enhance habitat, prevent or abate pollution affecting birds, and incorporate migratory bird conservation into agency planning processes whenever possible. The Bureau of Land Management and Forest Service have both completed, and are currently implementing, their respective memorandums of understanding with the U.S. Fish and Wildlife Service.

Compliance with the Migratory Bird Treaty Act of 1918 and Executive Order 13186

Forest Service and U.S. Fish and Wildlife Service Memorandum of Understanding

The purpose of this memorandum of understanding is, “to strengthen migratory bird conservation by identifying and implementing strategies that promote conservation and avoid or minimize adverse impacts on migratory birds through enhanced collaboration between the Parties, in coordination with State, Tribal, and local governments” (USDA and USDI 2008). Under the memorandum of understanding the Forest Service shall:

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

The Birds of Conservation Concern 2008

In December 2008 (most recent effort), the U.S. Fish and Wildlife Service released The Birds of Conservation Concern Report (USDI FWS 2008a) that identifies species, subspecies, and populations of migratory and resident birds not already designated as federally threatened or endangered that represent the highest conservation priorities and are in need of additional conservation actions. The goal is to prevent or remove the need for additional Endangered

Species Act bird listings by implementing proactive management and conservation actions. It is recommended that these lists be consulted in accordance with Executive Order 13186, "Responsibilities of Federal Agencies to Protect Migratory Birds." In the Forest Service and U.S. Fish and Wildlife Service memorandum of understanding, both parties shall: "Work collaboratively to identify and address issues that affect species of concern, such as migratory bird species listed in the Birds of Conservation Concern [USDI FWS 2008a] and USFWS's Focal Species initiative" (USDA and USDI 2008).

Birds of Conservation Concern 2008 (USDI FWS 2008a) is intended to stimulate coordinated and collaborative proactive conservation actions among Federal, State, Tribal, and private partners. The hope is that by focusing attention on these highest-priority species, this section will promote greater study and protection of the habitats and ecological communities upon which these species depend, thereby contributing to healthy avian populations and communities.

Partners-In-Flight Bird Conservation Regions

Bird conservation regions are ecologically distinct regions in North America with similar bird communities, habitats, and resource management issues. Bird conservation regions are a hierarchical framework of nested ecological units delineated by the Commission for Environmental Cooperation.

The overall goal of these bird conservation regions are to list and identify the migratory and resident bird species (beyond those already designated as federally threatened or endangered) that represent our highest conservation priorities.

The Malheur National Forest is included in bird conservation region 10 (Northern Rockies). Bird conservation regions lists are updated every 5 years by the U.S. Fish and Wildlife Service.

Bird Conservation Region 10: (Northern Rockies U.S. Portion Only)

Bald eagle (b)	Williamson's sapsucker
Swainson's hawk	White-headed woodpecker
Ferruginous hawk	Olive-sided flycatcher
Peregrine falcon (b)	Willow flycatcher (c)
Upland sandpiper	Loggerhead shrike
Long-billed curlew	Sage thrasher
Yellow-billed cuckoo (w. U.S. DPS) (a)	Brewer's sparrow
Flammulated owl	Sage sparrow
Black swift	McCown's longspur
Calliope hummingbird	Black rosy-finch
Lewis's woodpecker	Cassin's finch

(a) Endangered Species Act candidate, (b) Endangered Species Act delisted, (c) non-listed subspecies or population of threatened or endangered species.

Avian Conservation Planning (Migratory and Resident Birds)

Migratory birds are those that breed in the United States and winter south of the border in Central and South America. Many of our well-known passerine songbirds, flycatchers, vireos, swallows, thrushes, warblers, and hummingbirds fall into this category. Most others are included in the resident category. Birds are a vital element of every terrestrial habitat in North America. Conserving habitat for birds will contribute to meeting the needs of other wildlife and entire ecosystems (Partners-In-Flight Continental Plan). Continent-wide declines in population trends for many avian species have led to international concern and the creation of the North American

Bird Conservation Initiative. Under this initiative, plans have been developed for the conservation of waterbirds, shorebirds, seabirds, and landbirds. The landbird initiative known as Partners-In-Flight has developed a series of bird conservation plans for every state. Partners-In-Flight has gained wide recognition as a leader in landbird conservation.

The Oregon and Washington Chapter of Partners-In-Flight, formed in 1992, has developed a series of publications aimed at assisting private, State, Tribal, and Federal agencies in managing for landbird populations. The most recent and applicable publications for the two-state area have been conservation plans for landbirds.

Partners-In-Flight Bird Conservation Plans

Five conservation plans have been developed by Partners-In-Flight covering the various geographic regions found in Oregon and Washington. These documents have been prepared to stimulate and support a proactive approach to the conservation of landbirds throughout Oregon and Washington. They represent the collective efforts of multiple agencies and organizations within Oregon and Washington. Participants included biologists from federal and state agencies, industry, private consulting firms, environmental organizations, and academia to ensure a full range of ideas and practicalities were addressed by the plans.

Recommendations included in the documents are intended to inform planning efforts and actions of land managers, and stimulate monitoring and research to support landbird conservation. The recommendations are also expected to serve as a foundation for developing detailed conservation strategies at multiple geographic scales to ensure functional ecosystems with healthy populations of landbirds.

The plans can be found on the Oregon and Washington Partners-In-Flight website. The plan applicable to this planning effort is the Conservation Strategy for Landbirds in the Northern Rocky Mountains of Eastern Oregon and Washington (Altman 2000).

The overall goal of Partners-In-Flight bird conservation planning is to ensure long-term maintenance of healthy populations of native landbirds. These documents are intended to facilitate that goal by identifying conditions and habitat attributes important to the landbird community, describing the desired landscape based on habitat relationships of a select group of species, providing interim management targets (biological objectives) to achieve desired conditions, and recommending management actions (conservation options) that can be implemented by various entities at multiple scales to achieve the biological objectives.

Implementation of parts or all of the conservation strategy should help prevent reactionary approaches typically needed to address listed species issues. When these ecosystem-driven conservation strategies are fully implemented at large geographic scales, the aggregated effect will be the creation of landscapes that should function to conserve landbird communities.

The strategy for achieving functioning ecosystems for landbirds is described through the habitat requirements of “focal species.” By managing for a group of species representative of important components in a functioning coniferous forest ecosystem, many other species and elements of biodiversity also will be conserved. Executive Order 13186 and the memorandums of understanding signed by the Forest Service and Bureau of Land Management with the U.S. Fish and Wildlife Service require agencies to incorporate migratory bird conservation into agency planning processes whenever practicable. The Partners-In-Flight plans assist federal agencies in achieving this direction.

The appropriate bird conservation plan and birds of conservation concern species list for the Ragged Ruby planning area was reviewed. The species and habitats within the planning area are incorporated and effects disclosed in this analysis. Table 62 displays a list of birds of conservation concern in the Ragged Ruby planning area that are known or likely to be present and could be affected by the proposed actions.

Table 62. The U.S. Fish and Wildlife Service Birds of Conservation Concern found in the planning area. Bird Conservation Region 10 – Northern Rocky Mountains of eastern Oregon and Washington

Species	General habitat requirements	Impacts to habitat with alternative 1	Impacts to habitat with alternatives 2 and 3
Bald eagle	Associated with large bodies of water, forested areas near the ocean, along rivers, and at estuaries, lakes, and reservoirs.	See Threatened, Endangered, Proposed, and Sensitive Species section for analysis.	See Threatened, Endangered, Proposed, and Sensitive Species section for analysis.
Flammulated owl	Associated with ponderosa pine forests and mixed-conifer stands with a mean 67% canopy closure, open understory with dense patches of saplings, or shrubs.	Continued decline of open forest and early seral species.	Increase in grassy openings from commercial thinning and prescribed burning, but likely reduction of dense thickets from non-commercial thinning. There would be an expected increase in habitat.
Calliope hummingbird	Predominantly a montane species found in open shrub sapling seral stages (8 to 15 years) at higher elevations and riparian areas.	Continued decline of habitat as result of increased stand densities.	Forest gaps would increase open shrub sapling stages on 5 to 20 percent of treated areas and riparian areas would be enhanced.
Lewis's woodpecker	Ponderosa pine, cottonwood riparian or oak habitats with an open canopy, brushy understory, dead and downed material, available perches, and abundant insects.	See Threatened, Endangered, Proposed, and Sensitive Species section for analysis.	See Threatened, Endangered, Proposed, and Sensitive Species section for analysis.
Williamson's sapsucker	Eastern Cascades, mid- to high-elevation, mature open and mixed coniferous - deciduous forests. Snags are a critical component.	See Management Indicator Species – Dead and Defective Wood section for analysis.	See Management Indicator Species – Dead and Defective Habitat for Cavity Excavating Birds, Including Black-Backed Woodpecker section for analysis
White-headed woodpecker	Open conifer forests (<40 percent canopy cover) and edge habitats where standing snags and scattered tall trees remain after a disturbance.	See Threatened, Endangered, Proposed, and Sensitive Species section for analysis.	See Threatened, Endangered, Proposed, and Sensitive Species section for analysis.
Willow flycatcher*	Associated with riparian shrub dominated habitats, especially brushy or willow thickets. In southeast Washington also found in xeric brushy uplands.	Continued decline of riparian habitats. Stream channels would remain gullied. Riparian vegetation would be further departed from historical conditions.	Riparian treatments are designed to enhance hardwood species such as aspen, willow, alder, and cottonwood.

Species	General habitat requirements	Impacts to habitat with alternative 1	Impacts to habitat with alternatives 2 and 3
Olive-sided flycatcher (*Contopus cooperi*)	Open conifer forests (<40 percent canopy cover) and edge habitats where standing snags and scattered tall trees remain after a disturbance.	Suitable habitat condition would continue to be limited until suppression tree mortality-created gaps and edge habitat.	Thinning would create more open stand conditions and accelerate growth of larger trees that may become snags. Forest gaps would increase understory growth, contributing to increased insect production over the next 20 years. Increased forest edge habitat would also enhance foraging opportunities. Gaps created by thinning may allow foraging until the canopy eventually closes again and these opportunities are lost. Upland shrub enhancement treatments would create optimum foraging areas.
Cassin's finch	Open, mature coniferous forests of lodgepole and ponderosa pine, aspen, alpine fir, grand fir, and juniper steppe woodlands.	Continued risk of loss of habitat due to uncharacteristically severe wildfire.	Warm Dry late and old structure is moved from old forest multi-strata to old forest single stratum post treatment. Increased habitat suitability from aspen stand enhancement and thinning of young trees and upland shrub enhancement treatments.

*Non-listed subspecies or population of threatened or endangered species.

Aquatic Species – Primary Habitat Elements

Regulatory Framework

Malheur Forest Plan

The Malheur Forest Plan provides direction to protect and manage resources, including riparian and aquatic species habitats. Specific direction pertaining to fish and fish habitat for this project includes Forest goals 15, 18, and 19 related to aquatic resources, management objectives for riparian areas, and Forest-wide standards 61, 62, 64, 65, and 66. Additionally, management area 3B standards 5, 8, 10, 34, 41, 42, 43, 44, and 45 apply. Relevant amendments to the Malheur Forest Plan include:

- Amendment 29 (USDA Forest Service 1994), which incorporated recommendations for managing and restoring aquatic habitat, and including numeric desired future conditions for the following aquatic habitat elements: sediment and substrate, water quality, channel morphology, and riparian vegetation. These desired future conditions provide the criteria against which attainment or progress toward attainment of the riparian goals are measured.
- PACFISH (USDA and USDI 1995a), which provided ecosystem-based management strategies designed to arrest the degradation of and begin the restoration of aquatic habitat and riparian areas on the lands administered by the Forest Service, specifically in watersheds that provide habitat for Pacific salmon, Middle Columbia River steelhead, and sea-run cutthroat trout (anadromous fish), which includes the Ragged Ruby planning area.

- PACFISH riparian goals one through eight apply to this planning area and establish an expectation of the characteristics of healthy, functioning watersheds, riparian areas, and associated fish habitats.
- The following PACFISH standards also specifically apply to this planning area: TM-1a, TM-1b, RF-2b, RF-2f, RF-3a, RF-3b, RF-3c, RA-2, RA-4, RA-5, FM-1, and FM-4.
- PACFISH established riparian management objectives including pool frequency, water temperature, large woody debris, bank stability, lower bank angle, and wetted width to depth ratio.
- Additionally, PACFISH established riparian habitat conservation areas, establishing numeric riparian management objectives, and establishing standards and guidelines for managing activities in riparian habitat conservation areas. Within the planning area, the portions of the following streams identified as fish-bearing under PACFISH direction are protected by 600 foot wide (300 feet on each side) riparian habitat conservation areas (as defined within PACFISH): Butte, Bennett, Sulphur, Granite Boulder, Lemon, Ruby, Beaver, Ragged, Sunshine, Dry, Coyote, and Balance creeks and the Middle Fork John Day River. (For further discussion riparian habitat conservation areas categories, criteria, and associated buffer widths, please see Ragged Ruby Aquatic Resources Report.)
- Furthermore, PACFISH provided guidance on designating key watersheds based on specific criteria. The intent is to provide a pattern of protection across the landscape where habitat for anadromous fish would receive special attention and treatment. The Camp Creek-Middle Fork John Day River watershed meets the criteria for a PACFISH key watershed. (For further discussion on PACFISH key watersheds and specific criteria for designation, please see Ragged Ruby Aquatic Resources Report.)

The Malheur National Forest was directed to manage according to the more conservative standards applicable to habitat components of anadromous riparian areas as between the Amendment 29 desired future conditions and the riparian management objectives of the PACFISH/INFISH amendment. Where standards are more restrictive, such as state of Oregon water temperature requirements for bull trout, those would be applicable to the bull trout streams in the analysis area.

Important aquatic habitat elements as defined by PACFISH and Malheur Forest Plan Amendment 29 that will be analyzed for this planning area include: (1) pool frequency, (2) water temperature and stream shading, (3) embeddedness and fine sediment, (4) width-to-depth ratio, (5) bank stability, and (6) large woody debris. These habitat elements are important in maintaining aquatic habitat function and health and are linked to physical and biological processes within the watershed. See Table 63.

Table 63. PACFISH riparian management objectives and Malheur Forest Plan standards for fish habitat criteria

Habitat feature	Riparian management objectives	Amendment 29
Pool frequency[1] *Wetted width in feet* *Number of pools per mile*	 10 20 25 50 75 100 125 150 200 96 56 47 26 23 18 14 12 9	 <10 >10-20 >20-25 >25-50 75-132 38-66 30-53 15-26
Water temperature (all systems)	Compliance with state water quality standards, or maximum <68 degrees Fahrenheit / 20 degrees Celsius	N/A
Large woody debris (pieces per mile in forested systems) [2]	East of Cascade Crest in Oregon, Washington, and Idaho, >20 pieces >12 inch diameter, >35 foot length	*Ponderosa pine ecosystem* – 20-70 pieces ≥12 inch diameter and 20% >20 inches in diameter and ≥35 feet long or 1.5 times bankfull width. *Mixed conifer ecosystem* – 80-120 pieces ≥12 inch diameter and 20% >20 inches in diameter and ≥35 feet long or 1.5 times bankfull width. *Lodgepole pine ecosystem* – 100-350 pieces ≥6 inch diameter and 10% >12 inches in diameter and ≥18 feet long or 1.5 times bankfull width.
Bank stability [2]	>80% stable	>90% stable
Lower bank angle (undercut banks) non-forested system[3]	>75% of banks with <90º angle	50-75% undercut (with less than 2% gradient)
Wetted width-to-depth ratio[1]	<10 (mean wetted width divided by depth)	<10
Embeddedness[2]	N/A	≤20%
Percent shade / canopy closure[2]	N/A	*Ponderosa pine ecosystem* – 40-55% *Mixed conifer ecosystem* – 50-65% *Lodgepole pine ecosystem* – 60-75% *Hardwood/meadow complexes* – 80%

The standard with the more stringent condition or objective is what is followed.
1. The standards are the same
2. Amendment 29 is followed
3. The PACFISH riparian management objective is followed

Other Relevant Laws, Regulations, Policies, and Plans

Other relevant laws, regulations, policies, and plans for aquatic species include Executive Orders 11988 (floodplain management) and 12962 (aquatic systems and recreational fisheries), and three principle laws relevant to fisheries management: the National Forest Management Act of 1976, the Endangered Species Act of 1973, as amended (16 United States Code 1531 et seq.) and the Clean Water Act of 1972 (33 United States Code §1251 et seq.).

Resource Indicators

The measurement indicators detailed in Table 64 below are used for assessing impacts to primary habitat elements. See also Table 63 above for a more detailed description of each primary habitat element. The analysis following will be broken out over each primary habitat element (resource indicator), although some information (specifically, proximity to aquatic and riparian resources; a thorough analysis of cumulative effects on aquatic resources; and compliance with forest plan and other relevant laws, regulations, and policies) will only be provided in the Pool Frequency section for brevity but would generally apply to all primary habitat elements.

Table 64. Resource elements, indicators, and measures for assessing effects to aquatic species – primary habitat elements

Resource element	Resource indicator	Measure (quantify if possible)	Source
Aquatic habitat function and health	Primary habitat element – pool frequency	Pools per mile	PACFISH; Malheur Forest Plan Amendment 29
Aquatic habitat function and health	Primary habitat element – water temperature and stream shading	7-day mean maximum temperature (degrees Celsius and Fahrenheit) and percent shade	PACFISH; Malheur Forest Plan Amendment 29
Aquatic habitat function and health	Primary habitat element – embeddedness and fine sediment	Percentage of streambed composed of fine sediment	PACFISH; Malheur Forest Plan Amendment 29
Aquatic habitat function and health	Primary habitat element – width-to-depth ratio	Mean wetted width divided by depth	PACFISH; Malheur Forest Plan Amendment 29
Aquatic habitat function and health	Primary habitat element – bank stability	Percent stability	PACFISH; Malheur Forest Plan Amendment 29
Aquatic habitat function and health	Primary habitat element – large woody debris	Pieces per mile in forested systems	PACFISH; Malheur Forest Plan Amendment 29

Methodology – Primary Habitat Elements

Pacific Northwest Region stream survey reports provided existing condition data. Table 65 lists the most recent stream surveys and data for the 6 primary aquatic habitat elements for 12 streams in the analysis area. Other sources of information that may have been considered include field trips to perennial portions of fish-bearing streams within the planning area, the forest geographic information systems layers providing spatial and tabular data, streamnet.org, and discussions with Oregon Department of Fish and Wildlife and the Confederated Tribes of the Warm Springs Reservation of Oregon.

Analysis for aquatic habitat was conducted by analyzing the impacts of the action for each alternative on the six aquatic habitat elements.

Stream Conditions

Table 65 displays existing stream conditions for the six aquatic primary habitat elements as defined by PACFISH and Malheur Forest Plan Amendment 29 (pool frequency, water temperature and stream shading, embeddedness and fine sediment, width-to-depth ratio, bank stability, and large woody debris).

Table 65. Existing condition from most recent Pacific Northwest Region stream surveys for six primary habitat elements used for comparison of alternatives (values in bold font are meeting fish habitat objectives)

Stream name	Survey year	Pool frequency (pools per mile)	Water temperature (7-day mean maximum)	% Shade[3]	Embeddedness / fine sediment (<2 millimeters)	Width-to-depth	Average bank stability (% stable)	Forest type[5]	Coarse wood[6]	Large wood per mile[7]
Beaver Creek reach 1	2014	58.68	68.2 ^{0}F	**73.9**	**18.67**	10.99	**97.06**	CP	87	4.8
Beaver Creek reach 2	2014	40.7	**61.6 ^{0}F**	**73**	**18.08**	16.19	**99.56**	MC	89	26.75
Bennett Creek reach 1	2014	**93.48**	**51.8 ^{0}F[1]**	**53.8**	29.4	**6.98**	**97.31**	MC	47	39.81
Butte Creek reach 1	2014	36.97	64.2 ^{0}F	**55.7**	**14.1**	11.42	**94.68**	MC	31	66.39
Butte Creek reach 2	2014	28.63	**55.5 ^{0}F**	47.5	**13.2**	**7.70**	**94.22**	MC	91	30.04
Coyote Creek reach 1	2014	50	64.4^{0}F[1]	34	76.53	**7.89**	**96.12**	CP	77	**45.45**
Coyote Creek reach 3	2014	29.55	64.4^{0}F[1]	31.2	63.72	**8.27**	85.34	MC	68	28.41
Dry Creek reach 1	2014	60.66	**60.8^{0}F[1]**	**73.9**	54.26	11.07	**98.89**	CP	5	1.64
Granite Boulder Creek reach 1	2014	23.45	62.3 ^{0}F	**56.14**	**13.46**	23.89	**99.61**	MC	20	13.79
Granite Boulder Creek reach 2	2014	23.31	58.5 ^{0}F	**51.09**	**2.82**	32.50	**99.82**	MC	39	29.24
Lemon Creek reach 1	2014	43.48	**62.6 ^{0}F[1]**	**57**	24.53	18.77	**100**	MC	85	14.49
Middle Fork John Day River reach 4	2008	1.43	78.5 ^{0}F[2]	4	**2.84**	23.87	**97.19**	MHW	3	1.42
Ragged Creek reach 1	2014	32.29	65.5 ^{0}F	**83.4**	23.7	17.34	**95.36**	MC	103	23.21
Ruby Creek reach 1	2014	**75**	**63.7 ^{0}F**	**61.6**	**13.6**	34.36	**95.34**	MC	41	20.25
Ruby Creek reach 2	2014	32.52	**56.2 ^{0}F**	**92.4**	**16.3**	14.12	**99.83**	MC	62	36.96
Sulphur Creek reach 1	2014	**79.63**	**53.6 ^{0}F[1]**	**84.3**	55.2	**7.29**	**96.5**	MC	40	26.85
Sunshine Creek reach 1	1993	26.51	**53.6 ^{0}F[1]**	35	>30[4]	**6.13**	88	CP	25.3	29.90
Sunshine Creek reach 2	1993	54.19	**57.6 ^{0}F**	61	>30[4]	**5.16**	87	MC	37.4	49.80

1. Maximum temperature for the reach is recorded here, no 7-day mean average temperature data is available.
2. Temperature site is downstream of analysis area; data used to extrapolate temperatures within analysis area.
3. Shade for the month of July is reported here.
4. The 1993 stream survey data reported only whether substrate embeddedness was greater or less than 30 percent.
5. Forest type: MC: mixed conifer, CP: ponderosa pine, CL: lodgepole pine, MHW: hardwood/meadow complexes).
6. Coarse wood for PC and MC is >6 inch diameter and ≥ 20 feet long. Coarse wood for CL is < 6 inches in diameter.
7. Large wood for CP and MC is ≥12 inch diameter and ≥35 feet or 1.5 times bankfull width. For CL it is ≥ 6 inches in diameter and ≥18 feet long or 1.5 times bankfull.

Spatial and Temporal Context for Effects Analysis

The planning area lies within the Camp Creek Watershed of the Middle Fork John Day River subbasin. Based on topography, drainage patterns, and the effects analysis, the aquatic analysis area (action area) includes the following streams and their tributaries: Middle Fork John Day River near the confluence with Dry and Sunshine creeks; Beaver Creek, Bennett Creek, Butte Creek, Coyote Creek, Dry Creek, Granite Boulder Creek, Lemon Creek, Ragged Creek, Ruby Creek, Sulphur Creek, and Sunshine Creek to their confluence with the Middle Fork John Day River (please see Ragged Ruby planning area maps). Additionally, the Ragged Ruby Project includes proposed trail work on approximately 5.8 miles of trail located outside of, but adjacent to the Ragged Ruby planning area, in the Little Boulder Creek—Middle Fork John Day River and Vinegar Creek—Middle Fork John Day River subwatersheds (see Appendix B – Maps, Map 9). This proposal is being included in the Ragged Ruby Project because the Davis Creek Trail crosses subwatershed (and planning area) boundaries, and the proposal is a connected action to other trail system improvements proposed on the Davis Creek Trail. Therefore, the aquatic analysis area includes the following streams and their tributaries outside of the mapped project boundary that may be affected by proposed recreation system changes on the Davis Creek Trail #244: Davis Creek, Deerhorn Creek, Little Butte Creek, and Placer Gulch to their confluence with the Middle Fork John Day River. Measurable effects from proposed activities are unlikely to extend downstream of this area. The analysis area for aquatic species and the cumulative effects boundary are the same as used for aquatic habitat.

Effects timeframes for direct, indirect, and cumulative effects varies by habitat element. Measureable improvements in pool frequency, large woody debris, width-to-depth ratios, and bank stability are expected to occur immediately following habitat restoration activities identified in foreseeable actions related to aquatic restoration, and persist in the long term (35 years or more).

Past, Ongoing, and Reasonably Foreseeable Actions Relevant to Cumulative Effects Analysis

All past activities, past wildfires, present activities, foreseeable activities summarized within Appendix E – Past, Ongoing, and Reasonably Foreseeable Actions, and the current project proposal have been considered for their cumulative effects on aquatic habitat and associated aquatic species.

Specific past actions that have contributed to legacy impacts include: livestock grazing, railroad construction, mining, timber harvesting activities, stream dewatering, firewood cutting, fire suppression, road construction, road density, lack of road maintenance, and general road use on public and private lands. These have contributed to landscape changes that may have affected processes such as overland flows, channel development, and riparian and fish habitat within the drainages associated with this planning area. Legacy effects from past management activities may continue to impact aquatic habitat in the planning area and downstream of the planning area. The magnitude and timing of these potential impacts are unpredictable, but they would have short-term (1 to 3 years) to long-term (50 plus years) negative effects on fisheries habitat in this watershed.

Timber harvests planned since 1995 have left riparian habitat conservation areas largely intact, limiting further impacts to riparian habitat and stream channels, and contributing to greater crown retention. Additionally, current grazing management practices within the planning area have allowed stream reaches to improve and develop an upward trend. Recent projects have also incorporated watershed restoration activities that include increasing the size of culverts and removal of fish passage barriers, restoring streams to their historical channel alignment, installing fish screens to prevent entrainment, implementing best management practices, and decommissioning roads to decrease erosion and sediment delivery to streams.

Stream reaches within the planning area have also improved due to riparian fencing, large woody debris placement, changes in livestock management, and riparian planting. A natural slow, partial recovery from legacy impacts would occur as riparian trees grow larger, as large woody debris falls into the streams, as channel types change to more stable and narrow configurations, as sediment from past actions is washed out, and as riparian shrubs and herbs recover and contribute to more stable streambanks. However, recovery would be only partial because ongoing impacts from legacy timber harvest, legacy mining, adjacent roads, railroad berms, fire suppression, and stream crossings within the planning area would inhibit full recovery, or have resulted in degraded stream conditions that the streams do not have the ability to recover from under current climatic conditions.

Ongoing or reasonably foreseeable actions that could contribute cumulative effects include the 2005 Final Rule for Travel Management, Designated Routes and Areas for Motor Vehicle Use (Travel Management Rule), treatment of invasive plant infestations as authorized in the Malheur National Forest Site-Specific Invasive Plants Treatment Decision (USDA Forest Service 2015a), irrigation withdraws, the Austin Project, and the Aquatic Restoration Decision (USDA Forest Service 2014b). See the Ragged Ruby Aquatic Resources Report for more information.

Reasonably foreseeable aquatic habitat restoration activities authorized under the Aquatic Restoration Decision (USDA Forest Service 2014b) within the analysis area may result in short-term cumulative effects to pool frequency because the foreseeable activities would likely result in short-term increases in fine sediment that may reduce pool frequency within localized areas. The short-term sediment increases may add to adverse effects because many streams in the analysis area presently do not meet objectives for pool frequency and associated impacts to aquatic habitat and salmonids. However, the foreseeable aquatic habitat restoration activities would address current altered fine sediment transport processes and the lack of hydrological features that support pool formation, leading to a long-term reduction in fine sediment levels and an increase in pool frequency. Reasonably foreseeable aquatic habitat restoration activities would therefore have beneficial impacts to aquatic habitat and fish in the long term. (See spatial and temporal context effects discussion above).

Pool Frequency

Affected Environment

Methodology

Methodology for this primary habitat element is the same as described for Methodology – Primary Habitat Elements with the exception below.

Pool frequency is a gauge of aquatic habitat diversity, and an indicator of the degree to which streams are capable of supporting a varied and complex community of fish species. Pools are important for providing rearing habitat for juvenile fish, and cool-water refuge areas for adult fish during periods of low flow and elevated temperatures. Deep pools provide important habitat for adult Middle Columbia River steelhead, which spawn in streams located in the planning area.

Pool frequency is also an indicator of the function of physical processes such as scour and deposition.

Existing Condition

Stream surveys indicate that of the 18 stream reaches we have data for, pool frequency objectives are being met only in Bennett Creek reach 1 and Sulphur Creek reach 1, both tributaries to Butte Creek (see Table 65). Pool spacing is higher for reaches compared with potential channel types in the planning area, and there is an overall deficiency in quality pools (greater than 1 meter deep). This indicates a loss of pool habitat and general hydrological function as a result of past management activities, especially riparian logging, mining, and channel modification during railroad logging and road building.

Environmental Consequences

Methodology

Methodology for this primary habitat element is the same as described for Methodology – Primary Habitat Elements.

Alternative 1 – No Action

Direct and Indirect Effects – Primary Habitat Elements

Under alternative 1, no management activities would occur in the planning area as a result of the decision. Although there would be no direct or indirect effects from the no action alternative (and thus no cumulative effects either), some environmental outcomes would still occur as a result of taking no action, including the increased hazard of a severe crown fire, as described in the Fire and Fuels section.

Most of the forested stands in the planning area are identified as moderate to high risk for stocking-induced tree mortality and related infestation of pests or disease. Without upland restoration treatments and/or the controlled re-introduction of fire into the planning area, current stand conditions would worsen and increase the chance of a stand-replacement wildfire. A stand-replacement wildfire would result in the loss of shading along stream channels, loss of instream wood, and both short-term (3 to 5 years) and long-term (10 to 50 years) loss of streamside vegetation. This could adversely affect fish habitat. Water temperatures would increase for perhaps one to a few decades, depending on riparian shrub and tree recovery. Sediment from upland sources could increase for 1 to 5 years following a fire. Sediment from channel sources could increase due to higher peak flows and loss of stabilizing trees and shrubs. However, recovery of bank-stabilizing herbaceous and shrubby vegetation would probably limit increased sediment from channel sources to less than 5 years. Severe fire would also supply an extended pulse of woody debris to streams, which would gradually decay over decades. In addition, localized extirpation of these fish could occur as the result of severe wildfires (Rinne 1996).

As noted by Dunham et al. (2003), the effects of wildfires depend on a variety of factors including their timing, location, area, extent, and intensity. Other factors include the characteristics of the ecosystems and the species affected, along with other indirect physical and ecological linkages. While such events can cause short-term negative effects, such as those listed below, over long time periods the resulting habitat conditions may be more productive than in areas where natural disturbance has been suppressed (Dunham et al. 2003). Wildfires can have a number of detrimental effects to stream channels such as decreasing stream channel stability, increasing discharge and affecting discharge variability, altering large woody debris delivery and storage, increasing nutrient availability, increasing sediment delivery and transport, increasing solar radiation, and altering water temperature regimes (Dunham et al. 2003). In cases where natural stream processes are already impaired (Table 65), the recovery of the stream ecosystem from the effects of severe wildfire is likely to be slower, more sporadic, and potentially incomplete (Minshall 2003).

Recreational opportunities related to hiking, biking, and off-highway vehicle use within the analysis area would remain the same. Public use of the existing facilities is likely to increase in the future. The increase in recreational use without the recreation system changes identified in alternatives 2 and 3 may contribute to degradation of aquatic habitat.

Under alternative 1, streams not treated by foreseeable aquatic restoration activities (Appendix E – Past, Ongoing, and Reasonably Foreseeable Actions) would continue functioning in a degraded state, negatively affecting aquatic species habitat within the planning area and downstream reaches. Recovery of localized areas due to changes in management would continue. However, degraded conditions related to altered sediment transport processes beyond the control of management would continue.

In the long term, aquatic restoration activities would improve riparian condition and all six primary habitat elements within the planning area; however, the activities may have short-term negative and meaningfully measurable effects as described above. Furthermore, the lack of treatment of the uplands and riparian habitat conservation areas would not allow for more holistic watershed restoration.

Road and crossing improvements related to haul would not occur in this alternative, which would allow several miles of roads to continue acting as potential sediment sources, impeding and intercepting overland water flow, transporting sediment, and causing ground water seepage. Temporary road construction for haul would not occur and therefore effects related to fine sediment would not occur under alternative 1. The threat of severe wildfire within the planning area and its potential impacts on aquatic organisms would increase into the future under alternative 1. Recreational opportunities within the planning area would remain as they are with recreational facilities located such that they are negatively impacting aquatic primary habitat elements and providing suboptimal hiking and biking opportunities. Effects related to improvements of existing trail stream crossings, construction of new crossings, and trail construction within 100 feet of riparian habitat conservation areas would not occur under alternative 1.

Direct and Indirect Effects – Pool Frequency

Alternative 1 would maintain the current levels of pool habitat, which are below objectives for streams in the analysis area (Table 65) and limit important habitat for salmonids, especially for rearing juveniles and adults migrating prior to spawning.

Cumulative Effects

Because there are no direct or indirect effects of taking no action, there would be no cumulative effects.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

The no action alternative does not fully meet management area 3B standards, and PACFISH standards and guidelines. Alternative 1 is not consistent with the following Malheur Forest Plan standards:

- Management area 3B standard 41: "…Minimize the density of opens roads in this management area by obliterating, revegetating, or closing unnecessary roads or any roads causing significant resource damage."
- PACFISH Standard RF-3c: Determine the influence of each road on riparian management objectives. Meet riparian management objectives and avoid adverse effects on inland native fish by:
    - Closing and stabilizing or obliterating, and stabilizing roads not needed for future management activities. Prioritize these actions based on the current and potential damage to anadromous native fish in priority watersheds, and the ecological value of the riparian resources affected.

Degraded aquatic habitat conditions that have known adverse impacts to aquatic resources would remain in their current condition under alternative 1.

Alternative 1 would avoid adverse effects to the floodplains, and thus is consistent with Executive Order 11988.

Alternative would maintain the current degraded aquatic habitat conditions, thus would not meet compliance with Executive Order 12962. The current aquatic habitat conditions are resulting in reduced recreational fishing opportunities.

Alternative 1 complies with the Endangered Species Act and the Clean Water Act because taking no action would not require consultation and would not raise water temperatures.

Alternatives 2 and 3

For the purposes of this analysis, the component parts of the action alternatives are organized into the following project elements shown below:

- Timber felling (includes dry pine and mixed conifer treatments, dry meadow and scabland flat bunchgrass treatments, whitebark pine and western white pine treatments, aspen treatments, yarding, and danger tree felling)
- Prescribed burning and unplanned ignitions
- Temporary roads and landings
- Road decommissioning
- Road maintenance and use (includes maintenance, reconstruction, haul, water drafting, opening and closing roads, and interpretive sign installation)
- Recreation system changes (includes trail and trailhead construction, closure, and stream crossing improvements)
- Bat gate installation

See chapter 2, and Ragged Ruby Aquatic Resources Report for detailed descriptions of project elements.

Of the seven project elements listed above, bat gate installation (same action for both alternatives 2 and 3) would occur outside of riparian habitat conservation areas and has no mechanism to affect aquatic species or their habitats. This project element will not be analyzed further in this section.

Descriptions regarding proximity of project elements to aquatic resources are stated only in this section (Pool Frequency) for brevity, but apply to other primary habitat elements and aquatic resources as well.

Direct and Indirect Effects

Timber Felling

The Timber Felling project element includes dry pine and mixed conifer treatments, dry meadow and scabland flat bunchgrass treatments, whitebark pine and western white pine treatments, aspen treatments, yarding, and danger tree felling.

The majority of timber felling activities would occur outside of riparian habitat conservation areas under alternatives 2 and 3, therefore no meaningfully measureable effects to pool frequency are expected. The remaining analysis focuses on actions that would occur within riparian habitat conservation areas. Please note that portions of any commercial thinning units overlapping riparian habitat conservation areas on project maps would be identified as skips or gaps and would not be treated commercially.

Only non-commercial thinning would occur within riparian habitat conservation areas. This would occur under dry pine and mixed conifer treatments, dry meadow and scabland flat bunchgrass restoration treatments, and whitebark pine and western white pine restoration treatments (additional details below). Treatments would follow the Draft Ragged Ruby Silviculture Prescription. Key elements include:

- Non-commercial thinning would occur for trees 1 foot tall to 9 inches diameter at breast height.
- Leave all trees within 25 feet of trees exhibiting wildlife nests or surface water: streams, bogs, seeps, springs, and elk wallows. Trees shall be felled towards surface water where reasonably feasible.
- Leave approximately 110 trees per acre less than 9 inches diameter at breast height where available.
- The order of preference for leave tree species is western white pine, Englemann spruce, western larch, ponderosa pine, Douglas-fir, lodgepole pine, and grand fir.
- Thin double the dripline around large shrubs and hardwood tree species. No bucking of felled trees shall occur.
- Thin double the dripline from large, old early seral trees. Leave one healthy tree where it is available for future replacement, following leave tree order of preference.
- Leave clumps wherever possible. A tree clump would be defined as a group of trees in which the inter-tree distance is 20 feet or less, measured from tree center to tree center. Tree clumps should have a minimum of 3 trees and 20 or more trees. Clumps should comprise multiple sizes, age classes, and species.
- Select leave trees that are the tallest in height, have the largest crowns, and have the straightest stems that are free of damage due to insects, disease, and physical injury.
- Leave 5 to 15 percent of each unit in unthinned clumps that are 2 to 5 acres in size for wildlife hiding cover.
- Leave all shrubs and hardwood tree species, as well as all snags.

Dry pine and mixed conifer treatments include non-commercial thinning that would occur within riparian habitat conservation areas from stands that have high tree densities and/or high proportions of late seral species. Non-commercial thinning in riparian habitat conservation areas would be occur up to 9 inches diameter at breast height and where an abundance of regeneration provides ladder fuels. No material would be removed from riparian habitat conservation areas for biomass material. No piling of activity or natural fuels would occur within riparian habitat conservation areas. No mastication activities would occur in riparian habitat conservation areas. Mechanical treatments would be followed by prescribed burning to reduce surface and ladder fuels and to help restore fire back to the landscape (see Prescribed Burning and Unplanned Ignitions section below).

Dry pine and mixed conifer treatments under alternative 2 includes treatment within 213.5 acres of riparian habitat conservation areas (1.3 miles in category 1 riparian habitat conservation areas, 4 miles in category 2 riparian habitat conservation areas, and 3.6 miles in category 4 riparian habitat conservation areas) following the Draft Ragged Ruby Silviculture Prescription. These activities would occur within Middle Columbia River steelhead occupied and critical habitat for a distance of 0.17 miles in Ruby Creek, 0.5 miles in Bennett Creek, and 0.35 miles in Butte Creek. Bennett Creek and Butte Creek are also designated critical habitat for Columbia River bull trout. Under alternative 3, these treatments would occur within 284.8 acres of riparian habitat conservation areas (1.76 miles in category 1 riparian habitat conservation areas, 4.4 miles in category 2 riparian habitat conservation areas, and 5.5 miles in category 4 riparian habitat conservation areas). Activities within Middle Columbia River steelhead and bull trout occupied and designated critical habitat are the same as alternative 2, but with an additional 0.13 miles within Sunshine Creek.

Dry meadow and scabland flat bunchgrass restoration within riparian habitat conservation areas includes hand-felling. No mastication would occur within riparian habitat conservation areas. No material would be removed from riparian habitat conservation areas for biomass material. No piling of activity or natural fuels would occur within riparian habitat conservation areas. Non-commercial thinning of trees in riparian habitat conservation areas would occur up to 9 inches diameter at breast height. Trees would be felled and left on site for erosion control and to protect native shrubs and other species. Native species would be seeded (for example, with native bunchgrasses) and non-native invasive species would be treated in strategic areas in order to recolonize these areas with native species. No active ignitions would occur in these areas; however, fire would be allowed to move into these areas knowing that the sparseness of fuels and poor continuity of surface fuels would limit fire spread.

Dry meadow and scabland flat bunchgrass restoration under both alternatives 2 and 3 include treatment within approximately 52.8 acres of riparian habitat conservation areas (0 miles in category 1 riparian habitat conservation areas, 0.27 miles in category 2 riparian habitat conservation areas, and 0.3 miles in category 4 riparian habitat conservation areas) following silvicultural prescriptions described in the Ragged Ruby Silviculture Report. Most treatments would occur outside of proximity to aquatic species habitat, with the closest being unit 180 approximately 420 feet upstream of Middle Columbia River steelhead occupied and designated critical habitat on a category 4 tributary to Ruby Creek.

Whitebark pine and western white pine restoration includes hand-felling directly around these pine tree species to promote the health and vigor of the trees. Treatments would be non-commercial and limited to trees less than 9 inches diameter at breast height in riparian habitat conservation areas. Fuels treatments would include prescribed fire, underburning, jackpot burning, and/or natural ignition. No piling of activity or natural fuels would occur within riparian habitat conservation areas.

Whitebark pine and western white pine restoration under both alternatives 2 and 3 includes treatment within 112 acres of riparian habitat conservation areas (0.57 miles in category 1 riparian habitat conservation areas, 1.7 miles in category 2 riparian habitat conservation areas, 0.54 miles in category 4 riparian habitat conservation areas) following the Draft Ragged Ruby Silviculture Prescription. Since this treatment is the same within riparian habitat conservation areas between alternatives 2 and 3, the effects are considered the same. Most treatments would occur over 1.75 miles upstream from aquatic species habitat; however, treatment in western white pine restoration unit 352 would occur within 0.57 miles of Middle Columbia River steelhead occupied and designated critical habitat in Ruby Creek.

There are a total of approximately 5,263 acres of riparian habitat conservation area in the planning area, so approximately 7.2 percent of the riparian habitat conservation area acres in the planning area would be non-commercially thinned under alternative 2, and 8.5 percent under alternative 3. Due to the greater extent of non-commercial thinning under alternative 3, the effects to pool frequency from this action would be slightly greater.

The riparian habitat conservation area treatments would reduce stand density, reduce fire hazard, improve forest health, and accelerate large woody debris recruitment which forms and maintains pools. Thinning would be utilized to reduce conifer density, increase available soil moisture for hardwood survival and regeneration, and increase forage production in stands that are closely related to adjacent uplands.

Felling of trees within riparian habitat conservation areas would create locations where branches interact with the floodplain to capture sediment. As sediment is captured, the water table would rise, soaking in more water during snowmelt runoff and storing more water in the soil column later into the summer, which would provide for expanded herbaceous and shrub communities. Felled trees also provide sites for recruitment of hardwood regeneration that are sheltered from herbivory. Proposed activities would restore riparian processes and functions, enhancing floodplain roughness and stream channel complexity, including formation and maintenance of pools. This action would result in effects to pool frequency that may be negative but not meaningfully measureable. The large woody debris additions are fully analyzed under the subject section below.

Skyline yarding removal of trees that could function as large woody debris and affect pool frequency would be limited in size and frequency. All skyline yarding units were designed to yard uphill, and since no skyline units are within riparian habitat conservation areas, the need to yard across streams is unlikely. Tailholds (a sturdy stump or tree used to support a block through which a cable runs back to the yarder) are needed for each skyline corridor, which may cross streams. Usually no trees need to be felled, but some limbing may be needed within riparian habitat conservation areas. Tailhold trees are typically outside riparian habitat conservation areas. Further, the majority of trees that could be removed adjacent to streams occur along intermittent streams, upstream of occupied habitat for threatened, endangered, and sensitive species. Further, any trees needing felling would be felled into streams where feasible; where not feasible, it is usually because they lean away from the stream and would not have been recruited as large woody debris or affect pool frequency when falling under natural processes. Skyline yarding would have a negative effect on pool frequency that would not be meaningfully measureable.

Aspen restoration activities included in alternative 2 are the same as those in alternative 3, thus the effects to pool frequency are the same. Aspen restoration would occur in 18 aspen stands totaling 10 acres, including approximately 7.3 acres of riparian habitat conservation areas. Conifers that have grown into aspen stands may be tipped, felled, or girdled within 150 feet from the existing stand's perimeter to reduce competition for light and water and allow for stand expansion where appropriate. Treatment would not remove old trees, as defined in the silvicultural prescription. Western larch would generally be retained due to the lower amount of shade produced by these trees, and ponderosa pine with high ground-to-crown height ratio may also be retained due to the shade they produce largely falling outside of the aspen stand. Conifers felled or tipped within these stands may be used for stream or floodplain restoration purposes.

Fencing, jackstrawing, or hinging of conifers may be used to reduce grazing pressures from livestock and wildlife.

Of the 18 units, 14 are within riparian habitat conservation areas. Five are within category 4 riparian habitat conservation areas a minimum of 0.45 miles upstream of occupied and critical habitat for aquatic species, and six are within category 2 riparian habitat conservation areas a minimum of 0.8 miles upstream of occupied and critical habitat for aquatic species. There are three aspen stands within category 1 riparian habitat conservation areas. Unit A25 is a 0.4 acre unit with less than 0.1 acres that is within the riparian habitat conservation area, over 200 feet slope distance from occupied and critical habitat for aquatic species in Ruby Creek. Units A09 (0.3 acres) and A10 (0.5 acres) are completely within the category 1 riparian habitat conservation area of Sunshine Creek within the riparian zone.

Aspen restoration treatments would not likely result in adverse impacts to existing and future pool habitat due to the small scale of treatments, implementation of project design criteria, and that conifers would be felled into streams where feasible, thus large woody debris pool-forming processes may be accelerated in the short term. The reduction in stocking densities following treatments would increase new growth of aspen and the vigor of larger aspen in the overstory for future large woody debris to create pool habitat.

The felling of danger trees for human safety along haul routes in riparian habitat conservation areas has the potential to reduce the supply of large woody debris to stream channels and therefore reduce pool habitat. Under PACFISH, trees may be felled in riparian habitat conservation areas when they pose a safety risk (PACFISH standard RA-2). Danger trees felled within or into riparian habitat conservation areas would be felled into the stream where feasible or otherwise left within the riparian habitat conservation area. Felling of trees for temporary road construction also has the potential to reduce the supply of large woody debris to stream channels and therefore pool habitat; however, these trees would be treated in the same manner as danger trees as described above, and all road construction within riparian habitat conservation areas would occur either on existing roadbeds requiring minimal tree removal to bring to a useable state, or beyond the large woody debris recruitment zone. Where trees are felled into the stream, they may create pools.

Prescribed Burning and Unplanned Ignitions

The majority of fuels treatment activities would occur outside of riparian habitat conservation areas and would have beneficial effects to aquatic resources by reducing surface fuels, thinning trees, stimulating growth of aspen and other hardwoods, and increasing the canopy base height.

Prescribed burning would occur within riparian habitat conservation areas to help restore plant species composition and structure that would occur under natural fire regimes. Ignition would occur outside riparian habitat conservation areas and fire would be allowed to back into riparian habitat conservation areas from adjacent upslope areas. Ignition would also occur within some riparian habitat conservation areas using drip torches, stopping within 25 feet of the stream channel. No firelines would be constructed within riparian habitat conservation areas, nor down draw bottoms.

Both mechanically treated and untreated stands would be exposed to prescribed burning as fire is reintroduced into the planning area. Treated stands would see a combination of burning piled material and underburning. Machine or hand piling areas would not be located in riparian habitat conservation areas. Stands not being mechanically treated would be managed primarily with the use of prescribed burning. Prescribed burning would also be used to stimulate growth of aspen and other fire-adapted vegetation. Burning within aspen stands would be avoided if aspen suckering is determined to be extensive enough that fire would be detrimental to stand recovery.

Most prescribed burning would mimic low-intensity fires that create a mosaic pattern of burned and unburned landscape that are characteristic of natural burning patterns that tend to occur in riparian areas.

Low-intensity underburning would be scheduled to occur after any planned mechanical treatments are completed. No firelines would be constructed in riparian habitat conservation areas, and fireline construction would not occur down draw bottoms. Project design criteria specify that berms shall be pulled on all firelines, and specify the frequency of waterbars on firelines based on slope. Using these techniques, mortality of understory trees would occur in burned patches, but few overstory trees would be killed. Methods would be implemented as described in the Fire and Fuels section to protect large trees, prevent fire intensities that would be high enough to consume trees or downed wood large enough to function as large woody debris in stream channels, and retain a high percentage of the shrub and tree cover directly shading streams.

Burning activities would not result in delivery of fine sediment to stream channels sufficient to result in a meaningfully measureable reduction of pool habitat. The reduction in stocking densities following burning activities would also increase the vigor of larger trees in the overstory for future large woody debris to create pools; this effect would be positive but not meaningfully measureable.

No biomass removal activities would occur in riparian habitat conservation areas, therefore there would be no effects to aquatic resources from this activity.

Temporary Roads and Landings

Table 66 below shows temporary roads within riparian habitat conservation areas by alternative, length, riparian habitat conservation area category and stream name, and proximity to aquatic species habitat.

Table 66. Temporary roads in riparian habitat conservation areas by alternative, road number, stream riparian habitat conservation area category and name, and proximity to aquatic species habitat

Alternative	Temporary road number; length	Stream riparian habitat conservation area category – name	Proximity to category 1 riparian habitat conservation area, aquatic species habitat, and critical habitat
2 and 3	T5; 0.65 miles	Category 1, 2, 4 – Dry Creek	Parallels category 1 riparian habitat conservation area for approximately 500 feet but is over 250 feet from stream. Crosses category 2 riparian habitat conservation area where temporary culvert would be installed, approximately 540 feet upstream of category 1 riparian habitat conservation area. Re-enters category 1 for approximately 400 feet no closer than 150 feet from stream. Parallels category 4 riparian habitat conservation area of Dry Creek for 230 feet and comes within 50 feet of stream at a junction with existing closed road approximately 200 feet upstream from category 1 riparian habitat conservation area. Good condition existing roadbed.

Alternative	Temporary road number; length	Stream riparian habitat conservation area category – name	Proximity to category 1 riparian habitat conservation area, aquatic species habitat, and critical habitat
2 and 3	T6; 0.86 miles	Category 4 – tributary to Middle Fork John Day River	Crosses riparian habitat conservation area at headwaters of the stream over 0.5 miles upstream from category 1 riparian habitat conservation area using a temporary culvert. Existing roadbed.
2 and 3	T9; 0.08 miles	Category 4 – tributary to Beaver Creek	Crosses riparian habitat conservation area over 0.37 miles upstream from category 1 riparian habitat conservation area using a constructed ford due to low bank angles. Existing roadbed.
2 and 3	T15; 0.74 miles	Category 4 – Balance Creek	Crosses riparian habitat conservation area over 0.45 miles upstream from category 1 riparian habitat conservation area using a temporary culvert. Good existing roadbed.
2 and 3	T21; 0.24 miles	Category 1 – Ragged Creek	Enters riparian habitat conservation area over 210 feet from the category 1 stream. No existing roadbed.

Temporary roads would be rehabilitated after use, as described in chapter 2. Temporary road crossings of streams, including fords and installation of temporary culverts, shall be completed, utilized, and rehabilitated following methods prescribed by a hydrologist. Methods may include placement of coarse woody debris in stream channels and floodplains below crossings, as well as restrictions on season of use.

Most temporary roads would have a discountable effect to aquatic resources due to one or more of the following reasons: (1) they would be located outside of riparian habitat conservation areas; (2) they would be in a category 1 riparian habitat conservation area but more than 150 feet from stream channels; (3) they would cross a category 4 riparian habitat conservation areas over 0.3 miles upstream of aquatic species habitat and critical habitat; (4) they would be on existing roadbeds requiring minimal disturbance to bring them to a useable state; or (5) implementation of project design criteria would minimize impacts of temporary roads on pool frequency.

Temporary roads that may impact aquatic species habitat include the following:

- One segment of temporary road (Temporary Road T5) that crosses a category 2 riparian habitat conservation area tributary to Dry Creek approximately 540 feet upstream of aquatic species habitat, then comes within approximately 50 feet of a category 4 riparian habitat conservation area section of Dry Creek approximately 200 feet upstream of aquatic species habitat. This road segment is on an existing roadbed on low slopes requiring minimal disturbance to bring to a useable state. A temporary culvert would be installed and then removed at the conclusion of haul activities.

A study done on the Malheur National Forest by Robert McNeil, Soil Scientist, in 1999 found that under normal conditions, sediment was found no farther than 32 feet from road disturbance. The study concluded that buffer widths of 50 feet or less are sufficient to protect streams from sediment from existing roads, except near scabs. “Not normal conditions” in the study were (1) scabs (non-forested areas with shallow soils limited ground cover), or (2) where runoff hit an abandoned road (McNeil 1999).

With implementation of project design criteria, construction of this temporary road would not result in a meaningfully measureable reduction in pool frequency. Effects under alternative 2 are slightly greater than that of alternative 3, due to the greater extent of temporary road construction. This is the only stream where proximity of proposed temporary road work warrants specific discussion due to potential for effects to this indicator.

No landings are proposed within riparian habitat conservation areas under alternatives 2 or 3. Limiting these activities to areas outside of riparian habitat conservation areas would prevent adverse impacts to existing and future pool habitat.

Road Decommissioning

Road decommissioning activities result in the removal of a road from the permanent transportation system of the Forest. The impacts of the road on the environment are eliminated or reduced to an acceptable level; the goal is to leave the road in a "hydrologically disconnected" state and convert the former roadway to other resource uses.

Approximately 0.3 miles of open road would be decommissioned under alternatives 2 and 3, thus the effects to pool frequency are considered the same. National Forest System Road 4550020 is not drivable due to deferred maintenance and is returning to a natural state with vegetation and trees in the roadbed. The road is affecting water quality, is not needed for future management, and terminates next to Granite Boulder Creek, a category 1 riparian habitat conservation area with designated critical habitat for both bull trout and steelhead. Decommissioning would occur on approximately 0.17 miles of road within the category 1 riparian habitat conservation area. Decommissioning this road would minimize impacts to aquatic species habitat within Granite Boulder Creek. No active decommissioning is proposed under alternatives 2 and 3; however, active decommissioning activities to reinforce the natural recovery which has occurred, may be implemented as part of an Aquatic Restoration Decision at this site.

Decommissioning of approximately 1.2 miles of currently closed roads located in the Dixie Butte and Greenhorn Mountain inventoried roadless areas would occur under alternatives 2 and 3. National Forest System Road 4555 would be converted from a road to a trail (this is not considered decommissioning), and National Forest System roads 2050791, 2610502, 2610793, and 2610827 show no sign of a designed road. These roads are not needed for future timber harvest because they are located in inventoried roadless areas. None of these road segments occur within riparian habitat conservation areas. Decommissioning would be accomplished through passive restoration on most road segments (there would be no ground-disturbing activities).

Road decommissioning activities are as described in chapter 2, and would not include removal of trees that could function as large woody debris in stream channels, nor result in delivery of sediment to streams to a degree that pools are filled (due to the location of active decommissioning outside of riparian habitat conservation areas), therefore reductions in existing pool habitat would not occur and a neutral effect is expected. Restoration of floodplain connectivity and stream channel complexity through road decommissioning and revegetation activities would restore stream process and function, and result in an increase in pool frequency over the long term that is positive but not meaningfully measureable due to the small scale of decommissioning within riparian habitat conservation areas.

Road Maintenance and Use

The road maintenance and use project element includes maintenance, reconstruction, haul, water drafting, opening and closing roads, and interpretive sign installation. For both alternatives 2 and 3, approximately 24 miles of haul routes and road maintenance would occur in category 1, 2, and 4 riparian habitat conservation areas. Reconstruction activities for both alternatives would occur on approximately 0.72 miles of roads in category 2 riparian habitat conservation areas (includes one crossing of a tributary to Ragged Creek over 0.4 miles upstream of category 1 riparian habitat conservation area of Ragged Creek, and three crossings of Porky Creek and tributaries), 0.27 miles of roads in category 4 riparian habitat conservation areas, and no roads in category 1 riparian habitat conservation areas. Approximately 2.7 miles of haul routes and road maintenance would occur within 100 feet of category 1 riparian habitat conservation areas. Road maintenance would occur on all haul routes. With implementation of project design criteria, delivery of fine sediment resulting from road maintenance and use would not be of sufficient magnitude to result in a meaningfully measureable reduction in pool frequency.

Water withdrawals for dust abatement during haul activities would occur. Water withdrawals would be in accordance with the project design criteria, including National Marine Fisheries Service guidance. Use of these project design criteria would insure that water withdrawals do not result in a reduction in pool habitat.

Under alternatives 2 and 3, approximately 2.9 miles of closed roads would be opened to provide recreational access to trailheads in areas where roads are already open on the ground and are not causing resource damage. None would occur in category 1, 2, or 4 riparian habitat conservation areas.

Under alternative 2, approximately 6.3 miles of closed roads within riparian habitat conservation areas would be used for haul and then reclosed (approximately 2.3 miles within category 1 riparian habitat conservation areas). Alternative 3 includes slightly less miles (5.7 miles total) of closed roads within riparian habitat conservation areas used for haul, and then re-closed after haul (including approximately 2 miles within category 1 riparian habitat conservation areas). The closure would remain consistent with the intent of the original closure. With implementation of project design criteria, delivery of fine sediment resulting from use and reclosure of closed roads would not be of sufficient magnitude to result in a meaningfully measureable reduction in pool frequency.

Approximately 7.3 miles of roads would be changed from open to closed under alternatives 2 and 3. A total of 0.31 miles of this work occurs in riparian habitat conservation areas, with 0.1 miles in category 1 riparian habitat conservation areas, 0.01 miles in category 2 riparian habitat conservation areas, and 0.2 miles in category 4 riparian habitat conservation areas. Use of closed roads would be limited to infrequent management and other permitted activities. Closure may be by a physical barrier or gate, and by regulation. Maintenance would be performed for future management. Closing roads would help decrease sediment contribution from the road by improving drainage of the road. Maintenance of the road would also help prevent road failure and sediment entry from road failure.

Road closure actions include construction of drainage structures that would be self-maintaining after closure. Closure of these roads poses a negligible risk of sedimentation to fish-bearing streams because dry land “filtration” lies between the closure sites and any streams, and the amount of land disturbed during gate construction is too small and too flat to produce significant sediment. Since these roads would remain part of the Forest road system, the benefits of the closures would likely not be permanent; however, closure of these road segments meanwhile would likely reduce delivery of fine sediment to the streams. Because of the low risk of sedimentation from road closures and reduction in vehicle travel resulting in vegetation covering the roadbed, effects to pool frequency from road closure actions are expected to be positive but not meaningfully measurable.

Additionally, there are approximately 25.3 miles of road in the analysis area that are identified in the road system database as closed by previous administrative actions; these roads would be confirmed as closed under alternatives 2 and 3. A total of 2.43 miles would occur within riparian habitat conservation areas, including approximately 1.2 miles within category 1 riparian habitat conservation areas. The road segments' existing conditions range from overgrown with natural vegetation, physically blocked with a gate or earthen berm, or the road prism is no longer visible. No ground-disturbing activities would occur associated with this action. Closure of these road segments would not result in a meaningfully measurable reduction in sediment delivery to subject streams, because the roads are already effectively closed on the ground. Closure of these roads would not result in a meaningfully measurable change in pool frequency.

Interpretive sign installation would occur within the category 1 riparian habitat conservation area of Butte Creek, but over 100 feet from the active stream channel. With implementation of project design criteria, there would be a neutral effect to pool frequency from this activity.

Recreation System Changes

The recreation system changes project element includes trail and trailhead construction, trail closures, and stream crossing improvements. Under alternative 2, the majority of recreation system changes would occur outside of riparian habitat conservation areas and have beneficial effects to streams in the planning area through erosion control as discussed below. Under alternative 3, recreation system changes would be the same as described under alternative 2, with the exception that the designated recreational use type on the Blackeye, Dupratt, Princess, Sunrise Butte, and Tempest Mine trails would not include bicycle use or minor trail realignment.

Sunrise Butte Trail #255 and trailhead work would occur outside of riparian habitat conservation areas and involves minimal ground disturbance (no effect).

Blackeye Trail #243 and trailhead work would occur outside of riparian habitat conservation areas and involves minimal ground disturbance (no effect).

Princess Trail #251 and trailhead work would occur almost entirely outside of riparian habitat conservation areas and would involve minimal ground disturbance. A trail that crosses a category 2 riparian habitat conservation area of the headwaters of Granite Boulder Creek would be undesignated, involving no anticipated ground disturbance (no effect).

Tempest Mine Trail #256 and trailhead work involves ground-disturbing actions within riparian habitat conservation areas, as discussed further.

- An expanded parking area for this trailhead would be constructed within the category 1 riparian habitat conservation area of Granite Boulder Creek off National Forest System Road 4559, which is critical habitat for both Columbia River bull trout and Middle Columbia River steelhead. This work would occur over 150 feet from the active channel.
- Approximately 2.1 miles of this existing trail on a closed section of National Forest System Road 4559 would be improved to meet Americans with Disabilities Act accessibility standards. While most of this work would occur over 150 feet from Granite Boulder Creek, a hardened crossing of the creek would be constructed approximately 1,000 feet upstream of the end of steelhead critical habitat and within bull trout critical habitat. This section of trail also crosses Lemon Creek where a hardened crossing would be constructed within steelhead critical habitat.
- New trail construction would also occur in approximately 0.67 miles of category 2 riparian habitat conservation area in West Fork Granite Boulder Creek.

Davis Creek Trail #244 and trailhead work would involve ground-disturbing actions within riparian habitat conservation areas, as discussed further.

- For the approximately 6.4 miles of the Davis Creek Trail between National Forest System roads 2050666 and 2614229, actions to minimize impacts to aquatic habitat may include hardening stream crossings, minor contouring, trail drainage, and waterbarring. Note that this section of trail is outside of, but adjacent to, the Ragged Ruby planning area. However, it is included in the analysis for aquatic resources because the trail crosses subwatershed and planning area boundaries, and the proposal is a connected action to other trail system improvements proposed on the Davis Creek Trail #244. Work may occur on approximately 13 stream crossings. Nine of the 13 crossings are on category 2 riparian habitat conservation area streams over 0.25 miles upstream of fish-bearing habitat and Middle Columbia River steelhead critical habitat (see Table 67 below), and 1 of the 13 is on a category 4 riparian habitat conservation area over 0.18 miles upstream. Two stream crossings on category 1 riparian habitat conservation area streams would be hardened (Davis Creek and Placer Gulch, both fish-bearing and designated critical habitat for Middle Columbia River steelhead). Additionally, one crossing of a category 2 riparian habitat conservation area tributary to Davis Creek would be hardened approximately 100 feet upstream of its confluence with Davis Creek.
- Please note that the current Davis Creek Trailhead and 2.5 miles of the current Davis Creek Trail between National Forest System roads 2050072 and 2050666 would be undesignated through the Ragged Ruby project (no ground-disturbing activities) to allow aquatic restoration of Butte Creek under the Aquatic Restoration Decision. The trail is within the riparian habitat conservation area of Butte Creek for 0.8 miles, crosses Butte Creek multiple times, and crosses and parallels a category 2 riparian habitat conservation area tributary to Butte Creek for 1 mile.

With implementation of project design criteria, best management practices, and aquatic restoration biological opinion criteria for livestock crossing streams on recreational trail crossings within category 1 and 2 riparian habitat conservation areas, there would be a negative but not meaningfully measurable effect to pool frequency from this proposed activity. In the long term, the action alternatives would result in a decrease in fine sediment delivery to streams through improvements in the location and design of recreation features. The quantity of sediment that could be delivered to streams is not of such magnitude that pool frequencies would be affected. Effects are slightly greater under alternative 2 due to the inclusion of minor trail realignment activities.

Table 67. Alternatives 2 and 3 Davis Creek Trail #244 trail crossings. Stream crossings by riparian habitat conservation area category and designation, and proximity upstream of aquatic species habitat and Middle Columbia River steelhead critical habitat.

Stream riparian habitat conservation area category and designation	Proximity to category 1 riparian habitat conservation areas, aquatic species habitat, and critical habitat
Category 2 Little Butte Creek	Over 0.4 miles upstream.
Category 2 tributary to Little Butte Creek	Over 0.4 miles upstream.
Category 2 East Fork Little Butte Creek	Over 0.25 miles upstream.
Category 2 tributary to East Fork Little Butte Creek	Over 0.25 miles upstream.
Category 2 Deerhorn Creek	Over 0.25 miles upstream.

Stream riparian habitat conservation area category and designation	Proximity to category 1 riparian habitat conservation areas, aquatic species habitat, and critical habitat
Category 2 tributary to Deerhorn Creek	Over 0.55 miles upstream.
Category 2 tributary to Deerhorn Creek	Over 0.55 miles upstream.
Category 2 tributary to Deerhorn Creek	Over 0.55 miles upstream.
Category 2 tributary to Deerhorn Creek	Over 0.55 miles upstream.
Category 1 Davis Creek	Crosses category 1 riparian habitat conservation area, aquatic species habitat, and Middle Columbia River steelhead critical habitat; parallels Davis Creek for approximately 1 mile approximately 100 feet upslope.
Category 2 tributary to Davis Creek	Approximately 100 feet upstream.
Category 4 tributary to Davis Creek	Approximately 0.18 miles upstream.
Category 1 Placer Gulch	Crosses category 1 riparian habitat conservation area, aquatic species habitat, and Middle Columbia River steelhead critical habitat.

Cumulative Effects – Primary Habitat Elements

Effects of the past and ongoing actions included in Appendix E – Past, Ongoing, and Reasonably Foreseeable Actions are described in the Affected Environment section above:

- Effects of past and ongoing actions.
- General existing stream conditions.
- The affected environment sub-sections for pool frequency, large woody debris, bank stability, embeddedness and fine sediment, width-to-depth ratio, and water temperature and stream shading.

Effects are mostly due to roads (including former logging railroads), past grazing, and past riparian harvest. Lesser effects may be due to current grazing, irrigation withdrawals (temperature), riparian firewood cutting (large woody debris), and fish passage and habitat restoration projects (sediment).

The aquatic habitat and water quality effects of foreseeable activities described in Appendix E – Past, Ongoing, and Reasonably Foreseeable Actions are negligible, except for the ongoing actions mentioned in the preceding sentence. The effects of use and maintenance of roads which are not decommissioned would remain about the same as at present. The effects of past fish passage and habitat restoration projects would decrease after instream work is finished, and would likely be negligible within 2 years after implementation. The positive effects of fish passage would remain constant unless something impacts passage again. Stream shading may be reduced in the short term (5 to 10 years) at habitat restoration sites immediately following treatment, but are expected to return to baseline levels after that period. Measurable improvements in stream shading are expected to occur in the long term (beyond 10 years) once the synergistic benefits of the action alternatives and cumulative effects of improvements in passive riparian management are realized.

With full implementation of Malheur Forest Plan grazing standards there is little likelihood of cumulative effects from grazing, since these standards are designed to allow a near natural rate of recovery of aquatic habitat and riparian vegetation. The current grazing standards are designed to eliminate any effects on aquatic habitats that could carry over to the following year.

All project elements except for temporary road and landing construction would have positive and meaningfully measureable effects to one or more of the primary habitat elements (see Table 68 and Table 69). The Ragged Ruby Project would restore upland and riparian forest health and processes, and introduce disturbance-related fire effects. The cumulative effects of these actions when combined with the effects of past, ongoing, and reasonably foreseeable actions are expected to offset the adverse effects described above and result in overall beneficial cumulative effects to species habitat considered in this biological evaluation. A strong positive response to habitat and six primary habitat elements is expected.

Compliance with Relevant Laws, Regulations, and Policies

Malheur Forest Plan

This project is consistent with Malheur Forest Plan and PACFISH objectives, and is expected to achieve those objectives in treated areas where not currently met.

Specifically, alternatives 2 and 3 are consistent with the following applicable management area 3B and PACFISH standards:

- PACFISH RF-2b: proposed temporary roads and landings and staging areas in riparian habitat conservation areas are minimized.
- PACFISH RF-3a and b: roads that will be used for proposed vegetation management activities will have drainage problems repaired and will be brought up to standards prior to haul.
- PACFISH RA-2: danger trees felled in riparian habitat conservation areas and outside of the roadway will be left on site where woody debris objectives are not being met.
- Malheur Forest Plan desired future conditions and riparian management objectives: activities proposed under both alternatives would not retard the attainment of Malheur Forest Plan riparian management objectives for aquatic habitat (large woody debris, replacement large woody debris, pool frequency, bank stability, width-to-depth ratio, sediment and substrate, shading, and water temperature). Design criteria will be used to minimize the amount of fine sediment resulting from proposed activities. In the long term, restoration proposed would enhance the attainment of riparian management objectives (please see Direct and Indirect Effects sections).
- Design prescribed burn projects and prescriptions to contribute to the attainment of riparian management objectives (PACFISH standard FM-4).
- Prohibit storage of fuels and other toxicants within riparian habitat conservation areas. Prohibit refueling within riparian habitat conservation areas unless there are no other alternatives. Refueling sites within a riparian habitat conservation area must be approved by the Forest Service and have an approved spill containment plan (PACFISH standard RA-4).
- Locate water drafting sites to avoid adverse effects to listed anadromous fish and instream flows, and in a manner that does not retard or prevent attainment of riparian management objectives (PACFISH standard RA-5).
- Design fuel treatment and fire suppression strategies, practices, and actions so as not to prevent attainment of riparian management objectives, and to minimize disturbance of riparian ground cover and vegetation. Strategies should recognize the role of fire in ecosystem function and identify those instances where fire suppression or fuel management actions could perpetuate or be damaging to log-term ecosystem function, listed anadromous fish, or designated critical habitat (PACFISH standard FM-1).

The development of the proposed actions and project design criteria are consistent with all of these standards, as described in chapter 2 of the Ragged Ruby draft environmental impact statement.

Floodplains (Executive Order 11988)
Executive Order 11988 says that Federal agencies shall avoid direct adverse effects to floodplains or minimize potential harm. Floodplains several feet wide occur along much of the Middle Fork John Day River and its tributaries within the aquatic analysis area. The floodplains are well within riparian habitat conservation areas, and so all alternatives avoid adverse effects to the floodplains, and thus are consistent with Executive Order 11988.

Recreational Fisheries (Executive Order 12962)
Alternatives 2 and 3 include decommissioning roads and recreation system changes that would improve quantity, function, sustainable productivity, and distribution of recreational fisheries by reducing impacts from elevated levels of fine sediment as directed under Executive Order 12962, Recreational Fisheries.

National Forest Management Act
Alternatives 2 and 3 include decommissioning roads and recreation system changes that would improve the viability of native aquatic species and enhance conservation of listed threatened aquatic species populations.

Endangered Species Act
Federally listed fish species and their designated critical habitat in the planning area subject to consultation include Columbia River bull trout and their designated critical habitat, and Middle Columbia River steelhead and their designated critical habitat. The National Marine Fisheries Service and U.S. Fish and Wildlife Service aquatic restoration biological opinion addresses consultation on all aquatic restoration actions proposed in the Ragged Ruby Project. The Malheur National Forest will initiate Endangered Species Act section 7 consultation with National Marine Fisheries Service and U.S. Fish and Wildlife Service on the remaining actions of the Ragged Ruby Project, and expects to provide the regulatory agencies with a biological assessment regarding effects of the project to Middle Columbia River steelhead, Columbia River bull trout, and their designated critical habitats. The completed biological assessment and consultations will be located in the project file.

Clean Water Act
Alternatives 2 and 3 comply with the Clean Water Act and the Malheur Forest Plan, since none raise water temperatures, and since all follow best management practices as specified in "National Best Management Practices for Water Quality Management on National Forest System Lands Volume 1: National Core BMP Technical Guide" (USDA Forest Service 2012), and in standards and guidelines in the Malheur Forest Plan. The site-specific best management practices are listed in Appendix C – Project Design Criteria, in PACFISH standards and guidelines (as described earlier in the Regulatory Framework section), and in standard timber sale contracts.

Water Temperature and Stream Shading

Affected Environment

Methodology

Methodology for this primary habitat element is the same as described for Methodology – Primary Habitat Elements, with the exceptions below.

Water temperature influences the metabolism, behavior, and health of fish and other aquatic organisms. Fish can survive at temperatures near extremes of suitable temperature ranges; however, growth is reduced at low temperatures because all metabolic processes are slowed. At the opposite extreme, growth is reduced at high temperatures because most or all energy from food must be used for maintenance needs.

Water temperature monitoring data is available for six Middle Fork John Day River tributary streams in the analysis area: Beaver, Butte, Granite Boulder, Ragged, Ruby, and Sunshine creeks. Temperatures were recorded in 2015. Temperature loggers were deployed in early to late July and collected early to mid-October. There is also stream temperature monitoring data available for the Middle Fork John Day River approximately 7 miles downstream of the analysis area from 2013. See Ragged Ruby Aquatic Resources Report for more information.

The Malheur Forest Plan standards for water temperature are for no measurable increase in maximum water temperature, and to meet state standards. The Malheur Forest Plan standard for water temperature is for no measurable increase in maximum water temperature. Amendment 29 states there should be no instantaneous reading at any given time above 68 degrees Fahrenheit, and the PACFISH riparian management objective is for maximum water temperatures to be below 64 degrees Fahrenheit within migration and rearing habitat and below 60 degrees Fahrenheit within spawning habitats. PACFISH is a standard for fish habitat and may not be consistent with total maximum daily load. For comparison with total maximum daily load, see chapter 3, Watershed section.

The State of Oregon standard for water temperatures is a 7-day average maximum of 16 degrees Celsius (60.8 degrees Fahrenheit) for the Middle Fork John Day River “core cold water”; a 7-day average maximum of 12 degrees Celsius (53.6 degrees Fahrenheit) in bull trout spawning and rearing streams (including in bull trout designated critical habitat of Granite Boulder Creek in the analysis area); a 7-day average maximum of 18 degrees Celsius (64.4 degrees Fahrenheit) within salmon and steelhead migration and rearing habitat; and below 13 degrees Celsius (55.4 degrees Fahrenheit) within salmon and steelhead spawning habitats. Note that although Butte Creek is also designated critical habitat for bull trout, the state standard for salmon and steelhead habitats is still applicable.

Existing Condition

See Table 65 for existing conditions of planning area streams for the six aquatic primary habitat elements as defined by PACFISH and Malheur Forest Plan Amendment 29.

Temperature data indicates that Granite Boulder Creek meets adult bull trout temperature requirements of less than 15 degrees Celsius and almost meets the rearing temperature of less than or equal to 12 degrees Celsius. Average stream temperatures in Granite Boulder Creek are lower during July to October, at approximately 13 to 8 degrees Celsius than the lowest reach monitored at 16 degrees Celsius in July to 12 degrees Celsius in October.

The Middle Fork John Day River stream temperature data shows that the river is above standards for all life histories of bull trout until mid-September. During the summer months, the daily minimum and maximum stream temperatures fluctuate 5 to 6 degrees from daily high and low temperatures. These temperature fluctuations decrease with the cooler months. Large temperature fluctuations are undesirable on fish metabolism and survival.

Mean maximum water temperatures are above the suitable range for salmon and steelhead during summer months in the planning area in all of the stream reaches that we have monitoring data for (Table 65) except for Beaver Creek reach 2, Butte Creek reach 2, Ruby Creek reaches 1 and 2, and Sunshine Creek reaches 1 and 2. This data may also be used to extrapolate water temperatures both downstream and upstream of temperature sites. The average 7-day maximum stream temperature in Middle Fork John Day River tributaries across the planning area (where data is available), ranges from 56.2 to 70.1 degrees Fahrenheit. The temperature metrics by stream reach are summarized in Table 65 and chapter 3, Watershed section. Note that maximum spot temperatures are also reported in Table 65; however, this data cannot be used to determine the mean maximum 7-day temperature. Please see Ragged Ruby Aquatic Resources Report figures 1 to 13 for specific stream temperature data and graphing of temperature averages.

Environmental Consequences

Methodology

Methodology for this primary habitat element is the same as described for Methodology – Primary Habitat Elements, with the exceptions below.

Stream shading may be reduced in the short term (5 to 10 years) at habitat restoration sites immediately following treatment, but is expected to return to baseline levels after that period. Measurable improvements in stream shading are expected to occur in the long-term (beyond 10 years) once the synergistic benefits of the action alternatives and cumulative effects of improvements in passive riparian management are realized. Measureable increases in water temperature associated with the minor short-term reductions in stream shading are not anticipated. Restoration activities would have long-term beneficial impacts to aquatic habitat and fish.

Measurable improvements in water temperature are expected to occur in the long term beginning approximately 10 years after treatments, particularly in Butte, Ruby, Granite Boulder, and Beaver creeks once hardwoods become reestablished. Such improvements are expected to extend downstream of the planning area to approximately the confluence of these streams and the Middle Fork John Day River. Reduced peak flows and increased base flows associated with riparian and upland treatments are anticipated to contribute to reductions in water temperature in the long term as well. Increases in air temperature and reductions in snow pack (with associated increases in stream temperatures) described in some global climate change projections may offset expected improvements in stream temperatures resulting from the action alternatives. However, the expected improvements in riparian vegetation and hydrological processes (water conveyance and storage) are expected to provide the resiliency required to prevent further water temperature warming than currently exists even with expected climate scenarios.

Reasonably foreseeable aquatic habitat restoration activities authorized under the Aquatic Restoration Decision (USDA Forest Service 2014b) within the analysis area may result in short-term cumulative effects because the foreseeable activities would likely result in short-term decreases in stream shade. The short-term decrease may add to adverse effects because many streams in the analysis area presently do not meet objectives for water temperature and associated impacts to aquatic habitat and salmonids. However, the foreseeable aquatic habitat restoration activities would address the current riparian hardwood absence from localized stream reaches and reconnect floodplains through elevating water tables and invigorating riparian hardwood growth, leading to a long-term increase in stream shade levels and cool water storage resulting in improved water temperatures. Reasonably foreseeable aquatic habitat restoration activities would therefore have beneficial impacts to aquatic habitat and fish. (See spatial and temporal context effects discussion above).

Alternative 1 – No Action

Direct and Indirect Effects

Alternative 1 would maintain the current levels of stream shading, with perhaps a slow increase as trees in previously logged riparian areas continue to grow at a retarded rate due to overstocked stands.

Current water temperatures exceed objectives for water temperature in nearly all streams in the analysis area (Table 65). Mean maximum water temperatures are above the suitable range for bull trout, redband trout, and juvenile Middle Columbia River steelhead, which are all present in the aquatic analysis area during the summer months. Water temperatures in most streams within the aquatic analysis area would likely not change over the short term due in part to the influence of valley bottom roads, riparian shrub browse on streamside vegetation, lowered water tables, limited beaver activity, and disconnected floodplains. Water temperatures in the Middle Fork John Day River and tributaries may slowly improve as streamside vegetation responds to improvements in range management activities. Recent range observations indicate that there is an upward trend in channel and streambank vegetation in the analysis area.

The hazard from severe wildfire would be higher under this alternative than the action alternatives, as shown in the Fire and Fuels section. If a severe wildfire does occur, stream temperatures would likely increase due to a large-scale decrease in stream shading.

See also description in Pool Frequency section for effects on primary habitat elements under alternative 1 (Direct and Indirect Effects – Primary Habitat Elements section).

Cumulative Effects

Because there are no direct or indirect effects of taking no action, there would be no cumulative effects.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Compliance with the Malheur Forest Plan and other relevant laws, regulations, and policies are as described for Pool Frequency.

Alternatives 2 and 3

Direct and Indirect Effects

Timber Felling

As discussed with Pool Frequency, the majority of timber felling activities would occur outside of riparian habitat conservation areas under alternatives 2 and 3, therefore no meaningfully measureable effects to water temperature and stream shading are expected. The remaining analysis focuses on actions that would occur within riparian habitat conservation areas.

Non-commercial thinning in riparian habitat conservation areas would remove understory trees from densely stocked stands, no closer than 25 feet from streams. Trees felled within or into riparian habitat conservation areas would be left within the riparian habitat conservation area and felled towards the stream where reasonably feasible. Conifers felled into streams would immediately shade a minor portion of the stream, reducing the short-term impact to shade. Felled conifers would also provide sheltered sites for riparian hardwood growth through reduction of browse by herbivores, which would enhance stream shading in the long term.

The existing condition for stream shading currently exceeds Amendment 29 standards for most reaches identified for non-commercial thinning, providing a buffer for the minor reduction in stream shading. As water tables rise in response to the suite of restoration actions proposed here and under the Aquatic Restoration Decision, invigorated hardwoods would restore stream shading to baseline conditions within 10 to 15 years. Cold water storage and slow release, along with narrowing of overwidened channels, would increase the volume of water within stream channels and reduce solar gain.

These changes in stream shading are not likely to result in meaningfully measureable changes in stream temperature, owing primarily to the very small scale of treatments within the primary shade zone, and the implementation of project design criteria which would minimize the effects. Additionally, approximately half of all non-commercial thinning would occur within category 4 riparian habitat conservation areas where streams go dry before water temperatures become limiting for fish. Effects to water temperature and stream shading are slightly greater under alternative 3 due to the slight increase in riparian habitat conservation area acres treated.

Skyline yarding removal of shade-providing trees would be limited in size and frequency. All skyline yarding units were designed to yard uphill, and since no skyline units are within riparian habitat conservation areas, the need to yard across streams is unlikely. Tailholds are needed for each skyline corridor, which may cross streams. Yarding corridors 12 feet in width and a minimum 100 feet apart are highly unlikely to cause increased solar radiation and warming of surface waters. Usually no trees need to be felled, but some limbing may be needed within riparian habitat conservation areas. Tailhold trees are typically outside riparian habitat conservation areas. Further, the majority of shade-providing trees removed adjacent to streams would occur along intermittent streams, reducing the likelihood that removal of these trees would result in a change in water temperature because intermittent streams go dry before water temperatures in aquatic threatened, endangered, sensitive, and management indicator species habitat downstream become limiting to fish. No measureable stream heating from solar radiation is anticipated and water temperatures would be maintained; thus, the probability that stream temperatures would increase from these activities is discountable at the site and reach scale under either action alternative.

Felling of danger trees may occur along approximately 2.7 miles of haul routes that are within 100 feet of category 1 riparian habitat conservation area streams, and previous field observations suggest one to two trees per mile may be felled for a total of approximately four trees. Danger trees are usually dead and provide little shade, especially when surrounded by live trees. Considering this, as well as the minimal number of danger trees anticipated to be felled, measurable increases in stream temperatures would not likely result from proposed danger tree felling under alternatives 2 and 3. Additionally, danger trees felled within or into riparian habitat conservation areas would be felled into the stream where feasible or otherwise left within the riparian habitat conservation area. Conifers felled into streams would immediately shade a minor portion of the stream, as well as provide sheltered sites for riparian hardwood growth through reduction of browse by herbivores, which would enhance stream shading in the long term.

Of the 18 aspen restoration stands, 5 are within category 4 riparian habitat conservation areas, 6 are within category 2 riparian habitat conservation areas, and 3 are within category 1 riparian habitat conservation areas (see description in Pool Frequency section above). Most thinning in these small areas would occur away from streams towards the uplands. The greatest potential for aspen restoration work to affect shading and stream temperatures is within units A10 (0.5 acres) and A09 (0.3 acres) in the Sunshine Creek category 1 riparian habitat conservation area and occupied critical habitat for aquatic species. Under the most extreme case, shade may be reduced down to a minimum 30 percent in small portions of the aspen treatment areas. Where possible, conifers would be dropped across the channel, which would provide cover and some additional shade, as well as potentially raise the water table to further facilitate aspen restoration. Removal of shade from category 4 stream channels is expected to have a neutral effect on stream temperatures, as these streams go dry before water temperatures become limiting for fish.

As a result of the silviculture prescription to release shade for the expansion and accelerated growth of these aspen stands, it is expected that heights and densities of the units should be sufficient to return baseline shade conditions within 10 to 15 years.

After the first 10 to 15 years, shade is expected to improve beyond baseline. Other benefits include improved resiliency to fire within these aspen stands, an increase in deciduous leaf litter, bank root strength, riparian under and overstory complexity, and both width and length of a true riparian community. As a result, it is expected that a 10 to 15 year reduction in shade may impact habitat through an increase in solar radiation resulting in minor changes to the riparian microclimate. These changes are not likely to result in meaningfully measureable changes in stream temperature for either action alternatives, owing primarily to the very small scale of treatments, and the implementation of project design criteria which would minimize the effects. See chapter 3, Watershed section for additional analysis regarding the effects of the action alternatives on stream temperatures.

Prescribed Burning and Unplanned Ignitions

The majority of fuels treatment activities would occur outside of riparian habitat conservation areas and would have beneficial effects to aquatic resources by reducing surface fuels, thinning trees, stimulating growth of aspen and other hardwoods, and increasing the canopy base height.

Burn prescriptions and project design criteria would give the burn personnel a high degree of control over the burn intensities within the riparian habitat conservation areas to maintain the majority of the burn at a low intensity to minimize the severity on soils and riparian vegetation. These techniques would result in a patchy distribution of burned and unburned areas in riparian habitat conservation areas based on the Forest’s experience with past prescribed burning activities in riparian habitat conservation areas using the same technique. Best management practices for low intensity burning include retention of at least 90 percent of stream shade. The prescribed burning would occur when moisture and climate conditions would minimize the potential for a high-intensity burn. With a low-intensity burn, very little stream vegetation providing shade is expected to be consumed under the more moist conditions encountered in riparian areas associated with perennial streams. In a recent study, Beche et al. (2005) found that a fall prescribed fire within the riparian zone of a mixed-conifer forest in El Dorado County, California was patchy in terms of intensity, consumption, and severity. Additionally, they found that although 49.4 percent of all tagged trees (greater than 11.5 centimeters or 4.5 inches) and snags were scorched by the prescribed fire, only 4.4 percent of all tagged trees were dead 1 year after the prescribed fire. In general, the trees killed by the prescribed fire were small and located near areas of high litter accumulation (Beche et al. 2005).

The amount of shade lost during low-intensity burns is insignificant, and is expected to not be enough to affect stream temperature under either action alternative. Effects would be negative but not meaningfully measureable.

Temporary Roads and Landings

No landings are proposed within riparian habitat conservation areas under alternative 2 or 3. Limiting these activities to areas outside of riparian habitat conservation areas would prevent adverse impacts to water temperature and stream shading. Most temporary roads would have a discountable effect to aquatic resources (see discussion under Pool Frequency section). Sites requiring the removal of shade-providing trees for temporary road construction are limited in size and frequency, and the majority of shade-providing trees removed adjacent to streams occur along intermittent streams, reducing the likelihood that removal of these trees would result in a change in water temperature because intermittent streams go dry before water temperatures in occupied threatened, endangered, sensitive, and management indicator species habitat downstream become limiting to fish. Additionally, nearly all temporary road construction in riparian habitat conservation areas would occur on existing roadbeds requiring minimal removal of trees that could shade streams. The removal of shade associated with construction of temporary roads would have a negative effect to stream shading and water temperature that would not be meaningfully measureable for either action alternative.

Road Decommissioning

Road decommissioning actions would not have any immediate effect on shade. Removal of danger trees in riparian habitat conservation areas for decommissioning activities is not anticipated. Conifers and native riparian hardwoods would be planted in decommissioned road segments as part of the decommissioning process where active decommissioning occurs. Over the long term (50 to 70 years), shading would increase beyond baseline as conifers become established and grow to a size that provides shading. However, a neutral effect to water temperature and stream shading is anticipated due to the small scale of decommissioning in proximity to streams under both action alternatives.

Road Maintenance and Use

The Road Maintenance and Use project element includes maintenance, reconstruction, haul, water drafting, opening and closing roads, and interpretive sign installation. Road maintenance, reconstruction, haul, water drafting, and opening and closing roads would have a neutral effect to stream shading and water temperatures with adherence to project design criteria. As closed roads are deemed needed for future management and are accessed infrequently, trees would not likely grow of a sufficient size within the roadbed to provide shade. Water withdrawals for dust abatement during haul activities would occur. Water drafting can occur only as long as supply is adequate to provide for both fish and withdrawal. The maximum withdrawal from one site in an 8-hour period would be 18,000 gallons of water. Water withdrawals would be in accordance with project design criteria, the use of which would insure that water withdrawals do not result in a measurable increase in water temperatures under either action alternative.

Interpretive sign installation would occur within the category 1 riparian habitat conservation area of Butte Creek, but over 100 feet from the active stream channel. With implementation of project design criteria, there would be a neutral effect to temperature and stream shading from this activity under both action alternatives.

Recreation System Changes

The Recreation System Changes project element includes trail and trailhead construction, trail closures, and stream crossing improvements. The extent of recreation system changes in proximity to aquatic species habitat is the same as that discussed under the Pool Frequency section. No felling of primary shade trees or large woody debris within 100 feet of the stream channel is expected. With implementation of project design criteria, best management practices, and aquatic restoration biological opinion criteria for livestock crossing streams on recreational trail crossings within category 1 and 2 riparian habitat conservation areas, there would be a neutral effect to shade and water temperature from this proposed activity under both action alternatives.

Cumulative Effects

Cumulative effects are as described for Pool Frequency, under alternatives 2 and 3 in the Cumulative Effects – Primary Habitat Elements section.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Compliance with the Malheur Forest Plan and other relevant laws, regulations, and policies are as described for Pool Frequency.

Embeddedness and Fine Sediment

Affected Environment

Methodology

Methodology for this primary habitat element is the same as described for Methodology – Primary Habitat Elements, with the exceptions below.

Composition of the stream substrate is an important feature of aquatic habitat. Cobble and gravel substrates provide habitat for macroinvertebrates as well as eggs and early life stages of numerous fish species. Macroinvertebrates represent a substantial portion of the diet available to fish. Filling of interstitial spaces (the gaps between rocks on the stream bottom) with fine sediment (particles less than 2 millimeters in size) eliminates habitat for many macroinvertebrates. Fish eggs, early life stages, and winter habitat for juvenile salmonids can also be buried and smothered when interstitial spaces are embedded with fine sediment. However, fine sediment is part of the bedload of the stream, and is utilized by some aquatic organisms such as mussels and lamprey, which burrow in fine sediment. Thus, there is a balance of how much fine sediment the organisms that inhabit a stream can handle.

Existing Condition

Stream surveys indicate that substrate embeddedness and fine sediment objectives (less than 20 percent fine sediment) are not being met in Coyote Creek reach 1, Coyote Creek reach 3, Dry Creek reach 1, Lemon Creek reach 1, Bennett Creek reach 1, Ragged Creek reach 1, and Sulphur Creek reach 1 (Table 65). Fine sediment data is not available for the 1993 surveys of Sunshine Creek reaches 1 and 2, as a different method (percent embeddedness) was used as the metric; this method has since been discontinued.

Likely sources for fine sediment are activities in the riparian area and the areas upslope of the stream in streams that have steep slopes. Activities that may contribute fine sediment to the riparian areas include: channel modification from railroad logging, mining, severe wildfire, channel erosion, livestock grazing (especially past grazing), and roads.

Several roads in the planning area have been identified as potential sources of fine sediment and are within the active floodplain; select roads would be addressed in this project through passive decommissioning, conversion to trails, and closures. Other problem roads are identified for treatment under the Aquatic Restoration Decision (see Appendix E – Past, Ongoing, and Reasonably Foreseeable Actions, Table E-2).

As mentioned previously, fine sediment is utilized by some aquatic organisms and thus is needed in streams in specific locations. Fine sediment also provides the medium for development of nutrient-rich soils. However, fine sediment loading is out of balance when deposition occurs on pool tailouts or fills pools; this indicates altered hydrology and channel morphology, since fine sediment would normally drop out onto the floodplain or be trapped behind large woody debris or boulders. Thus, roughness features like instream large woody debris and beaver dams that help build banks and streambeds, or that capture pockets of fine sediment, are lacking.

Contemporary land management activities such as effective road maintenance and adherence to best management practices aid in controlling the amount of fine sediment entering streams; however, the effects of legacy land management are still evident, as shown by the fine sediment data.

Environmental Consequences

Methodology

Methodology for this primary habitat element is the same as described for Methodology – Primary Habitat Elements, with the exceptions below.

A short-term increase in fine sediment and embeddedness may occur at and immediately downstream of aquatic habitat restoration treatment sites, but treatments would lead to a long-term reduction (5 years or more) in fine sediment levels and therefore would have beneficial impacts to aquatic habitat and fish.

Reasonably foreseeable aquatic habitat restoration activities authorized under the Aquatic Restoration Decision (USDA Forest Service 2014b) within the analysis area may result in short-term cumulative effects because the activities would likely result in short-term increases in fine sediment. The short-term sediment increases may add to adverse effects because many streams in the analysis area presently do not meet objectives for embeddedness and fine sediment and associated impacts to aquatic habitat and salmonids. However, the foreseeable aquatic habitat restoration activities would address current excessive fine sediment input and lack of hydrological features that support fine sediment deposition, leading to a long-term reduction in fine sediment levels. Reasonably foreseeable aquatic habitat restoration activities would therefore have beneficial impacts to aquatic habitat and fish. (See spatial and temporal context effects discussion above.)

Alternative 1 – No Action

Direct and Indirect Effects

Alternative 1 would maintain the current levels of embeddedness and fine sediment over much of the analysis area. Existing fine sediment levels are likely having adverse impacts to aquatic habitat. These adverse effects include reduced spawning success for salmonids and reduced quality of rearing habitat for juvenile salmonids. Fine sediment levels in the streams discussed above would slowly decrease as channels stabilize from past grazing and road building. However, native surface roads that are contributing fine sediment would stay in their current conditions.

The hazard from severe wildfire would remain high under alternative 1, as shown in the Ragged Ruby Fire, Fuels, and Air Quality Report. If a severe wildfire does occur, a pulse of sediment would likely enter the streams due to soil erosion, and due to channel erosion from increased peak flows and decreased root structure on stream channels.

Existing native surface roads located in riparian habitat conservation areas would remain. Delivery of fine sediment to streams would continue at their current levels. Stronghold populations of salmonids are associated with higher elevation forested lands, and the proportion declines with increasing road densities (Quigley et al. 1996). The higher the road density, the lower the proportion of subwatersheds that support strong populations of key salmonids. Specifically, Quigley et al. (1996) showed a strong correlation with road densities of 2 miles per square mile or higher and reduction of strong populations of salmonids. Further reductions of strong salmonid populations were identified at densities of 3 miles per square mile and 4 miles per square mile or greater. Roads in the planning area that occur within 100 feet of streams, or cross streams, commonly impact fish and fish habitat more than roads located in uplands.

A high percentage of roads in riparian habitat conservation areas in the planning area are native surface roads which contribute fine sediment to streams that adversely affects aquatic habitat. Total open and closed road densities are approximately 4.1 miles per square mile. There are approximately 23.5 miles of open and closed roads in the planning area that impact streams due to proximity (100 feet or less). These conditions reduce availability of subsurface cool water storage and have caused streams to become disconnected from floodplains.

See also description in Pool Frequency section for effects on primary habitat elements under alternative 1 (Direct and Indirect Effects – Primary Habitat Elements section).

Cumulative Effects

Because there are no direct or indirect effects of taking no action, there would be no cumulative effects.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Compliance with the Malheur Forest Plan and other relevant laws, regulations, and policies are as described for Pool Frequency.

Alternatives 2 and 3

Direct and Indirect Effects

Timber Felling

The majority of timber felling activities would occur outside of riparian habitat conservation areas under alternatives 2 and 3, therefore no meaningfully measureable effects to embeddedness and fine sediment are expected. No commercial treatments would occur within riparian habitat conservation areas. The remaining analysis focuses on actions that would occur within riparian habitat conservation areas.

Non-commercial thinning would occur within riparian habitat conservation areas no closer than 25 feet from streams, and would not involve ground-disturbing activities, thus inputs of fine sediment to streams is not expected. Thinned trees would be felled towards streams and floodplains where reasonably feasible; this would be done in a manner where branches interact with the stream and floodplain to capture sediment, increase sinuosity, and reduce gullying. As sediment is captured, the water table would rise, soaking in more water during snowmelt runoff and storing more water in the soil column later into the summer, providing for expanded herbaceous and shrub communities. Proposed activities would restore riparian processes and functions, enhancing floodplain roughness and stream channel complexity including storage and sorting of stream substrates, resulting in a reduction in substrate embeddedness and fine sediment in the long term. Because of the implementation of project design criteria and riparian habitat conservation area buffers to trap any fine sediment generated from these activities (including specific project design criteria to address treatments in scablands that consist of limited herbaceous vegetation), no meaningfully measurable effects to stream embeddedness and fine sediment are expected for either action alternative.

In the unexpected event that skyline corridors would cross streams, full suspension of logs across channels through limited-width skyline corridors would filter sediment caused by ground-disturbing activities.

Heavy equipment may be used during aspen restoration treatments. Project design criteria on use of equipment within the riparian habitat conservation area would limit the inputs of fine sediment, and although fine sediment may result from implementation of this treatment, the amount of sediment that enters the stream is expected to be trapped by the trees felled and would not result in a meaningfully measurable effect.

Since proposed danger tree felling does not involve ground-disturbing activities, inputs of fine sediment are not expected to occur under either action alternative.

Prescribed Burning and Unplanned Ignitions

Most fuel treatment activities would occur outside of riparian habitat conservation areas. Ignition of prescribed burns would occur outside riparian habitat conservation areas and fire would be allowed to back into riparian habitat conservation areas from upslope burning units. Ignition would also occur within some riparian habitat conservation areas, stopping within 25 feet of the stream channel. Most burning activities would mimic low-intensity fires that are characteristic of natural burning patterns in riparian areas. These techniques would result in a patchy distribution of burned and unburned areas in riparian habitat conservation areas. Using these techniques, fire intensities would not be high enough to consume downed wood that plays a role in trapping fine sediment. Some ground cover would be consumed but would be quickly replaced as litter fall occurs in the first year following burning, and herbaceous plants recover in the second year following burning. A measurable increase in fine sediment in stream channels as a result of low-severity burning activities is unlikely due to the combination of a patchy, low-intensity burn in riparian habitat conservation areas, typical recovery of ground cover within 2 years of burning, and the low erosion potential for the subwatersheds. Firelines would not be constructed in riparian habitat conservation areas, nor down draw bottoms.

Due to the expected mosaic pattern of burning within and outside of riparian habitat conservation areas, and the project design criteria that would be implemented with this action, prescribed burning would not result in delivery of fine sediment to stream channels sufficient to result in meaningfully measureable effects to embeddedness and fine sediment under either action alternative. As invigorated riparian vegetation growth following the reintroduction of fire occurs, fine sediment from upland sources would be filtered and stored in outer portions of riparian habitat conservation areas, resulting in a long-term beneficial effect to embeddedness and fine sediment that is not meaningfully measureable. Beche et al. (2005) conducted intense post-prescribed fire monitoring (for example, pebble counts, longitudinal profiles, and cross-sections) and observed little to no change in stream sediment composition 1 year post-fire. Similarly, they observed little to no change in stream channel morphology and no substantial change in erosion or deposition in the surveyed reaches (Beche et al. 2005).

Temporary Roads and Landings

No landings are proposed within riparian habitat conservation areas under alternatives 2 or 3. Limiting these ground-disturbing activities to areas outside of riparian habitat conservation areas along with erosion control best management practices, would prevent negative and meaningfully measurable impacts to embeddedness and fine sediment. PACFISH riparian habitat conservation area buffer widths were designed to provide an area to trap fine sediment generated from upslope activities such as timber harvest.

With implementation of project design criteria, construction of most temporary roads would not result in a meaningfully measureable increase in embeddedness and fine sediment under either action alternative.

Temporary road construction (including post-use rehabilitation) of the segment that comes to within 50 feet of the Dry Creek category 4 stream channel and crosses a category 2 riparian habitat conservation area stream (stream has very low flow and may be intermittent) near its confluence with Dry Creek would likely result in creation and transport of a negligible amount of fine sediment to Dry Creek due to loosening of sediment particles and destruction of ground cover. However, implementation of project design criteria during these activities, the fact that this road segment is on an existing roadbed requiring minimal disturbance to bring to a useable state, and the presence of low slopes and a minimum 40-foot vegetated buffer between the stream and road, fine sediment delivery to Dry Creek is expected to be limited, keeping amounts reaching the stream channel to negligible levels for other than rare precipitation events (negative but not meaningfully measurable effects under both action alternatives). This is the only stream where proximity of proposed temporary road work warrants specific discussion due to potential for effects to this indicator (see discussion under the Pool Frequency section).

A notable study done on the Malheur National Forest by Robert McNeil, Soil Scientist, in 1999 found that under normal conditions, sediment was found no farther than 32 feet from road disturbance. The study concluded that buffer widths of 50 feet or less are sufficient to protect streams from sediment from existing roads, except near scabs. “Not normal conditions” in the study were: (1) scabs (non-forested areas with shallow soils limited ground cover), or (2) where runoff hit an abandoned road (McNeil 1999).

Road Decommissioning

The procedure for active decommissioning of roads would include removing all culverts and reshaping the immediate area. In addition, cross ditches would be constructed to maintain drainage and reduce the potential for surface erosion. These measures would be implemented during decommissioning to “hydrologically disconnect” roads from streams, to reduce sediment entering streams and affecting fish habitat.

Since no active road decommissioning would occur within riparian habitat conservation areas, fine sediment delivery to streams is expected to be limited, keeping amounts reaching the stream channel to negligible levels for other than rare precipitation events (negative but not meaningfully measurable effects for both action alternatives).

Road Maintenance and Use

Road maintenance would occur at a level commensurate with use, and includes several activities that potentially result in sedimentation from the road prism to the ditch line, or the adjacent slope. Typical road maintenance activities include: blade and shape road including existing drainage dips, grade sags, and waterbars; repair damaged culverts and ditches; place rock in some existing drainage dips and grade sags; place rock in wet areas of road; brush the road;

remove danger trees; and perform dust abatement. Project design criteria include rocking of stream crossings to minimize sediment delivery to streams from haul. Machinery would be kept on the road prism.

The longer-term effects of road maintenance are to maintain or improve existing road conditions. Road maintenance may decrease chronic sedimentation in some locations. Improving drainage, removing ruts and rills from the driving surface, and adding less erosive surfacing material would reduce detachment and transport of sediment. This is especially important for roads within riparian habitat conservation areas. Because road maintenance activities would be commensurate with use, it is possible that if winter logging occurs, little to no road maintenance may be necessary and therefore would not occur. Alternatively, if operations occur in the summer, road maintenance may occur on all or nearly all of the haul roads.

Proposed road maintenance and haul activities in riparian habitat conservation areas would likely result in creation and transport of a negligible amount of fine sediment to stream channels due to loosening of sediment particles and destruction of ground cover. However, project design criteria would be implemented during these activities, and are expected to limit fine sediment delivery to streams, keeping amounts reaching stream channels to negligible levels for other than rare precipitation events (negative but not meaningfully measurable under both action alternatives).

Water withdrawals for dust abatement during haul would be in accordance with the project design criteria, including National Marine Fisheries Service guidance. Use of project design criteria for water drafting would ensure that water withdrawals do not result in significant delivery of fine sediment to streams.

Road closure actions include construction of drainage structures that would be self-maintaining after closure. Closure of these roads poses a negligible risk of sedimentation to fish-bearing streams since dry land "filtration" lies between the closure sites and any streams, and since the amount of land disturbed during gate construction is too small and too flat to produce significant sediment. However, since these roads are being kept as part of the Forest road system, the benefits of the closures would likely not be permanent.

Because of the low risk of sedimentation from road closures and reduction in vehicle travel (resulting in vegetation covering the roadbed) effects to embeddedness and fine sediment are expected to be positive but not meaningfully measurable due to the lack of permanency for closures under both action alternatives.

The installation of an interpretive sign would be a small-scale disturbance, thus no effect related to embeddedness and fine sediment is expected from placing interpretive signs.

Recreation System Changes

The extent of recreation system changes in proximity to aquatic species habitat is the same as that discussed under the Pool Frequency section. There is a short-term risk of mobilizing and/or delivering sediment to streams during and shortly after trail construction, realignment, and maintenance near streams and trail stream crossing improvements. Bare soil is prone to erosion and can result in fine sediment entering stream channels and resultant increases in turbidity. Habitat impacts are likely to include areas of exposed streambank in isolated locations primarily in the vicinity of stream crossings. Exposed areas and other disturbances that occur are likely to result in a slight increase in turbidity for a short distance downstream during rainstorms or runoff events. However, given background levels of turbidity during runoff events it would be difficult to distinguish between turbidity resulting from this project activity and background turbidity. An unknown amount of sediment would be mobilized into streams. Timing of work outside of the wet season and adherence to all project design criteria and best management practices (including aquatic restoration biological opinion criteria for livestock crossing streams on recreational trail crossings) would further limit fine sediment delivery. A slight increase in fine sediment deposition for a short distance downstream of exposed and disturbed areas is also likely to occur. There is the potential for fine sediment to slightly increase embeddedness within gravels suitable for spawning when the gravel is located immediately downstream of stream crossing sites. Increased embeddedness may also result in a decrease in the potential for production of aquatic macroinvertebrates (a forage item for rearing salmonids) in small, isolated patches. These impacts are expected to be localized and short term. Consequently, the effect to embeddedness and fine sediment by trail construction, realignment, and maintenance near streams and stream crossing improvements is negative and expected to be measureable under both action alternatives.

Recreation system changes would also have a positive and meaningfully measureable effect on embeddedness and fine sediment due to a lasting but minor decrease in fine sediment delivery to streams as a result of hardening stream crossings and improving trail drainage features. Design criteria include those identified in the aquatic restoration biological opinion as well as design criteria developed by the Blue Mountain Ranger District interdisciplinary team. The aquatic restoration biological opinion project design criteria specific to this project would be implemented as described in the aquatic restoration biological opinion. Implementation of the project design criteria would reduce the probability and magnitude of this short-term risk. After about 2 years, effects of recreation system changes would be beneficial for water quality and fish habitat. The improved drainage and reductions in erosion would help restore natural watershed function, including reduced sediment yield from the trail system.

Cumulative Effects

Cumulative effects are as described for Pool Frequency, under alternatives 2 and 3 in the Cumulative Effects – Primary Habitat Elements section. The exceptions are described below.

Common sources of sediment within the analysis area include both natural processes and past and ongoing actions on both National Forest System and private lands, such as channel and floodplain modification from railroad logging, channel erosion, past mining, livestock grazing (especially past grazing), and roads/stream crossings. The analysis of effects determined that recreation system changes would have a short-term negative and meaningfully measurable effect on embeddedness and fine sediment. However it is unlikely that these increases would result in cumulative adverse effects when combined with other past, ongoing, or reasonably foreseeable actions. Sediment production by recreation system changes in alternatives 2 and 3 would be a small proportion of the total sediment from natural processes and from past and ongoing actions. Design criteria for the project would limit sediment delivery to streams. Thus, the cumulative effect of alternatives 2 and 3 would be a relatively small increase in total sediment production.

Ongoing grazing activities could potentially contribute sediment to streams. The effect of the remaining five project elements on the remaining five primary habitat elements was either negative and not meaningfully measurable or neutral. It is unlikely that these negative and not meaningfully measureable effects would result in measurable adverse cumulative effects when considered with range management activities. Sediment production by recreation system changes in alternatives 2 and 3 may result in short-term increases in fine sediment. However, where grazing standards are met, the level of these cumulative effects with grazing management activities is not likely to reach a point where measurable adverse effects would occur.

Recreation system changes would have positive and meaningfully measureable effects to the primary habitat element of embeddedness and fine sediment.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Compliance with the Malheur Forest Plan and other relevant laws, regulations, and policies are as described for Pool Frequency.

Width-to-Depth Ratio

Affected Environment

Methodology

Methodology for this primary habitat element is the same as described for Methodology – Primary Habitat Elements, with the exceptions below.

Malheur Forest Plan standards for width-to-depth ratios are based on wetted width and depth. A large wetted width-to-depth ratio indicates a wide and shallow stream channel. Wide and shallow streams are prone to increases in stream temperatures due to high surface area to volume ratio and provide little habitat for fish, due to the lack of water depth. This stage within the stream channel evolution model is associated with poor biological and physical habitat complexity (Cluer and Thorne 2014).

Existing Condition

Stream surveys indicate that objectives for wetted width-to-depth ratios are being met in: Coyote Creek reaches 1 and 3; Bennett Creek reach 1; Butte Creek reach 2; Sulphur Creek reach 1; and Sunshine Creek reaches 1 and 2. Objectives for wetted width-to-depth ratios are not being met in the remaining 11 of 18 stream reaches (Table 65).

Many of the streams in this planning area have roads on either or both sides of the stream. Close proximity of roads to the stream focuses flows within the stream channel, over-widening or incising the stream channel. Perched culverts can also lead to stream down-cutting and incising, and undersized culverts can further the impacts of this by concentrating and increasing flow, both of which occur within the planning area. Legacy effects from timber harvest and livestock grazing have also contributed to the channel over-widening and incising. The Middle Fork John Day River also has a railroad berm within the stream's floodplain that affects its ability to meander, which also focuses flows in the stream channel and contributes to channel incision and over-widening. Water withdrawals from the Middle Fork John Day River for irrigation decrease summer flow a small amount, and contribute to an increase in the wetted width-to-depth ratio in the Middle Fork John Day River.

Environmental Consequences

Methodology

Methodology for this primary habitat element is the same as described for Methodology – Primary Habitat Elements, with the exceptions below.

Foreseeable aquatic restoration activities authorized under the Aquatic Restoration Decision (USDA Forest Service 2014b) may add to adverse effects related to width-to-depth ratios because many streams in the analysis area presently do not meet objectives for width-to-depth ratios and associated impacts to aquatic habitat and salmonids. However, the foreseeable aquatic habitat restoration activities would address current width-to-depth ratios and lack of the hydrological features that support fine sediment deposition (streambank building characteristics) and reduce streambank sheer stress, leading to a long-term reduction in fine sediment levels and width-to-depth ratios, and an increase in floodplain connectivity. Reasonably foreseeable aquatic habitat restoration activities would therefore have beneficial impacts to aquatic habitat and fish. (See spatial and temporal context effects discussion above.)

Alternative 1 – No Action

Direct and Indirect Effects

Alternative 1 likely would maintain the current width-to-depth ratios over much of the analysis area. Width-to-depth ratios are higher than objectives for all but three of the surveyed reaches in the analysis area (Table 65) and are likely having adverse effects to aquatic habitat, primarily through altered sediment routing and elevated water temperatures. Adjacent roads are influencing the channel morphology of several of these streams by conveying water off adjoining hillslopes at elevated rates and altering sediment transport through modification of tributary alluvial fans. Railroad berms on the Middle Fork John Day River are also influencing channel morphology. Livestock grazing to Malheur Forest Plan standards on allotments within the analysis area and natural large woody debris recruitment should maintain or slowly improve width-to-depth ratios of these streams.

See also description in Pool Frequency section for effects on primary habitat elements under alternative 1 (Direct and Indirect Effects – Primary Habitat Elements section).

Cumulative Effects

Because there are no direct or indirect effects of taking no action, there would be no cumulative effects.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Compliance with the Malheur Forest Plan and other relevant laws, regulations, and policies are as described for Pool Frequency.

Alternatives 2 and 3

Direct and Indirect Effects

Note, the analysis for width-to-depth ratio and bank stability are grouped since they are affected similarly by project elements.

Timber Felling

Most timber felling activities would have no effect on width-to-depth ratios or streambank stability due to location of most actions away from the stream channel and implementation of project design criteria. The possible minor amounts of sediment entering channels and small areas of bank instability would not affect width-to-depth ratios at the site or reach scale. Effects from these actions on width-to-depth ratios would be neutral for both action alternatives.

Prescribed Burning and Unplanned Ignitions

A minor short-term decrease in streambank stability would occur as a result of prescribed burning activities in riparian habitat conservation areas until vegetation recovers. However, it is unlikely that burned patches along streambanks would be of sufficient sizes or quantities to result in a meaningfully measureable decreases in bank stability. These impacts would not be of a scale that would result in destabilization of stream channels, thus a neutral effect to width-to-depth ratios from fuels treatments is anticipated under both action alternatives. Over the long-term, as fire invigorates riparian shrub growth, bank stability would increase. No effects to bank stability or width-to-depth ratios are expected from pile burning and biomass removal, due to proximity of these activities away from stream channels. Grapple or handpile areas would not be located within riparian habitat conservation areas.

Temporary Roads and Landings

Construction of a temporary road that comes to within 50 feet of Dry Creek is proposed (see discussion under the Pool Frequency section), but this work would not damage streambanks or deliver sediment to the degree that measurable effects to bank stability or width-to-depth ratios would occur. Additionally, installation of a temporary culvert on a category 2 riparian habitat conservation area (possibly category 4) tributary to Dry Creek is proposed. This work would cause highly localized effects to bank stability and width-to-depth ratios that would be negative but not meaningfully measurable under both action alternatives.

Road Decommissioning

Road decommissioning would positively affect bank stability and width-to-depth ratios in the long term by removing roads from the transportation network that restrict floodplain connectivity. The minor amount of sediment potentially delivered to streams associated with road decommissioning would not affect width-to-depth ratios. Due to the extent and location of treatments, this effect would be positive but not meaningfully measurable for width-to-depth ratios and bank stability under both action alternatives.

Road Maintenance and Use

The possible minor amounts of sediment entering channels from road maintenance activities would not affect floodplain connectivity, streambank stability, or width-to-depth ratios at the site or reach scale. A neutral effect is anticipated under both action alternatives.

Interpretive sign installation would occur within the category 1 riparian habitat conservation area of Butte Creek, but over 100 feet from the active stream channel. With implementation of project design criteria, there would be a neutral effect to width-to-depth ratios and streambank stability under both action alternatives from this activity.

Recreation System Changes

The extent of recreation system changes in proximity to aquatic species habitat is the same as that discussed under the Pool Frequency section for alternatives 2 and 3. No felling of bank-stabilizing trees within 100 feet of the stream channel is expected. With implementation of project design criteria, best management practices, and aquatic restoration biological opinion criteria for livestock crossing streams on recreational trail crossings within category 1 and 2 riparian habitat conservation areas, there would be a negative but not meaningfully measurable effect on streambank stability and a neutral effect on width-to-depth ratios from this proposed activity under both action alternatives.

Cumulative Effects

Cumulative effects are as described for Pool Frequency, under alternatives 2 and 3 in the Cumulative Effects – Primary Habitat Elements section.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Compliance with the Malheur Forest Plan and other relevant laws, regulations, and policies are as described for Pool Frequency.

Bank Stability

Affected Environment

Methodology

Methodology for this primary habitat element is the same as described for Methodology – Primary Habitat Elements.

Existing Condition

Channel types differ in their sensitivity to management activities due to differences in bank erosion potential and the influence of streamside vegetation on bank stability. Stream surveys indicate that bank stability objectives are not being met in Coyote Creek reach 3 and Sunshine Creek reaches 1 and 3. While the remaining 15 stream reaches with bank stability data available are shown to be meeting objectives, unstable banks have been observed in multiple streams in the planning area. In some streams, bank stability is being impacted by a lack of instream roughness, and a lack of floodplain connectivity, preventing banks from forming so that the streambanks are dominated by cobble on both sides of the stream. Thus, pockets of finer sediment which can catch hardwood seeds, and build up to form banks which then can form beneficial habitat such as undercuts banks, cannot form in these locations. Although cobble banks are stable because large substrate is harder to erode, some streams are not functioning the way they would have historically.

Bank instability is more prevalent in areas that lack riparian hardwoods, as well as in areas of heavy cattle use.

Environmental Consequences

Methodology

Methodology for this primary habitat element is the same as described for Methodology – Primary Habitat Elements, with the exception below.

Reasonably foreseeable aquatic habitat restoration activities authorized under the Aquatic Restoration Decision (USDA Forest Service 2014b) within the analysis area may result in short-term cumulative effects because the activities would likely result in short-term increases in bank instability. The short-term increases would not result in an adverse effect to bank stability because the majority of streams meet bank stability criteria.

Alternative 1 – No Action

Direct and Indirect Effects

Alternative 1 would maintain the current levels of bank stability. Bank stability is generally high in the analysis area with the exception of specific locations where bank instability is occurring due to altered hydrological processes. Altered hydrology can result in high streambank stability (as observed in the majority of streams in the analysis area), and a lack of instream complexity and roughness has resulted in banks that are composed primarily of large cobble due to flushing flows preventing deposition of fine material. Range allotment monitoring in allotments within the analysis area indicates that bank stability is on an upward trend. This trend is expected to continue under current grazing levels.

See also description in Pool Frequency section for effects on primary habitat elements under alternative 1 (Direct and Indirect Effects – Primary Habitat Elements section).

Cumulative Effects

Because there are no direct or indirect effects of taking no action, there would be no cumulative effects.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Compliance with the Malheur Forest Plan and other relevant laws, regulations, and policies are as described for Pool Frequency.

Alternatives 2 and 3

Direct and Indirect Effects

Please see Width-to-Depth Ratio section for analysis of effects from alternatives 2 and 3. The analysis for width-to-depth ratio and bank stability were grouped since they are affected similarly by project elements.

Cumulative Effects

Cumulative effects are as described for Pool Frequency, under alternatives 2 and 3 in the Cumulative Effects – Primary Habitat Elements section.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Compliance with the Malheur Forest Plan and other relevant laws, regulations, and policies are as described for Pool Frequency.

Large Woody Debris

Affected Environment

Methodology

Methodology for this primary habitat element is the same as described for Methodology – Primary Habitat Elements, with the exceptions below.

Large woody debris and coarse woody debris play an important role in forested stream reaches and for maintaining beaver-created meadows (Burchsted et al. 2010) by dissipating stream energy, trapping sediment, trapping riparian hardwood and hydric plant seeds, and providing suitable microclimates for seed germination (Osei et al. 2015). Woody debris provides stream grade stabilization, initiates streambed aggradation and channel braiding, and forms pools (Polvi and Wohl 2013, Cluer and Thorne 2014), all of which increase habitat complexity.

Riparian forests, especially individual trees that are within one-half to three-quarters tree length of the stream channel, produce large woody debris that is recruited into a stream where it creates critical habitat features for aquatic species. Malheur Forest Plan Amendment 29 specifies a range in the number of pieces of large woody debris to be maintained for each mile of stream in certain ecotypes. Standards for large woody debris are located in Table 63 of this section.

Pacific Northwest Region stream survey reports provided existing condition data. Table 65 lists the most recent stream surveys and data for the 6 primary aquatic habitat elements for 12 streams in the analysis area. Other sources of information that may have been considered include field trips to perennial portions of fish-bearing streams within the planning area, the forest geographic information systems layers providing spatial and tabular data, streamnet.org, and discussions with Oregon Department of Fish and Wildlife and the Confederated Tribes of the Warm Springs Reservation of Oregon.

Existing Condition

Prior to the PACFISH amendment (USDA and USDI 1995a) to the Malheur Forest Plan, timber was harvested from areas adjacent to streams in the planning area and removed where mining activity occurred. In the past, firewood was also taken from streamside areas. See the Existing Condition section for more information on past silvicultural activities within riparian areas. In extreme cases, removal of floodplain timber coupled with large increases in peak flows and large increases in channel width resulted in destabilization of instream pieces and subsequent transport downstream, thus resulting in a decrease of large woody debris.

Stream surveys indicate that of the 18 stream reaches there is data for, Amendment 29 large woody debris objectives are not being met in 17, with Coyote Creek reach 1 being the only one meeting standards (see Table 65).

Please note that although Coyote Creek reach 1 may be meeting the Amendment 29 riparian management objectives for large woody debris, those objectives do not take into account coarse woody debris objectives, nor the importance of large woody debris on the floodplain. However, the benefits of coarse woody debris along with large woody debris on the floodplain are well documented (Fox and Bolton 2007). For this planning area, the coarse woody debris objectives are derived from research done by Fox and Bolton, using data from the northern Blue Mountains, managing for the stream to meet 75 percent of the recommended coarse woody debris (Fox and Bolton 2007). Objectives for coarse woody debris are 467 pieces of coarse and large woody debris per mile, within the floodplain, or a number of coarse woody debris determined by aquatic specialists.

The most recent data for large and coarse woody debris are derived from Forest Service Region 6 stream surveys which require at least part of the wood to be within bankfull for the piece of wood to be counted during the stream surveys (USDA Forest Service 2015f). Since the coarse wood objective includes those pieces outside of bankfull but on the floodplain, existing data is not adequate to indicate which streams are currently meeting this objective.

Environmental Consequences

Methodology

Methodology for this primary habitat element is the same as described for Methodology – Primary Habitat Elements, with the exception below.

Reasonably foreseeable aquatic habitat restoration activities authorized under the Aquatic Restoration Decision (USDA Forest Service 2014b) within the analysis area may result in short-term cumulative effects because the activities would likely result in short-term and long-term increases in instream large woody debris. The short-term increases would benefit many streams in the analysis area that presently do not meet objectives for large woody debris and have associated impacts to aquatic habitat and salmonids. The reasonably foreseeable aquatic habitat restoration activities would address the current lack of instream large woody debris and the lack of hydrological features that support water storage, leading to a long-term increase in stocking levels of large woody debris for future recruitment. Foreseeable aquatic habitat restoration activities would therefore have beneficial impacts to aquatic habitat and fish. (See spatial and temporal context effects discussion above).

Alternative 1 – No Action

Direct and Indirect Effects

Alternative 1 would maintain the current levels of large woody debris. Current levels of large woody debris are below objectives for all but one stream reach in the planning area (Table 65), resulting in degraded stream conditions including low pool frequencies. Replacement large woody debris would be recruited into properly functioning stream channels as conifers die and fall into streams, as the stream undermines root systems, or as windfall or slide events cause trees to fall or slide into the stream. In mined areas or incised or confined channels, wood would likely be suspended over the channel and not become incorporated as functional large woody debris. However, over time these pieces break up and are incorporated into the floodplain and stream channel. Limbs, treetops, and individual pieces of the tree bole become coarse woody debris, which are an integral part of debris jams associated with key pieces or large woody debris. Within 25 years, large woody debris would likely increase over current levels in the planning area because trees present in the floodplain of most stream reaches would fall into streams. However, National Forest System roads parallel 7 of the 12 critical habitat streams within riparian habitat conservation areas, decreasing the area available for large woody debris growth and increasing the potential illegal removal of trees for firewood. This decrease in large woody debris would also impact sediment transport, influencing both the trapping of fine sediment (the preferred habitat for larval lamprey, and when trapped behind large woody debris, benefits salmonids by decreasing turbidity which can impact egg survival in redds), and aggradation of gravel which is utilized for spawning habitat. Large woody debris also influences pool formation and habitat complexity.

The hazard from severe wildfire would be remain high under alternative 1, as shown in the Ragged Ruby Fire, Fuels, and Air Quality Report. If a severe wildfire does occur, a pulse of large woody debris likely would fall in most streams within the planning area over an extended period of time. The development of large woody debris along reaches with relatively few trees within the floodplain would be postponed for over 90 years until trees grow to suitable size and become recruited into the stream.

See also description in Pool Frequency section for effects on primary habitat elements under alternative 1 (Direct and Indirect Effects – Primary Habitat Elements section).

Cumulative Effects

Because there are no direct or indirect effects of taking no action, there would be no cumulative effects.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Compliance with the Malheur Forest Plan and other relevant laws, regulations, and policies are as described for Pool Frequency.

Alternatives 2 and 3

Direct and Indirect Effects

Timber Felling

The majority of timber felling activities would occur outside of riparian habitat conservation areas under alternative 2, therefore no meaningfully measureable effects to large woody debris are expected. The remaining analysis focuses on actions that would occur within riparian habitat conservation areas.

Only non-commercial thinning of trees up to 9 inches diameter at breast height would occur within riparian habitat conservation areas. Non-commercial thinning within riparian habitat conservation areas would occur under dry pine and mixed conifer treatments, dry meadow and scabland flat bunchgrass restoration treatments, and whitebark pine and western white pine restoration treatments. For information on proximity of these treatments to aquatic species habitat, see the discussion under the Pool Frequency section above. There are a total of approximately 5,263 acres of riparian habitat conservation area in the planning area. Approximately 7.2 percent of these acres would be non-commercially thinned under alternative 2 (378.3 acres), and 8.5 percent would be non-commercially thinned under alternative 3 (449.6 acres).

Non-commercial thinning in riparian habitat conservation areas would remove understory trees from densely stocked stands, no closer than 25 feet from streams. Trees felled within or into riparian habitat conservation areas would be left within the riparian habitat conservation area and felled towards the stream where reasonably feasible. Conifers felled into streams would immediately function as coarse woody debris. Accelerated growth of remaining conifers in response to thinning of overstocked stands would contribute to restoration of large woody debris recruitment. Short- and long-term effects to large woody debris would be negative and not meaningfully measurable under either action alternative due to the localized and limited number of trees that may be felled.

Trees felled for skyline yarding or as danger trees that could function as large woody debris would be limited in size and frequency. All skyline yarding units were designed to yard uphill, and since no skyline units are within riparian habitat conservation areas, the need to yard across streams is unlikely. Tailholds are needed for each skyline corridor, which may cross streams. Usually no trees need to be felled, but some limbing may be needed within riparian habitat conservation areas. Tailhold trees are typically outside riparian habitat conservation areas. Further, the majority of trees that could be removed adjacent to streams occur along intermittent streams, upstream of occupied habitat for threatened, endangered, and sensitive species. Further, any trees needing felling would be felled into streams where feasible. Where not feasible, it is usually because they lean away from the stream and would not have been recruited as large woody debris when falling under natural processes. Skyline yarding and danger tree felling would have a negative effect on large woody debris that would not be meaningfully measureable under either action alternative.

Aspen restoration treatments would not likely result in negative and meaningfully measurable effects to large woody debris under either action alternative due to the small scale of treatments, and because trees felled within riparian habitat conservation areas would be felled into stream channels where feasible and become large woody debris, thus large woody debris development may be accelerated in the short term. The reduction in stocking densities following treatments would increase new growth of aspen and the vigor of larger aspen in the overstory for future large woody debris.

Prescribed Burning and Unplanned Ignitions

The majority of fuels treatment activities would occur outside of riparian habitat conservation areas. Where prescribed burning does occur within riparian habitat conservation areas, the majority would be low-intensity fires, using techniques that would achieve mortality of understory trees in burned patches but kill few overstory trees. Methods would be implemented as described in the fuels section to protect large trees. Fire intensities would not be high enough to consume trees or downed wood large enough to function as large woody debris in stream channels. The reduction in stocking densities following burning activities would increase the vigor of larger trees in the overstory. Consumption of coarse woody debris near stream channels greater than 4 inches diameter at breast height would be minimized. Beche et al. (2005) found that prescribed fire did not change the amount or movement of large woody debris in their study reach relative to unburned streams. Effects are negative and not meaningfully measurable under both action alternatives.

Temporary Roads and Landings

No landings are proposed within riparian habitat conservation areas under alternatives 2 or 3. Limiting these activities to areas outside of riparian habitat conservation areas would prevent adverse impacts to existing and future large woody debris. Most temporary roads would have a discountable effect to fisheries resources (see discussion under Pool Frequency section). Sites requiring the removal of trees that could be recruited as large woody debris for temporary road construction are limited in size and frequency, and the majority of trees removed adjacent to streams occur along intermittent streams, upstream of occupied habitat for threatened, endangered, sensitive, and management indicator species. Conifers would be felled into streams where feasible as described above. In most cases, trees that can only safely be felled across the road often have a lean away from the stream channel and would be less likely to fall into stream channels where they could function as large woody debris. Further, only a percentage of conifers removed would be close enough to the channel to provide large woody debris. Temporary road construction would have a negative effect on large woody debris that would not be meaningfully measurable under either action alternative.

Road Decommissioning

Road decommissioning activities would not include removal of trees that could function as large woody debris in stream channels. Conifers would be planted in decommissioned road segments as part of the active decommissioning process. Over the long term (70 to 100 years), large woody debris recruitment processes would be restored on the sides of streams previously occupied by roads as conifers become established and trees that fall across the previous roaded area are no longer cut and removed for vehicle access. This would result in a long-term effect that is positive but not meaningfully measureable under both action alternatives due to the small scale of decommissioning in proximity to streams. Road decommissioning would have a short-term neutral effect on large woody debris under both action alternatives due to the small scale of decommissioning in proximity to streams.

Road Maintenance and Use

Activities would not likely result in a reduction of large woody debris to category 1, 2, or 4 riparian habitat conservation area stream channels because in most cases, trees that can only safely be felled across the road often have a lean away from the stream channel and would be less likely to fall into stream channels where they could function as large woody debris. Where conifers are felled into the stream, they would immediately function as large woody debris. The effects of this action would be negative but not be meaningfully measurable for large woody debris under either action alternative.

The installation of an interpretive sign would not require the removal or felling of trees, thus no effect to large woody debris is expected for either action alternative.

Recreation System Changes

The extent of recreation system changes in proximity to aquatic species habitat is the same as that discussed under the Pool Frequency section. No felling of primary shade trees or large woody debris within 100 feet of the stream channel is expected. With implementation of project design criteria, best management practices, and aquatic restoration biological opinion criteria for livestock crossing streams on recreational trail crossings within category 1 and 2 riparian habitat conservation areas, there would be a neutral effect to large woody debris from this proposed activity for both action alternatives.

Cumulative Effects

Cumulative effects are as described for Pool Frequency, under alternatives 2 and 3 in the Cumulative Effects – Primary Habitat Elements section.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Compliance with the Malheur Forest Plan and other relevant laws, regulations, and policies are as described for Pool Frequency.

Summary of Effects to Primary Habitat Elements

Table 68 shows a summary of the effects to the primary habitat elements from each of the proposed actions under alternative 2. Table 69 shows a summary of the effects to the primary habitat elements from each of the proposed actions under alternative 3. In some cases, there are differing effects over time for sort term and long term.

Table 68. Alternative 2 summary of project element effects of the Ragged Ruby Project to the primary habitat elements

Primary habitat elements	Timber felling	Prescribed burning and unplanned ignitions	Temporary roads and landings	Road decommissioning	Road maintenance and use	Recreation system changes
Pool frequency (short term)	NNMM[1]	NNMM	NNMM	Neutral	NNMM	NNMM
Pool frequency (long term)	PNMM[2]	PNMM	N/A	PNMM	PNMM	PNMM
Water temperature and stream shading (short term)	NNMM	NNMM	NNMM	Neutral	NNMM	Neutral

Primary habitat elements	Timber felling	Prescribed burning and unplanned ignitions	Temporary roads and landings	Road decommissioning	Road maintenance and use	Recreation system changes
Water temperature and stream shading (long term)	PNMM	PNMM	N/A	PNMM	N/A	N/A
Large woody debris (short term)	NNMM	NNMM	NNMM	Neutral	NNMM	Neutral
Large woody debris (long term)	PNMM	PNMM	N/A	PNMM	N/A	N/A
Embeddednes s and fine sediments (short term)	NNMM	NNMM	NNMM	NNMM	NNMM	NMM[3]
Embeddednes s and fine sediments (long term)	PNMM	PNMM	N/A	PNMM	PNMM	PMM[4]
Width-to-depth ratio	Neutral	Neutral	NNMM	PNMM	Neutral	Neutral
Bank stability	NNMM	PNMM	NNMM	PNMM	Neutral	NNMM

[1] NNMM = Negative but not meaningfully measured

[2] PNMM = Positive but not meaningfully measured

[3] NMM = Negative and meaningfully measured

[4] PMM = Positive and meaningfully measured

Table 69. Alternative 3 summary of project element effects of the Ragged Ruby Project to the primary habitat elements

Primary habitat elements	Timber felling	Prescribed burning and unplanned ignitions	Temporary roads and landings	Road decommissioning	Road maintenance and use	Recreation system changes
Pool frequency (short term)	NNMM[1]	NNMM	NNMM	Neutral	NNMM	NNMM
Pool frequency (long term)	PNMM[2]	PNMM	N/A	PNMM	PNMM	PNMM
Water temperature and stream shading (short term)	NNMM	NNMM	NNMM	Neutral	NNMM	Neutral
Water temperature and stream shading (long term)	PNMM	PNMM	N/A	PNMM	N/A	N/A
Large woody debris (short term)	NNMM	NNMM	NNMM	Neutral	NNMM	Neutral
Large woody debris (long term)	PNMM	PNMM	N/A	PNMM	N/A	N/A

Primary habitat elements	Timber felling	Prescribed burning and unplanned ignitions	Temporary roads and landings	Road decommissioning	Road maintenance and use	Recreation system changes
Embeddedness and fine sediments (short term)	NNMM	NNMM	NNMM	NNMM	NNMM	NMM[3]
Embeddedness and fine sediments (long term)	PNMM	PNMM	N/A	PNMM	PNMM	PMM[4]
Width-to-depth ratio	Neutral	Neutral	NNMM	PNMM	Neutral	Neutral
Bank stability	NNMM	PNMM	NNMM	PNMM	Neutral	NNMM

[1] NNMM = Negative but not meaningfully measured
[2] PNMM = Positive but not meaningfully measured
[3] NMM = Negative and meaningfully measured
[4] PMM = Positive and meaningfully measured

Aquatic Species – Threatened, Endangered, Sensitive, and Management Indicator Species

Regulatory Framework

The Malheur Forest Plan provides direction to protect and manage resources, including riparian and aquatic species habitats. Specific direction pertaining to fish and fish habitat for this project includes Forest goals 15, 18, and 19 related to aquatic resources, management objectives for riparian areas, and Forest-wide standards 61, 62, 64, 65, and 66. Additionally, management area 3B standards 5, 8, 10, 34, 41, 42, 43, 44, and 45 apply. Relevant amendments to the Malheur Forest Plan include: Amendment 29 and PACFISH (see also Regulatory Framework section under Aquatic Species – Primary Habitat Elements).

Other relevant laws, regulations, policies, and plans for aquatic species include Executive Orders 11988 (floodplain management) and 12962 (aquatic systems and recreational fisheries), and three principle laws relevant to fisheries management: the National Forest Management Act of 1976, the Endangered Species Act of 1973, as amended (16 United States Code 1531 et seq.) and the Clean Water Act of 1972 (33 United States Code §1251 et seq.).

Resource Indicators

The measurement indicators detailed in Table 70 are used for assessing impacts to aquatic species below. However, due to similarities in information considered for threatened, endangered, Region 6 sensitive, and management indicator species analyses, this information is consolidated within individual species sections below. Some information (specifically, proximity to aquatic and riparian resources and a thorough analysis of cumulative effects on aquatic resources, and compliance with forest plan and other relevant laws, regulations, and policies) was covered above with Aquatic Species – Primary Habitat Elements in the Pool Frequency section. Because this information generally applies to all aquatic species, for brevity, it will not be repeated in this section.

Table 70. Resource elements, indicators, and measures for assessing effects to aquatic species – threatened, endangered, sensitive, and management indicator species

Resource element	Resource indicator	Measure	Source
Proposed, endangered, threatened, and sensitive species	Effects to species	Effects determination	Endangered Species Act; Region 6 Regional Forester's special status species list (USDA Forest Service 2015e); Malheur Forest Plan (USDA Forest Service 1990a, Forest-wide standards 62-67, pages IV-32 to IV-33)
Management indicator species – riparian habitat	Effects to species	Effects determination	Malheur Forest Plan (USDA Forest Service 1990a, Fish and Wildlife Objectives, pages IV-17 to IV-18; Forest-wide standard 61, page IV-32)

Aquatic Species Analyzed in This Section

Middle Columbia River steelhead (threatened, management indicator species) and interior redband trout (Region 6 sensitive, management indicator species) (*Oncorhynchus mykiss gairdneri)* are documented to occur within the planning area in all streams listed in Table 72. Columbia River bull trout (*Salvelinus confluentus*) (threatened, management indicator species) are documented to occur within the planning area in all streams listed in Table 73. The Western ridged mussel (*Gonidea angulata*) (Region 6 sensitive), California floater (*Anodonta californiensis*) (Region 6 sensitive), and Pacific lamprey (*Entosphenus tridentatus*) (Region 6 sensitive) may occur in the Middle Fork John Day River within the planning area. The Columbia spotted frog (*Rana luteiventris*) (Region 6 sensitive) is considered present in all subwatersheds of the Malheur National Forest and is known to occur within the analysis area.

Table 71. Miles of habitat for threatened, endangered, regionally sensitive, and/or management indicator species in the Ragged Ruby planning area

Threatened and endangered aquatic species	Miles of habitat in the planning area
Middle Columbia River steelhead critical habitat[1]	24.70
Redband trout[2]	31.10
Columbia River bull trout critical habitat[1]	13.16
Pacific lamprey[2]	1.18
Columbia spotted frog[2]	31.1
Western ridged mussel[2]	1.18
California floater[2]	1.18

1. Threatened
2. Regionally sensitive species

The following threatened, endangered, regionally sensitive, and/or management indicator species have not been found within the planning area nor do they have suitable habitat, thus they will not be discussed further in this section: westslope cutthroat trout, shortface lanx, Columbia clubtail, pristine springsnail, Please see Aquatic Resources Report for more information.

Aquatic species without special management status documented within or downstream of the aquatic analysis area include Middle Columbia River spring Chinook salmon (*Oncorhynchus tshawytscha*). Nongame fish within the aquatic analysis area include northern pikeminnow

(*Ptychocheilus oregonensis*), mountain whitefish (*Prosopium williamsoni*), sucker species (*Catostomus macrocheilus or C. columbianus*), speckled dace (*Rhinichthys osculus*), longnose dace (*Rhinichthys cataractae*), redside shiner (*Richardsonius balteatus*), and sculpin (*Cottus spp*.). These species will not be discussed further in this section.

Methodology – All Aquatic Species

Information for the aquatic existing condition and analysis was compiled from multiple sources. Pacific Northwest Region stream survey reports provided existing condition data (see Table 65 for the most recent stream surveys and data).

The existing condition for potential fish-bearing streams that have not been surveyed was evaluated qualitatively, based on principles of applied fisheries and watershed science, professional judgment, and knowledge of the area. Other sources of information considered for this section include field trips to perennial portions of fish-bearing streams within the planning area, the forest geographic information systems layers providing spatial and tabular data, Forest water temperature monitoring data, streamnet.org, discussions with the Oregon Department of Fish and Wildlife personnel from the John Day Watershed District, and discussions with personnel from the Confederated Tribes of the Warm Springs Reservation of Oregon.

Additionally, the following sources of information have been reviewed to determine if threatened, endangered, sensitive, or management indicator species and their associated habitats occur within the planning area:

- Malheur National Forest geographic information system database
- Region 6 Regional Forester's special status species list (7/2015)
- Oregon Department of Fish and Wildlife stream/fish survey reports (ODFW 2016a, 2016b, 2016c, 2016d, 2017)
- Forest Service stream survey reports, Blue Mountain Ranger District, John Day, OR.
- Oregon Natural Heritage Program database
- NatureServe database (www.natureserve.org/aboutUs/)

An endangered species is an animal or plant species listed under the Endangered Species Act that is in danger of extinction throughout all or a significant portion of its range. A threatened species is an animal or plant species listed under the Endangered Species Act likely to become endangered within the foreseeable future throughout all or a significant portion of its range. Threatened species known to inhabit the Malheur National Forest include Columbia River bull trout and Middle Columbia River steelhead, and both species are currently present in the Ragged Ruby planning area.

A sensitive species is an animal or plant species identified by the Regional Forester for which species viability is a concern either: (1) because of a current or predicted downward trend in population numbers or density, or (2) because of current or predicted downward trends in habitat capability that would reduce a species' existing distribution (Pacific Northwest Region [Region 6] sensitive).

Management indicator species are species of vertebrates and invertebrates whose population changes are believed to best indicate effects of land management activities. Through the management indicator species concept, the total number of species found within a planning area is reduced to a subset of species that collectively represent habitats, species, and associated management concerns. Management indicator species are used to assess the maintenance of populations (the ability of a population to sustain itself naturally) and biological diversity (which includes genetic diversity, species diversity, and habitat diversity), and to assess effects on species in public demand.

The Malheur Forest Plan identifies the following aquatic species as management indicator species for healthy stream and riparian habitats: westslope cutthroat trout, redband/rainbow trout, Middle Columbia River steelhead, and bull trout (USDA Forest Service 1990a). The planning area has bull trout, redband/rainbow trout, and Middle Columbia River steelhead; of these, Middle Columbia River steelhead and bull trout are also threatened, endangered, and sensitive species. These aquatic management indicator species were selected to indicate healthy stream and riparian ecosystems across the landscape. Riparian ecosystems occur at the margins of standing and flowing water, including intermittent stream channels, ephemeral ponds, and wetlands. Attributes of a healthy aquatic ecosystem include: cold and clean water; channel substrates; stable streambanks; healthy streamside vegetation; complex channel habitat created by large woody debris, cobbles, boulders, streamside vegetation, and undercut banks; deep pools; and waterways free of barriers. Healthy riparian areas maintain adequate temperature regulation, nutrient cycles, natural erosion rates, and provide for instream wood recruitment.

In general, the aquatic management indicator species have similar stream and riparian ecosystem requirements. However, they do represent a range of minor differences in habitat conditions found and utilized across the Malheur National Forest. As an example, bull trout require slightly colder water compared to redband trout. Because the habitat requirements for each species are generally similar and often overlap, they were collectively chosen to represent healthy stream and riparian ecosystems. All aquatic management indicator species on the Blue Mountain Ranger District of the Malheur National Forest are currently listed as threatened or sensitive.

Spatial and Temporal Context for Effects Analysis

The planning area lies within the Camp Creek Watershed of the Middle Fork John Day River subbasin. The analysis area encompasses all known and potential habitats for threatened, endangered, Region 6 sensitive, and management indicator species that may be affected by the Ragged Ruby Project. Based on topography, drainage patterns, and the effects analysis, the aquatic analysis area (action area) includes the following streams and their tributaries: Middle Fork John Day River near the confluence with Dry and Sunshine creeks; Beaver Creek, Bennett Creek, Butte Creek, Coyote Creek, Dry Creek, Granite Boulder Creek, Lemon Creek, Ragged Creek, Ruby Creek, Sulphur Creek, and Sunshine Creek to their confluence with the Middle Fork John Day River.

Additionally, the Ragged Ruby Project includes proposed trail work on approximately 5.8 miles of trail located outside of, but adjacent to the Ragged Ruby planning area, in the Little Boulder Creek—Middle Fork John Day River and Vinegar Creek—Middle Fork John Day River subwatersheds (see Appendix B – Maps, Map 9). This proposal is being included in the Ragged Ruby Project because the Davis Creek Trail crosses subwatershed (and planning area) boundaries, and the proposal is a connected action to other trail system improvements proposed on the Davis Creek Trail. Therefore, the aquatic analysis area includes the following streams and their tributaries outside of the mapped project boundary that may be affected by proposed recreation system changes on the Davis Creek Trail #244: Davis Creek, Deerhorn Creek, Little Butte Creek, and Placer Gulch to their confluence with the Middle Fork John Day River. Measurable effects from proposed activities are unlikely to extend downstream of this area. The analysis area for aquatic species and the cumulative effects boundary are the same as used for aquatic habitat.

Past, Ongoing, and Reasonably Foreseeable Actions Relevant to Cumulative Effects Analysis

All past activities, past wildfires, present activities, foreseeable activities, and the current project proposal have been considered for their cumulative effects on aquatic habitat and associated aquatic species. Effects are addressed for all aquatic species considered in this analysis together due to the insignificant differences between the species' niches. The effects determination and rationale by species and alternative are discussed in the effects section and summarized in Table 74. The analysis area for aquatic species and the cumulative effects boundary are the same as used for Aquatic Species – Primary Habitat Elements, above (see Pool Frequency and the section for Past, Ongoing, and Reasonably Foreseeable Actions Relevant to Cumulative Effects Analysis).

Middle Columbia River Steelhead

Affected Environment

Methodology

Methodology for this species is the same as described for Methodology – All Aquatic Species.

Existing Condition

Middle Columbia River steelhead are currently listed as threatened under the Endangered Species Act. For background on their listing, or for more information regarding the Middle Columbia River Steelhead Recovery Plan (NMFS 2009), extinction risk viability criteria and ratings, or this species' full range and life history, please see the Ragged Ruby Aquatic Resources Report.

The Middle Columbia River steelhead distinct population segment includes all naturally-spawned populations of steelhead in streams within the Columbia River drainage basin, including major tributaries such as the Deschutes, John Day, Klickitat, Umatilla, Walla Walla, and Yakima River systems. This distinct population segment does not include co-occurring resident forms of *Oncorhynchus (O.) mykiss* (rainbow trout), only the anadromous form of *O. mykiss.* Middle Columbia River steelhead runs in the John Day River basin are composed entirely of native stocks; however, hatchery fish do stray into the John Day River basin from the Columbia River (NMFS 2009). The John Day River probably represents the largest naturally spawning, native stock of steelhead in the region, with the Middle Fork John Day River subbasin contributing approximately 22 percent of the total run for the basin.

The Middle Columbia River Steelhead Recovery Plan lists viability ratings, based on the risk of species extinction and factoring in a combination of ratings for abundance/productivity risk and spatial structure/diversity risk. For the North Fork John Day population, the primary tributary habitat-limiting factors are degraded floodplain connectivity and function, degraded channel structure and complexity (key habitat quantity, habitat diversity, and channel stability), altered sediment routing, water quality (temperature), and altered hydrology. The North Fork John Day major population group thus rates low/very low by the viability criteria. The Middle Fork and South Fork John Day major population groups rate low/moderate, and the Lower Mainstem and Upper Mainstem John Day major population groups have the highest extinction risk at moderate/moderate.

Redd counts have displayed wide variability since 1964 (ODFW 2017). Redds per mile in the Middle Fork John Day River subbasin have been below Oregon Department of Fish and Wildlife management objectives (5.8 redds per mile) for 9 of the past 16 years, but have met objectives for 7 years (ODFW 2016a, 2016b, 2016c, 2016d, 2017). (See Ragged Ruby Aquatic Resources Report for more information.)

In 2008, a portion of the Middle Fork John Day River was designated an intensively monitored watershed, facilitating long-term, largescale research designed to restore the river and aquatic habitat and monitor fish populations. Oregon Department of Fish and Wildlife completes yearly adult Middle Columbia River steelhead population estimates for this portion of the Middle Fork John Day River. They estimate there are currently 281 miles of spawning habitat available to adult Middle Columbia River steelhead. Based on the redd densities Oregon Department of Fish and Wildlife observed within their survey sites, they estimate 1,261 observable Middle Columbia River steelhead redds were present in the intensively monitored watershed portion of the Middle Fork John Day River in spring of 2016.

See Ragged Ruby Aquatic Resources Report for additional data including escapement estimates associated with the above surveys, as well as the 10-year geometric mean abundance by population; estimated productivity; minimum abundance threshold needed for long-term viability; risk ratings of high, moderate, low, and very low for abundance and productivity; and spatial structure and diversity.

Spawning and rearing takes place in all major tributaries of the Middle Fork John Day River. Middle Columbia River steelhead utilize the Middle Fork John Day River for migration, as well as for spawning and juvenile rearing habitat during years when water conditions are favorable. Spawning and juvenile rearing habitat are also present in Beaver, Bennett, Butte, Coyote, Dry, Granite Boulder, Lemon, Ragged, Ruby, Sulphur, and Sunshine creeks, all designated critical habitat. Steelhead occupy approximately 410 miles of habitat on the Malheur National Forest, and occupy approximately 24.7 miles of habitat within the planning area, which represents approximately 6 percent of available habitat on the Forest; see Table 72.

Table 72. Miles of Middle Columbia River steelhead critical habitat by stream within the Ragged Ruby planning area

Stream name	Miles of Middle Columbia River steelhead critical habitat
Beaver Creek	3.47
Bennett Creek	0.49
Butte Creek	4.29
Coyote Creek	1.11
Dry Creek	0.52
Granite Boulder Creek	3.79
Lemon Creek	1.05
Middle Fork John Day River	1.18
Ragged Creek	1.43
Ruby Creek	3.16
Sulphur Creek	1.06
Sunshine Creek	2.88
Unnamed tributary to Middle Fork John Day River	0.27
Total	**24.7**

Critical habitat for Middle Columbia River steelhead was (re-)designated on September 2, 2005 (70 Federal Register 52630). Streams listed in Table 72 and depicted in Appendix B – Maps, Map 15 were designated as critical habitat under the 2005 rule. For background on critical habitat designation and more information on the physical or biological features essential for the conservation of listed distinct population segments on the Malheur National Forest, please see Ragged Ruby Aquatic Resources Report.

Environmental Consequences

Methodology

Methodology for this species is the same as described for Methodology – All Aquatic Species.

Alternative 1 – No Action

Direct and Indirect Effects – All Aquatic Species

Under alternative 1, no management activities would occur in the planning area as a result of the decision. Although there would be no direct or indirect effects from the no action alternative (and thus no cumulative effects either), some environmental outcomes would still occur as a result of taking no action.

Habitat for Middle Columbia River steelhead, Columbia River bull trout, redband trout, Pacific lamprey, Columbia spotted frog, Western ridged mussel, and California floater in the aquatic analysis area is currently in a degraded state. High water temperatures, high fine sediment levels, low large woody debris levels, and loss of floodplain connectivity from past land management practices have reduced the habitat capability of streams in the aquatic analysis area to support these species. Loss of cold water storage in meadows and stream networks has increased peak flows, reduced baseflows, and elevated water temperatures toward the upper end of thermal limits for salmonids. The reduced number of large deep pools in the Middle Fork John Day River limits the number of resting pools available for migrating fluvial bull trout. Legacy railroad berms along the Middle Fork John Day River and legacy mining and road building in several of its tributaries with associated loss of floodplain connectivity has resulted in high stream energy that prevents smaller streambed substrates from depositing. This reduces the available spawning sites for Middle Columbia River steelhead, Columbia River bull trout, redband trout, and possibly lamprey, and reduces establishment of available suitable habitats for mussels and lamprey. Log weirs in several streams and inadequately functioning road stream crossing structures limit aquatic species habitat connectivity.

The hazard from severe wildfire would remain high under this alternative. If a severe wildfire does occur, the lack of aquatic habitat connectivity may prevent fish from recolonizing disconnected streams after fire-related local extirpation (Rinne 1996).

A slow and partial recovery of some habitat conditions would occur as a result of passive improvements in overall land management. Aquatic restoration activities proposed under the Aquatic Restoration Decision would likely still occur if alternative 1 is chosen; however, the magnitude of these actions in facilitating recovery towards desired condition would be diminished and occur at a slower rate due to continual maintenance of the existing condition stated above.

See also alternative 1 environmental consequences described with Aquatic Species – Primary Habitat Elements section (see Pool Frequency and alternative 1 Direct and Indirect Effects – Primary Habitat Elements section).

Direct and Indirect Effects – Middle Columbia River Steelhead

Middle Columbia River Steelhead Determinations:

- Middle Columbia River steelhead Endangered Species Act determination (threatened): No Effect.
- Middle Columbia River steelhead management indicator species determination: no impact to viability.
- Middle Columbia River steelhead designated critical habitat Endangered Species Act determination (designated): No Effect.

Cumulative Effects

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

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

The no action alternative does not fully meet management area 3B standards, and PACFISH standards and guidelines. Alternative 1 is not consistent with the following Malheur Forest Plan standards:

- Management area 3B standard 41: "…Minimize the density of opens roads in this management area by obliterating, revegetating, or closing unnecessary roads or any roads causing significant resource damage."
- PACFISH Standard RF-3c: Determine the influence of each road on riparian management objectives. Meet riparian management objectives and avoid adverse effects on inland native fish by:
    - Closing and stabilizing or obliterating, and stabilizing roads not needed for future management activities. Prioritize these actions based on the current and potential damage to anadromous native fish in priority watersheds, and the ecological value of the riparian resources affected.

Degraded aquatic habitat conditions that have known adverse impacts to aquatic resources would remain in their current condition under alternative 1.

Alternative 1 would avoid adverse effects to the floodplains, and thus is consistent with Executive Order 11988.

Alternative would maintain the current degraded aquatic habitat conditions, thus would not meet compliance with Executive Order 12962. The current aquatic habitat conditions are resulting in reduced recreational fishing opportunities.

Alternative 1 complies with the Endangered Species Act and the Clean Water Act because taking no action would require no consolation ad would not raise water temperatures.

Alternatives 2 and 3

For the purposes of this analysis, the component parts of the action alternatives are organized into the following project elements shown below:

- Timber felling (includes dry pine and mixed conifer treatments, dry meadow and scabland flat bunchgrass treatments, whitebark pine and western white pine treatments, aspen treatments, yarding, and danger tree felling)
- Prescribed burning and unplanned ignitions
- Temporary roads and landings

- Road decommissioning
- Road maintenance and use (includes maintenance, reconstruction, haul, water drafting, opening and closing roads, and interpretive sign installation)
- Recreation system changes (includes trail and trailhead construction, closure, and stream crossing improvements)
- Bat gate installation

See chapter 2, and Ragged Ruby Aquatic Resources Report for detailed descriptions of project elements.

Of the seven project elements listed above, bat gate installation (same action for both alternatives 2 and 3) would occur outside of riparian habitat conservation areas and has no mechanism to affect aquatic species or their habitats. This project element will not be analyzed further in this section.

Descriptions regarding proximity of project elements to aquatic resources are described with Aquatic Species – Primary Habitat Elements in the Pool Frequency section.

Effect determinations for threatened, endangered, sensitive, and management indicator species are presented in each species subsection and summarized in Table 74. Determinations are made depending on Federal listing status and determinations are for threatened and endangered species, Region 6 sensitive species, and designed critical habitat.

Direct and Indirect Effects – All Aquatic Species

The Ragged Ruby planning area contains Columbia River bull trout, Middle Columbia River steelhead, and redband trout spawning, rearing, and migration habitat. At certain times and under various conditions it is possible for components of two project elements (recreation system changes and water drafting) to directly affect one or more of these species. Direct effects to Middle Columbia River steelhead, Columbia River bull trout, and redband trout from the remaining project elements are not expected. Project design criteria for recreation system changes and water drafting include those specified in the aquatic restoration biological opinion.

For project elements requiring work area isolation through the project design criteria (for example, setting up nets and blocking off areas for recreation system improvements [hardening of trail crossings]), Middle Columbia River steelhead, redband trout, and Columbia River bull trout may be captured and relocated. Direct effects on juvenile salmonids from work area isolation and fish relocation may include mechanical injury during capture, holding, or release, and potential horizontal transmission of disease and pathogens and stress-related phenomena. Stress approaching or exceeding the physiological tolerance limits of individual fish could impair reproductive success, growth, resistance to infectious diseases, and survival. Electro-fishing would be used to salvage fish, and would particularly increase stress loads. Harmful effects of electro-fishing include internal and external hemorrhage, fractured spines, and death. Although some fish may die from electro-shocking, fish would only be exposed to stress caused by work area isolation activities once, and the fish relocation is only expected to last a few hours. In the absence of work area isolation and relocation activities, more fish would potentially be injured or killed because of project activities.

Several conservation measures would be implemented to limit stress and mortality during work area isolation and fish relocation. Limiting the activities to the July 15 to August 15 instream work period would greatly reduce the chance of affecting adult fish, as these periods are designated to avoid times when adult Middle Columbia River steelhead, Columbia River bull trout, or redband trout are most likely to be present.

In-water equipment use could temporarily affect Middle Columbia River steelhead, Columbia River bull trout, and redband trout, including impacts on redds, smothered or crushed eggs and alevins, blocked migration, and disrupted or disturbed over-summering behavior. Middle Columbia River steelhead within the John Day River basin are particularly vulnerable during the spring, when adults are migrating and spawning. Also, they are vulnerable during late spring through early summer when eggs and fry are still present in the substrate. The activities could move juveniles out of over-summering habitats (such as deep pools) and into inferior habitats. However, if using seasonal restrictions imposed by instream work windows, these effects would be avoided.

Water withdrawals for dust abatement during haul activities would occur. Some water drafting sites are located on the Middle Fork John Day River where Pacific lamprey, Western ridged mussel, California floater, and their habitat are located and may be affected, in addition to Middle Columbia River steelhead, Columbia River bull trout, and redband trout. Water is the only agent that would be used for dust abatement for proposed haul activities. Dust abatement typically occurs only during the dry summer months (late June, July, and early August) when road dust is an issue; disturbance of spawning fish is unlikely since fish in the planning area do not spawn at this time. Water drafting could potentially decrease stream flow and thus the amount of water available for fish and mussels. Water drafting could also remove fish from the stream or injure them, if they are held against screens. Water drafting can occur only as long as supply is adequate to provide for both fish and withdrawal. Approved screens would be attached to intake hoses to prevent adverse impacts to fish. National Marine Fisheries Service developed criteria for pump intake screens would be used on all water pump intakes. Screen mesh openings shall not exceed 3/32 inch for woven wire or perforated plate screens, or 0.0689 inch for profile wire screens, with a minimum 27 percent open area. Trucks would be maintained to prevent oil leaks. Loading would be done in a manner to minimize overflowing and discharge of wash into stream. The maximum withdrawal from one site in an 8-hour period would be 18,000 gallons of water. Project design criteria include the National Marine Fisheries Service screening criteria and water drafting guidelines. These guidelines would avoid or minimize the potential harm to fish and mussels.

Direct and Indirect Effects – Aquatic and Riparian Habitats

Use of the six primary habitat elements to determine effects to threatened, endangered, and sensitive species is based upon using the effects of the action on key habitat elements as a surrogate for effects to the species. The premise is that the primary habitat elements depict the biological requirements of the threatened, endangered, and sensitive species. Since there is a direct relationship between habitat condition and the growth and survival of individual fish and sensitive species at various life stages, the effects of the action on habitat variables can be linked to effects to individuals of the species, and ultimately to an effects determination.

The analysis in the primary habitat elements section evaluated specific key habitat features that correspond to the physical or biological features of listed species critical habitat. The physical or biological features are used to describe "those physical or biological features that are essential to the conservation of the listed species." The same subset of key habitat features evaluated for effects to physical or biological features also apply to the analysis of effects to the species. Those primary habitat element or project element combinations for which a conclusion of effect was "negative and meaningfully measured" are listed below, and have the potential to adversely affect listed Middle Columbia River steelhead, Columbia River bull trout, and their designated critical habitat. Negative and meaningfully measurable effects do not meet the Endangered Species Act definition of “insignificant” effects and they are not discountable because the effects are likely to occur. Consequently, the effect determination for Middle Columbia River steelhead, Columbia River bull trout, and designated critical habitat is “may affect, likely to adversely affect” (Endangered Species Act effects); they also may impact individuals or habitat (Region 6 sensitive species effects to redband trout, Pacific lamprey, Western ridged mussel, California floater, and Columbia spotted frog). These conclusions were found for the following component of the project elements: recreation system changes (on a short-term basis). The indicators for which “negative and meaningfully measured” effects were concluded are:

- Embeddedness and fine sediment

The following project element would also have positive and meaningfully measurable long-term effects to three or more of the primary habitat elements as displayed in Table 68 shows a summary of the effects to the primary habitat elements from each of the proposed actions under alternative 2. Table 69 shows a summary of the effects to the primary habitat elements from each of the proposed actions under alternative 3. In some cases, there are differing effects over time for sort term and long term.

This project element with an aquatic restoration component was included in the National Marine Fisheries Service and U.S. Fish and Wildlife Service aquatic restoration biological opinion because the long-term effects of improved stream connectivity and habitat conditions far outweigh the short-term adverse effects associated with sedimentation, ground disturbance, and other environmental consequences of these actions. The degree of the potential adverse effects acknowledged in the aquatic restoration biological opinion is so limited that it does not rise to the level of significance in the National Environmental Policy Act context because the effect would be short term and limited in context and intensity.

The scientific literature reports that suspended sediment and turbidity influences on fish range from beneficial to detrimental. Elevated total suspended solids have been reported to enhance cover conditions, reduce piscivorous fish and bird predation rates, and improve survival, but elevated total suspended solids have also been reported to cause physiological stress, reduce growth, and adversely affect survival. Although fish that remain in turbid waters experience a reduction in predation from piscivorous fish and birds, chronic exposure can cause physiological stress response that can increase maintenance energy and reduce feeding and growth. Mussels are affected in a similar fashion.

As suspended fine sediment settles out downstream from the construction areas, minor increases in stream substrate embeddedness occurs. The scientific literature reports that increases in fine sediments in stream substrates can decrease productivity and habitat quality for juvenile salmonids. Increases in fine sediment levels reduce interstitial spaces between substrate particles, lead to shifts in invertebrate community structure, fill pools, and can entomb redds. In such cases, eggs are smothered, prey available for rearing juveniles is reduced, and habitat features are lost.

When heavy equipment is operating in the riparian areas or stream, there is also the potential for fuel or other contaminant spills. Operation of bulldozers, excavators, and other equipment requires the use of fuel and lubricants which, if spilled into the channel of a water body or into the adjacent riparian zone, can injure or kill aquatic organisms. Petroleum-based contaminants (such as fuel, oil, and some hydraulic fluids) contain polycyclic aromatic hydrocarbons, which can be acutely toxic to salmonids at high levels of exposure and can cause acute and chronic sub-lethal effects on aquatic organisms.

The Forest Service would implement a suite of project design criteria including those identified in the aquatic restoration biological opinion that are intended to reduce the short-term effects caused by near instream construction. Limiting instream construction to low flow periods and using sediment control measures has been shown to greatly reduce the amount of fine sediment and turbidity created by such actions. Refueling and servicing equipment outside the riparian area reduces the chances of spilling toxic fuels and lubricants. Development and implementation of a pollution and erosion control plan would limit adverse effects of a toxic material spill by ensuring that spill response materials are on site during all construction activities. Ensuring that all heavy equipment that would operate instream are cleaned and free of leaks would also reduce the introduction of contaminants into the aquatic environment. Also, several conservation measures would be implemented to limit stress and mortality during work area isolation and fish relocation. Limiting the activities to instream work periods would greatly reduce the chance of affecting adult fish, as these periods are designated to avoid times when adult salmonids are present.

The Ragged Ruby Project would restore upland and riparian forest health and processes, and introduce disturbance-related fire effects. Ragged Ruby proposed actions, in conjunction with reasonably foreseeable aquatic restoration actions, would restore riparian processes and functions resulting in a strong positive effect on aquatic threatened, endangered, sensitive, and management indicator species.

Direct and Indirect Effects – Middle Columbia River Steelhead

Middle Columbia River Steelhead determinations:

- Middle Columbia River steelhead Endangered Species Act determination (threatened): May affect, likely to adversely affect in the short term. Beneficial Effect in the long term when combined with foreseeable aquatic restoration actions.
- Steelhead management indicator species determination: continued viability at the Forest scale.
- Steelhead designated critical habitat (designated): May affect, likely to adversely affect in the short term. Beneficial Effect in the long term when combined with foreseeable aquatic restoration actions.

Because this project impacts less than 6 percent of suitable Middle Columbia River steelhead habitat across the Forest, the overall direct, indirect, and cumulative effects (discussed below) would result in a small negative trend of habitat in the short term. The negative effect on habitat would be insignificant at the scale of the Forest. This alternative is consistent with the Malheur Forest Plan, and thus continued viability of Middle Columbia River steelhead is expected on the Malheur National Forest.

- Overall, proposed actions would result in a Beneficial Effect to Neutral effect on habitat conditions for Middle Columbia River steelhead in the aquatic analysis area. However, high water temperatures and altered stream channel conditions in untreated stream reaches would likely persist.

Cumulative Effects

Ragged Ruby project actions, in conjunction with reasonably foreseeable aquatic restoration actions, would restore riparian processes and functions, resulting in a strong positive effect on aquatic threatened, endangered, sensitive, and management indicator species.

Project design criteria for reasonably foreseeable aquatic restoration activities include those identified in the aquatic restoration biological opinion (USDI FWS 2013) and those within the Malheur National Forest Aquatic Restoration Decision (USDA Forest Service 2014b). The aquatic restoration biological opinion and Aquatic Restoration Decision project design criteria specific to this project would be implemented as described in the aquatic restoration biological opinion and the Aquatic Restoration Decision, and would minimize the amount or extent of incidental take of Middle Columbia River steelhead or Columbia River bull trout. After about 2 years, effects of these activities would be beneficial for water quality and fish habitat, including reduced sediment yield from the road prism.

See also discussion of cumulative effects of alternatives 2 and 3 in the Aquatic Species – Primary Habitat Elements section, under Pool Frequency.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Malheur Forest Plan

This project is consistent with Malheur Forest Plan and PACFISH objectives, and is expected to achieve those objectives in treated areas where not currently met.

Specifically, alternatives 2 and 3 are consistent with the following applicable management area 3B and PACFISH standards:

- PACFISH RF-2b: proposed temporary roads and landings and staging areas in riparian habitat conservation areas are minimized.
- PACFISH RF-3a & b: roads that will be used for proposed vegetation management activities will have drainage problems repaired and will be brought up to standards prior to haul.
- PACFISH RA-2: danger trees felled in riparian habitat conservation areas and outside of the roadway will be left on site where woody debris objectives are not being met.
- Malheur Forest Plan desired future conditions and riparian management objectives: activities proposed under both alternatives would not retard the attainment of Malheur Forest Plan riparian management objectives for aquatic habitat (large woody debris, replacement large woody debris, pool frequency, bank stability, width-to-depth ratio, sediment and substrate, shading, and water temperature). Design criteria will be used to minimize the amount of fine sediment resulting from proposed activities. In the long term, restoration proposed would enhance the attainment of riparian management objectives (please see Direct and Indirect Effects sections).
- Design prescribed burn projects and prescriptions to contribute to the attainment of riparian management objectives (PACFISH standard FM-4).
- Prohibit storage of fuels and other toxicants within riparian habitat conservation areas. Prohibit refueling within riparian habitat conservation areas unless there are no other alternatives. Refueling sites within a riparian habitat conservation area must be approved by the Forest Service and have an approved spill containment plan (PACFISH standard RA-4).

- Locate water drafting sites to avoid adverse effects to listed anadromous fish and instream flows, and in a manner that does not retard or prevent attainment of riparian management objectives (PACFISH standard RA-5).
- Design fuel treatment and fire suppression strategies, practices, and actions so as not to prevent attainment of riparian management objectives, and to minimize disturbance of riparian ground cover and vegetation. Strategies should recognize the role of fire in ecosystem function and identify those instances where fire suppression or fuel management actions could perpetuate or be damaging to log-term ecosystem function, listed anadromous fish, or designated critical habitat (PACFISH standard FM-1).

The development of the proposed actions and project design criteria are consistent with all of these standards, as described in chapter 2 of the Ragged Ruby draft environmental impact statement.

Floodplains (Executive Order 11988)

Executive Order 11988 says that Federal agencies shall avoid direct adverse effects to floodplains or minimize potential harm. Floodplains several feet wide occur along much of the Middle Fork John Day River and its tributaries within the aquatic analysis area. The floodplains are well within riparian habitat conservation areas, and so all alternatives avoid adverse effects to the floodplains, and thus are consistent with Executive Order 11988.

Recreational Fisheries (Executive Order 12962)

Alternatives 2 and 3 include decommissioning roads and recreation system changes that would improve quantity, function, sustainable productivity, and distribution of recreational fisheries by reducing impacts from elevated levels of fine sediment as directed under Executive Order 12962, Recreational Fisheries.

National Forest Management Act

Alternative 1 would maintain the current degraded aquatic habitat conditions, however those conditions are maintaining viable populations of native aquatic species and providing for conservation of listed threatened aquatic species populations.

Alternatives 2 and 3 include decommissioning roads and recreation system changes that would improve the viability of native aquatic species and enhance conservation of listed threatened aquatic species populations.

Endangered Species Act

Federally listed fish species and their designated critical habitat in the planning area subject to consultation include Columbia River bull trout and their designated critical habitat, and Middle Columbia River steelhead and their designated critical habitat. The National Marine Fisheries Service and U.S. Fish and Wildlife Service aquatic restoration biological opinion addresses consultation on all aquatic restoration actions proposed in the Ragged Ruby Project. The Malheur National Forest will initiate Endangered Species Act section 7 consultation with National Marine Fisheries Service and U.S. Fish and Wildlife Service on the remaining actions of the Ragged Ruby Project, and expects to provide the regulatory agencies with a biological assessment regarding effects of the project to Middle Columbia River steelhead, Columbia River bull trout, and their designated critical habitats. The completed biological assessment and consultations will be located in the project file.

Clean Water Act

Alternatives 2 and 3 comply with the Clean Water Act and the Malheur Forest Plan, since none raise water temperatures, and since all follow best management practices as specified in

“National Best Management Practices for Water Quality Management on National Forest System Lands Volume 1: National Core BMP Technical Guide” (USDA Forest Service 2012), and in standards and guidelines in the Malheur Forest Plan. The site-specific best management practices are listed in Appendix C – Project Design Criteria, in PACFISH standards and guidelines (as described earlier in the Regulatory Framework section), and in standard timber sale contracts.

Redband Trout

Affected Environment

Methodology

Methodology for this species is the same as described for Methodology – All Aquatic Species.

Existing Condition

Interior redband trout are the resident form of *Oncorhynchus (O) mykiss*, and a Region 6 sensitive species and a Malheur National Forest management indicator species. Redband trout Redband trout (potadromous) may or may not be reproductively isolated from Middle Columbia River steelhead (anadromous), and the species inhabit the same geographic area, share a common gene pool, and share similar habitat requirements. Potadromous redband trout exhibit a wide variety life history strategies in freshwater systems, including migratory (fluvial and adfluvial) and resident forms. Redband trout are sensitive to changes in water quality and habitat, and prefer a water temperature range from 10 to 16 degrees Celsius (50 to 60.8 degrees Fahrenheit). For more information on this species’ specific habitat needs and life history, see Ragged Ruby Aquatic Resources Report.

Redband trout currently occupy 42 percent of their historical range within the western United States, of which 47 percent of the streams occupied by redband trout occur on private lands, 45 percent on government lands, and 8 percent in protected areas (Muhlfeld et al. 2015). Primary threats to redband trout include invasive species, habitat degradation and fragmentation, and climate change (Muhlfeld et al. 2015).

Neither Oregon Department of Fish and Wildlife nor the Forest Service routinely monitor abundance and distribution of redband trout in the John Day River basin. Juvenile *O. mykiss* with resident (redband trout) and anadromous (Middle Columbia River steelhead) life history types are difficult to differentiate where the two populations coexist, making independent monitoring difficult.

Currently in the John Day River basin, redband trout are present in the North Fork, Middle Fork mainstem, and South Fork John Day rivers and their tributaries. Redband trout are present in all fish-bearing streams in the aquatic analysis area (see Appendix B – Maps, Map 15); however, their population abundance is unknown. Spawning and rearing habitat is present in all fish-bearing streams in the analysis area, with the Middle Fork John Day River also serving as a migratory corridor. Their distribution within the analysis area and habitat needs are similar to those of Middle Columbia River steelhead. However, redband trout spawning may occur in areas with insufficient flow or two small of substrate for Middle Columbia River steelhead spawning. Redband trout occupy approximately 1,100 miles of habitat on the Malheur National Forest, and occupy approximately 31.1 miles of habitat within the planning area, which represents approximately 2.8 percent of available habitat on the Forest.

Aquatic biota surveys of fish-bearing streams in the planning area in 2014 were used to update *O. mykiss* fish distribution. The Malheur National Forest fish distribution geographic information systems layer for redband trout was updated in 2017, and the analysis area includes two categories of distribution information: documented observation and presumed (professional opinion). For the purposes of this analysis, streams are considered as redband trout habitat only if it is a documented observation.

Environmental Consequences

Methodology

Methodology for this species is the same as described for Methodology – All Aquatic Species.

Alternative 1 – No Action

Direct and Indirect Effects

Effects of alternative 1 are the same as described for Middle Columbia River Steelhead, in the Direct and Direct Effects – All Aquatic Species section.

Redband Trout Determinations:

- Interior redband trout sensitive species determination (sensitive): no impact.
- Interior redband trout management indicator species determination: no impact to viability.

Cumulative Effects

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

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Compliance with the Malheur Forest Plan and other relevant laws, regulations, and policies are as described as for Middle Columbia River Steelhead.

Alternatives 2 and 3

Direct and Indirect Effects

Direct and indirect effects of alternatives 2 and 3 are described as for Middle Columbia River Steelhead section for all aquatic species and aquatic and riparian habitats.

Determinations:

- Interior redband trout sensitive species determination (sensitive): may impact individuals or habitat, but would not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species in the short term. There would be a beneficial impact in the long term.
- Redband trout management indicator species determination: continued viability at the Forest scale.

Because this project impacts less than approximately 2.8 percent of suitable redband trout habitat in relation to the distribution throughout the Malheur National Forest, the overall direct, indirect, and cumulative effects would result in a small negative trend of habitat in the short term. The effect on habitat would be insignificant at the scale of the Forest. As such, the implementation of the project may impact individuals or habitat, but would not likely contribute toward federal listing or cause a loss of viability to the population or species at the Forest scale.

Overall, proposed actions would result in a beneficial impact in habitat conditions for redband trout in the aquatic analysis area. However, high water temperatures and altered stream channel conditions in untreated stream reaches would likely persist.

Cumulative Effects

Cumulative effects are the same as described for Middle Columbia River steelhead.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Compliance with the Malheur Forest Plan and other relevant laws, regulations, and policies are as described for Middle Columbia River steelhead.

Columbia River Bull Trout

Affected Environment

Methodology

Methodology for this species is the same as described for Methodology – All Aquatic Species.

Existing Condition

Columbia River bull trout are currently listed as threatened under the Endangered Species Act. Based on a 2008 5-year status review, bull trout have a recovery priority number of 9C on a scale of 1 (highest) to 18 (lowest) indicating that: (1) the population is a distinct population segment of a species; (2) the coterminous U.S. population is subject to a moderate degree of threat(s); (3) the recovery potential is high; and (4) the degree of potential conflict with construction or other development projects during recovery is high (USDI FWS 2015b).

The most recent recovery plan (USDI FWS 2015b) organized bull trout by six “recovery units.” The bull trout in the Middle Fork John Day River basin are part of the Middle Columbia Recovery Unit, which has 24 occupied core areas, including the John Day River core area. The rankings for this core area as of the 2008 status review were:

Middle Fork John Day River

- Population abundance (individuals) = unknown
- Range in stream miles = 125 to 620
- Short term trend = Increasing
- Threat rank = Substantial, imminent
- Final rank = At risk

North Fork John Day River (Umatilla and Wallowa-Whitman national forests)

- Population abundance (individuals) = unknown
- Range in stream miles = 125 to 620
- Short term trend = Increasing
- Threat rank = Substantial, imminent
- Final rank = At risk

Upper Mainstem John Day River

- Population abundance (individuals) = 1 to 50
- Range in stream miles = 125 to 620
- Short term trend = Increasing
- Threat rank = Moderate, non-imminent
- Final rank = At risk

See Ragged Ruby Aquatic Resources Report for more information on the listing of this species and the associated recovery plan, historical range and population status based on two decades of surveys, and detailed critical habitat designation information.

Middle Columbia River steelhead are currently believed to be widely distributed in the Middle Fork John Day River subbasin in the analysis area, persisting at low abundance levels. The primary stream that is also occupied by bull trout in the analysis area is Granite Boulder Creek. Critical habitat for bull trout also includes Butte Creek. Bull trout have been documented in Butte Creek only once in the last 5 years (one redd during a 2013 survey by the Forest Service).

Bull trout occupy approximately 9.26 miles of habitat within the planning area, which represents approximately 4.4 percent of available habitat on the Malheur National Forest. It is notable that miles of occupied habitat differs from that of designated critical habitat (13.16 miles) due to U.S. Fish and Wildlife Service designation of critical habitat beyond the upstream extent of occupied habitat.

Streams within the analysis area designated as critical habitat (with the 2010 designation) for bull trout include Butte Creek, Granite Boulder Creek, and the Middle Fork John Day River. See Table 73. The planning area is situated at the northern edge of available habitat on the Malheur National Forest.

Table 73. Miles of Columbia River bull trout critical habitat by stream name within the Ragged Ruby planning area

Stream name	Miles of Columbia River bull trout critical habitat
Butte Creek	4.76
Granite Boulder Creek	7.22
Middle Fork John Day River	1.18
Total	**13.16**

Environmental Consequences

Methodology

Methodology for this species is the same as described for Methodology – All Aquatic Species.

Alternative 1 – No Action

Direct and Indirect Effects

Effects of alternative 1 are the same as described for Middle Columbia River Steelhead, in the Direct and Direct Effects – All Aquatic Species section.

Bull trout Determinations:

- Columbia River bull trout Endangered Species Act determination (threatened): No Effect.
- Columbia River bull trout management indicator species determination: no impact to viability.
- Columbia River bull trout designated critical habitat Endangered Species Act determination (designated): No Effect.

Cumulative Effects

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

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Compliance with the Malheur Forest Plan and other relevant laws, regulations, and policies are as described as for Middle Columbia River steelhead.

Alternatives 2 and 3

Direct and Indirect Effects

Direct and indirect effects of alternatives 2 and 3 are described as for Middle Columbia River Steelhead section for all aquatic species and aquatic and riparian habitats.

Determinations:

- Columbia River bull trout Endangered Species Act determination (threatened): May affect, likely to adversely affect in the short term. Beneficial effect in the long term when combined with foreseeable aquatic restoration actions.
- Bull trout management indicator species determination: continued viability at the Forest scale.
- Columbia River bull trout designated critical habitat (designated): May affect, likely to adversely affect in the short term. Beneficial effect in the long term when combined with foreseeable aquatic restoration actions.

Because this project impacts less than 4.4 percent of suitable Columbia River bull trout habitat across the Forest, the overall direct, indirect, and cumulative effects (discussed below) would result in a small negative trend of habitat in the short term. The negative effect on habitat would be insignificant at the scale of the Forest. This alternative is consistent with the Malheur Forest Plan, and thus continued viability of Columbia River bull trout is expected on the Malheur National Forest.

- Overall, proposed actions would result in a Beneficial Effect to Neutral effect on habitat conditions for Columbia River bull trout in the aquatic analysis area. However, high water temperatures and altered stream channel conditions in untreated stream reaches would likely persist.

Cumulative Effects

Cumulative effects are the same as described for Middle Columbia River steelhead.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Compliance with the Malheur Forest Plan and other relevant laws, regulations, and policies are as described for Middle Columbia River steelhead.

Pacific Lamprey

Affected Environment

Methodology

Methodology for this species is the same as described for Methodology – All Aquatic Species.

Existing Condition

The Pacific lamprey (*Entosphenus tridentatus*) is a Region 6 sensitive species and is identified as a vulnerable species of concern in Oregon (Gunckel et al. 2009; Close et al. 2002). Aammocoete (larvae) occurrence corresponds positively with low water velocity, pool habitats, and the availability of suitable burrowing habitat (fine substrate) (Roni 2003; Pirtle et al. 2003; Torgersen and Close 2004; Claire et al. 2007). Lampreys are anadromous; they spend 3 to 7 years in streams as larvae and are filter feeders, then they transform into juveniles and migrate to the ocean where they live as adults for 1 to 3 years. Radio tagged lampreys in the John Day River have been observed to over-winter under boulders in riffles and glides (Robinson et al. 2002, Robinson and Bayer 2005). Lamprey spawn in habitat similar to that of salmon: gravel-bottomed streams at the upstream end of riffle habitat. For more information about the habitat requirements and life histories of Pacific lamprey, see the Ragged Ruby Aquatic Resources Report.

Within the John Day River basin, lamprey distribution is expected to be in the mainstem rivers and low-gradient sections of larger tributary streams. In the Middle Fork John Day River, they have been documented at the confluence of Granite Boulder Creek (within the planning area), near the confluence of Vincent Creek, and in Clear Creek approximately 0.5 kilometers upstream of its confluence with the Middle Fork John Day River (both upstream of the planning area). Substrate in tributaries within the Ragged Ruby planning area are dominated by cobble and gravel, and lack ideal larval lamprey habitat. This species may have been present historically; however, current conditions do not likely support larval life stages. It is unlikely that the species or its habitat is present within the planning area outside of the Middle Fork John Day River. Pacific lamprey would thus occupy approximately 1.2 miles of habitat within the planning area, which is situated at the northern edge of available habitat on the Malheur National Forest.

Environmental Consequences

Methodology

Methodology for this species is the same as described for Methodology – All Aquatic Species.

Alternative 1 – No Action

Direct and Indirect Effects

Effects of alternative 1 are the same as described for Middle Columbia River steelhead, in the Direct and Direct Effects – All Aquatic Species section.

Pacific lamprey Determination:

- Pacific lamprey sensitive species determination (sensitive): no impact.

Cumulative Effects

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

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Compliance with the Malheur Forest Plan and other relevant laws, regulations, and policies are as described as for Middle Columbia River steelhead.

Alternatives 2 and 3

Direct and Indirect Effects

Direct and indirect effects of alternatives 2 and 3 are as described for the Middle Columbia River Steelhead section for all aquatic species and aquatic and riparian habitats.

Determinations:

- Pacific lamprey sensitive species determination (sensitive): may impact individuals or habitat, but would not likely contribute toward federal listing or loss of viability to the population or species in the short term. There would be a beneficial impact in the long term.

Because this project impacts a very small percentage (1.2 miles) of suitable Pacific lamprey habitat in relation to the distribution throughout the Malheur National Forest, the overall direct, indirect, and cumulative effects would result in a small negative trend of habitat in the short term. The effect on habitat would be insignificant at the scale of the Forest. As such, the implementation of the project may impact individuals or habitat, but would not likely contribute toward federal listing or cause a loss of viability to the population or species at the Forest scale.

Overall, proposed actions would result in a beneficial impact in habitat conditions for Pacific lamprey in the aquatic analysis area. However, high water temperatures and altered stream channel conditions in untreated stream reaches would likely persist.

Cumulative Effects

Cumulative effects are the same as described for Middle Columbia River steelhead.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Compliance with the Malheur Forest Plan and other relevant laws, regulations, and policies are as described for Middle Columbia River steelhead.

Columbia Spotted Frog

Affected Environment

Methodology

Methodology for this species is the same as described for Methodology – All Aquatic Species.

Existing Condition

The Columbia spotted frog is a Region 6 sensitive species. Spotted frogs are highly aquatic and are rarely found far from permanent water. They are most commonly associated with perennial streams, and less commonly with lakes, ponds, springs, and marshes. For more information on this species' life history, and the full extent of its range, see the Ragged Ruby Aquatic Resources Report.

The U.S. Fish and Wildlife Service lists livestock grazing and the introduction of nonnative fish (salmonids and bass) as primary threats to the Great Basin population of Columbia spotted frogs (66 Federal Register 1295).

The spotted frog is considered present in all subbasins of the Malheur National Forest, including the aquatic analysis area. It is assumed this species is widely distributed in the Middle Fork John Day River subbasin. Limited habitat surveys have been conducted specifically for spotted frogs; however, habitat probably exists along low-gradient perennial streams. Fish surveys record incidental sightings of frogs but most do not differentiate species.

Spotted frogs may be considered to occupy a similar range as redband trout on the Forest due to their predominantly stream-oriented habitat use. Spotted frogs would thus occupy approximately 31.1 miles of habitat within the planning area, which represents approximately 2.8 percent of available habitat on the Malheur National Forest. The planning area is situated at the northern edge of available habitat on the Malheur National Forest.

Environmental Consequences

Methodology

Methodology for this species is the same as described for Methodology – All Aquatic Species.

Alternative 1 – No Action

Direct and Indirect Effects

Effects of alternative 1 are the same as described for Middle Columbia River steelhead, in the Direct and Direct Effects – All Aquatic Species section.

Columbia Spotted Frog Determination:

- Columbia spotted frog sensitive species determination (sensitive): no impact.

Cumulative Effects

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

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Compliance with the Malheur Forest Plan and other relevant laws, regulations, and policies are as described as for Middle Columbia River steelhead.

Alternatives 2 and 3

Direct and Indirect Effects

Direct and indirect effects of alternatives 2 and 3 are as described for the Middle Columbia River Steelhead section for all aquatic species and aquatic and riparian habitats.

Columbia spotted frogs, which are highly aquatic and rarely found far from permanent water. At certain times and under various conditions it is possible for all project elements to directly affect spotted frogs. Due to the implementation of project design criteria, the short-term nature of this risk, the timing of ground-disturbing in- and near-water project activities during dry-field conditions (low to moderate soil moisture levels) when spotted frogs are unlikely to be dispersing, and the distance of the vast majority of project sites from permanent water, direct effects on spotted frogs would be minimized.

Determination:

- Columbia spotted frog sensitive species determination (sensitive): May impact individuals or habitat, but would not likely contribute toward federal listing or loss of viability to the population or species in the short term. There would be a beneficial impact in the long term.

Because this project impacts a small percentage of suitable spotted frog habitat (approximately 2.8 percent) on the Malheur National Forest, the overall direct, indirect, and cumulative effects would result in a small negative trend of habitat in the short term. The effect would be insignificant at the scale of the Forest. The action alternatives may impact individuals or habitat, but would not likely contribute toward federal listing or loss of viability to the population or species at the Forest scale.

Overall, proposed actions would result in a beneficial impact on habitat conditions for Columbia spotted frogs in the aquatic analysis area. However, altered stream channel conditions in untreated stream reaches would likely persist.

Cumulative Effects

Cumulative effects are the same as described for Middle Columbia River steelhead.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Compliance with the Malheur Forest Plan and other relevant laws, regulations, and policies are as described for Middle Columbia River steelhead.

Western Ridged Mussel

Affected Environment

Methodology

Methodology for this species is the same as described for Methodology – All Aquatic Species.

Existing Condition

The Western ridged mussel (*Gonidea [G] angulata*) is a Region 6 sensitive species. They are associated with substrates that range from gravel to firm mud with low shear stress (shear stress is caused by fast-flowing water over substrate) and substrate stability; flow refuges are important determinants of freshwater mussel survival (Vannote and Minshall 1982). This species is generally associated with constant flow, shallow water (less than 3 feet in depth), and well oxygenated substrates (COSEWIC 2003), and is often present in areas with seasonally turbid streams. *G. angulata* generally occurs at low to mid elevations (Nedeau et al. 2005). Many sites where this species has been found lack dense macrophyte beds. Typically, individuals of this species are found buried to at least half their length in fine substrate, with the posterior end facing upstream (COSEWIC 2003). Since this species prefers stable habitats, it may be particularly threatened by dewatering and other activities that cause shifting substrates, water level fluctuations, and seasonal hypoxia or anoxia (COSEWIC 2003).

See the Ragged Ruby Aquatic Resources Report for information on this species' life history.

U.S. populations are regarded as declining. This species is threatened by the continued loss or degradation of suitable habitat. In general, North American freshwater mussels are very sensitive to environmental changes, and consequently, the order contains a high percentage of endangered species in North America. Other threats to this species are eutrophication, heavy metals, and transition elements. Freshwater mussels are ecologically important because they act as nutrient sinks, provide water filtration thus contributing to maintenance of water clarity, and provide a valuable food source for many species.

The Western ridged mussel is known to occur within the planning area in the Middle Fork John Day River. Surveys for Western ridged mussel and two other mussel species were conducted in 2011, based on survey data described in further detail in the Ragged Ruby Aquatic Resources Report. It is unlikely that the Western ridged mussel or its habitat is present within the planning area outside of the Middle Fork John Day River. The Western ridged mussel would thus occupy approximately 1.2 miles of habitat within the planning area, which is situated at the northern edge of available habitat on the Malheur National Forest.

Environmental Consequences

Methodology

Methodology for this species is the same as described for Methodology – All Aquatic Species.

Alternative 1 – No Action

Direct and Indirect Effects

Effects of alternative 1 are the same as described for Middle Columbia River steelhead, in the Direct and Direct Effects – All Aquatic Species section.

Western Ridged Mussel Determination:

- Western ridged mussel sensitive species determination (sensitive): no impact.

Cumulative Effects

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

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Compliance with the Malheur Forest Plan and other relevant laws, regulations, and policies are as described as for Middle Columbia River steelhead.

Alternatives 2 and 3

Direct and Indirect Effects

Direct and indirect effects of alternatives 2 and 3 are as described for the Middle Columbia River Steelhead section for all aquatic species and aquatic and riparian habitats.

Determination:

- Western ridged mussel sensitive species determination (sensitive): may impact individuals or habitat, but would not likely contribute toward federal listing or loss of viability to the population or species in the short term. Beneficial impact in the long term.

Because this project impacts a very small percentage (1.2 miles) of suitable Western ridged mussel habitat on the Malheur National Forest, the overall direct, indirect, and cumulative effects would result in a small negative trend of habitat in the short term. The effect would be insignificant at the Forest scale. The action alternatives may impact individuals or habitat, but would not likely contribute toward federal listing or loss of viability to the population or species at the Forest scale.

Overall, proposed actions would result in a beneficial impact on habitat conditions for the Western ridged mussel in the aquatic analysis area. However, high water temperatures and altered stream channel conditions in untreated reaches would likely persist.

Cumulative Effects

Cumulative effects are the same as described for Middle Columbia River steelhead.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Compliance with the Malheur Forest Plan and other relevant laws, regulations, and policies are as described for Middle Columbia River steelhead.

California Floater

Affected Environment

Methodology

Methodology for this species is the same as described for Methodology – All Aquatic Species.

Existing Condition

The California floater (*Anodonta californiensis)* is a Region 6 sensitive species. It is a freshwater mussel typically found at low elevations, burrowed in soft substrate (mud, sand, or silt) (Cummings and Cordeiro 2011). They are generally found in fairly large streams and lakes only, in relatively slow current (and are essentially limnophilic species, they prefer lakes, still, or stagnant water) (Frest and Johannes 1995). For this species' life history information, see the Ragged Ruby Aquatic Resources Report.

California floaters have been observed in the Middle Fork John Day River throughout the planning area, and occur at higher densities in channel units greater than 1 meter deep (Hegeman et al. 2014). The presence of this species in tributaries to the Middle Fork John Day River is unlikely, based on available survey data and limited habitat characteristics described in further detail in the Ragged Ruby Aquatic Resources Report. The California floater would thus occupy approximately 1.2 miles of habitat within the planning area, which is situated at the northern edge of available habitat on the Malheur National Forest.

Environmental Consequences

Methodology

Methodology for this species is the same as described for Methodology – All Aquatic Species.

Alternative 1 – No Action

Direct and Indirect Effects

Effects of alternative 1 are the same as described for Middle Columbia River steelhead, in the Direct and Direct Effects – All Aquatic Species section.

California Floater Determination:

- California floater sensitive species determination (sensitive): no impact.

Cumulative Effects

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

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Compliance with the Malheur Forest Plan and other relevant laws, regulations, and policies are as described for Middle Columbia River steelhead.

Alternatives 2 and 3

Direct and Indirect Effects

Direct and indirect effects of alternatives 2 and 3 are described as for Middle Columbia River Steelhead section for all aquatic species and aquatic and riparian habitats.

Determination:

- California floater sensitive species determination (sensitive): may impact individuals or habitat, but would not likely contribute toward federal listing or loss of viability to the population or species in the short term. Beneficial impact in the long term.

Because this project impacts a very small percentage (1.2 miles) of suitable California floater habitat on the Malheur National Forest, the overall direct, indirect, and cumulative effects would result in a small negative trend of habitat in the short term. The effect would be insignificant at the Forest scale. Alternatives 2 and 3 may impact individuals or habitat, but would not likely contribute toward federal listing or loss of viability to the population or species at the Forest scale.

Overall, proposed actions would result in a beneficial impact on habitat conditions for the California floater in the aquatic analysis area. However, high water temperatures and altered stream channel conditions in untreated reaches would likely persist.

Cumulative Effects

Cumulative effects are the same as described for Middle Columbia River steelhead.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Compliance with the Malheur Forest Plan and other relevant laws, regulations, and policies are as described for Middle Columbia River steelhead.

Summary of Effects to Aquatic Species

Table 74 below summarizes effects to threatened, endangered, sensitive, and management indicator aquatic species by alternative. Effects to Middle Columbia River steelhead and Columbia River bull trout are broken up by short-term and long-term effects.

Table 74. Threatened, endangered, Region 6 sensitive, and management indicator aquatic species with effects determinations by alternative

Aquatic species	Status[1]	Alternative 1 (no action)[2]	Alternatives 2 and 3[3]
Middle Columbia River steelhead (*Oncorhynchus [O] mykiss*)	T	NE	LAA- BE
Middle Columbia River steelhead (*Oncorhynchus [O] mykiss*)	MIS	NI	MIIH - BI
Middle Columbia River steelhead designated critical habitat	D	NE	LAA - BE
Columbia River bull trout (*Salvelinus confluentus*)	T	NE	LAA-BE
Columbia River bull trout (*Salvelinus confluentus*)	MIS	NI	MIIH - BI
Columbia River bull trout designated critical habitat	D	NE	LAA - BE
Interior redband trout (*O. mykiss gairdneri*)	S, MIS	NI	MIIH - BI
Pacific lamprey (*Entosphenus tridentatus*)	S	NI	MIIH - BI
Columbia spotted frog (*Rana luteiventris*)	S	NI	MIIH - BI
Western ridged mussel (*Gonidea angulata*)	S	NI	MIIH - BI
California floater (*Anodonta californiensis*)	S	NI	MIIH - BI

1. Status: T = threatened, MIS = management indicator species, D = designated, S = sensitive.
2. Alternative 1 (no action) effects: NE = No Effect, NI = no impact.
3. Alternatives 2 and 3 effects: LAA = may affect, likely to adversely affect; BE = Beneficial Effect; MIIH = may impact individuals or habitat, but would not likely contribute toward federal listing or loss of viability to the population or species; BI = beneficial impact.

Other Relevant Mandatory Disclosures

Irreversible and Irretrievable Commitments of Resources

Irreversible effects are not expected. Reduced population viability for Middle Columbia River steelhead, Columbia River bull trout, redband trout, Columbia spotted frog, Western ridged mussel, and California floater is not expected. PACFISH established explicit goals and objectives for anadromous fish habitat condition and function. By following PACFISH standards and guidelines, as well as design criteria specific to this project, it is believed that irretrievable commitments of this resource can be avoided. The goal is to achieve a high level of habitat diversity and complexity through a combination of habitat features.

Fire and Fuels

Regulatory Framework

Regulatory framework for fire and fuels includes the Malheur Forest Plan; the Federal Wildland Fire Management Policy and Program Review (USDA and USDI 1995b); the Wildland and Prescribed Fire Management Policy and Implementation Procedures Reference Guide (Forest Service Manual 5101, 5103, and 5108); the National Forest Management Act of 1976; the Forest and Rangeland Renewable Resources Planning Act of 1974; the National Fire Plan (USDA and USDI 2000); Fire-Adapted Ecosystems, a Cohesive Strategy, October, 2000: The 10-Year Comprehensive Strategy (USDA Forest Service 2000); and the Grant County Community Fire Protection Plan (Grant County 2013).

Resource Indicators

The resource indicators used in this section are:

- Flame length: The length of flame measured in feet. Increased flame lengths reduce fire suppression strategies and effectiveness and increase the likelihood of torching events and crown fires.
- Tree mortality: The percentage of trees that are killed in a stand when a wildfire or prescribed fire burn through the stand. In the planning area, stands historically survived frequent low-intensity fires.
- Crown fire activity: Fire that burns in the crowns of trees and shrubs. Usually ignited by a surface fire. Crown fires are common in coniferous forests and chaparral-type shrublands. There are two types of crown fires: active and passive. An active crown fire is one in which the entire fuel strata[29] is involved in flame, but the crowning phase remains dependent on heat released from surface fuel for continued spread. A passive crown fire is one in which the crowns of individual trees or small groups of trees burn but the entire fuels strata is not involved, and active crown fire in the canopy cannot be maintained except for short periods.

These are appropriate indicators for this analysis because they give information about potential fire behavior and fire effects. The fuel load not only determines whether a fire will grow, but also the fire intensity and effects. Flame length influences suppression strategies and tactics by firefighters and mechanical equipment. Tree mortality determines the effects of fire on stands and the historical variability of fire effects.

Table 75. Resource elements, indicators, and measures for assessing fire and fuels effects

Resource element	Resource indicator	Measure	Source
Flame length	Length of flame (feet)	Feet	Andrews and Rothermel 1982
Tree mortality	Percentage of tree mortality	Percentage	Wyant et al. 1986
Crown fire activity	Surface, passive, active	Activity type	Andrews and Rothermel 1982

[29] Fuel strata is a horizontal layer of fuels of similar general characteristics. Three fuel strata are recognized: ground, surface, and canopy (Scott and Reinhardt 2001).

Flame Length, Tree Mortality, and Crown Fire Activity

Affected Environment

Methodology

Field inventories were conducted to measure attributes of existing vegetation in the planning area. Treatments units within the planning area were inventoried using on-site photo interpretation and the forest vegetation simulator program. These treatment units are representative of the planning area and the project areas to be treated in alternatives 2 and 3. Data was collected on live and dead trees. These data were used in the following analysis, data tables, graphs, and charts, and are incorporated by reference. Geographic information system LANDFIRE program[30] data and onsite visits were used to determine fuel models, and a study conducted in 2005 and associated surface fire spread model were used for fire modeling (Scott and Burgan 2005). Analysis for fire behavior was calculated using the 90th percentile fire weather factors from Keeney Two Weather Station during 1995 to 2016 (5,120 feet elevation; May 1 through October 31). Ninetieth percentile[31] weather is used to define the high conditions for an area using historical weather data of that area.

Existing Condition

Within the planning area there have been three recorded large fires (1994 Reed Fire, 1996 Summit Fire, and 2008 Sunshine Fire) and 158 additional fires, the majority of which were less than 1 acre in size.

The historical fire regime in the Ragged Ruby planning area was characterized by frequent fires of mixed severity known as fire regime III (35 to 100+ year frequency and mixed severity). Within the planning area, fire return intervals ranged between 11 to 18 years in dry pine sites and 12 to 21 years in mixed conifer sites (Johnston et al. 2017). Currently, 90 percent of the Ragged Ruby planning area falls within fire regime condition class 3, which is characterized by a high departure from the natural (historical) regime of vegetation characteristics; fuel composition; fire frequency, severity, and pattern; and other associated disturbances.

Current conditions include increases in tree density, encroachment of shade-tolerant tree species, or high loss of shade-intolerant tree species. This creates fuel conditions above historical fire behavior and effects. Current fire behavior conditions under 90th percentile weather conditions are expected to have flame lengths of 4 to 8 feet with some areas exceeding 11 feet. Tree mortality would vary by species and wildfire intensity, but on average it is expected that 76 percent of the greater than 21 inches diameter at breast height trees (averaged across all species) would die. These conditions have created a concern over potential fire behavior, fire effects on public and private lands, and threats to forest resources and potential impacts to air quality.

In the Grant County Community Wildfire Protection Plan, the planning area is within the Upper Middle Fork Zone. The Upper Middle Fork Zone is rated as a "high" hazard for wildfire risk.

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[30] See https://www.landfire.gov/.

[31] Percentiles are used to help measure the significance of outputs as they relate to levels of fire risk, fuel conditions, and fire danger. Weather percentiles are based on a scale of 0 to 100, and utilize weather data compiled by the National Digital Forecast Database to average weather conditions for the area. The top 90th percentile weather means that only 10 percent of days have had weather values the same or higher. These conditions warrant the classification of "extreme" for fire hazard, and might be characterized by high temperatures, low humidity levels, high winds, or other conditions that drive fire behaviors.

This zone is extremely vulnerable to wildfire due to the location, vegetation type, topography, communications structure, and complete absence of structural fire protection in the area.

Environmental Consequences

Methodology

The analysis below considers forest vegetation, fuels, and fire at the stand level. The effects of treatments (or lack thereof) on fire behavior, fire effects, smoke effects, and fire suppression capability were analyzed for each alternative, using flame length, tree mortality, and crown fire activity. Flame lengths were based on fuel models. Dead and live fuels used in fuel models are described by size (1-hour, 10-hour, 100-hour, and 1,000-hour fuels). Crown fire activity level is based on fuel models, canopy base heights, and canopy bulk density. Fuel models are used to determine the flame length. Flame length and the distance to the canopy base height determines crown fire initiation. The density of the canopy determines the type of crown fire the stand may have under a certain weather percentile. Fuel conditions resulting from implementation of each of the alternatives would have associated effects on fire behavior.

Fire effects are estimated as the predicted flame length (feet), and the crown fire activity (surface, passive, or active). Increased flame lengths can increase the likelihood of torching events and crown fires. Flame length is influenced in part by fuel type, fuel arrangement, fuel moisture, and weather conditions. Flame length influences suppression actions including types of resources that can be used to effectively suppress fires. Flame lengths over 4 feet may present serious control problems, and are typically too dangerous to be directly contained by hand crews (Schlobohm and Brain 2002, Andrews and Rothermel 1982). Flame lengths over 8 feet are generally not controllable by ground-based equipment or aerial retardant, and present serious control problems including torching, crowning, and spotting. Flame length directly affects suppression tactics. Crown fire activity limits suppression resources, and firefighters have to wait until fire comes back to the ground to be effective at suppressing fires.

Tree mortality (displayed in Table 78) was modeled using BehavePlus 5, a fire modeling system is a computer program that is based on mathematical models that describe wildland fire behavior and effects, and the fire environment. For each forest type, the highest number of treatment acres (alternative 2) was used as the baseline acreage to model each alternative, in order to compare tree mortality percentages. Untreated acres in alternative 3 were assumed to have similar tree mortality rates as untreated acres in alternative 1.

Mathematical surface fire behavior and fire effects models and prediction systems are driven in part by fuelbed inputs such as load, bulk density, fuel particle size, heat content, and moisture of extinction. To facilitate use in models and systems, fuelbed inputs have been formulated into a stylized set of 40 fuel bed characteristics (Scott and Burgan 2005). The average flame length numbers are based on 90th percentile weather conditions.

FlamMap (Finney 2006) is designed to examine the spatial variability in fire behavior assuming that fuel moisture, wind speed, and wind direction are held constant in time, thereby allowing for more direct comparison of fuel treatment effects. The fuel models that were used are estimates of what the fuel loading and fire behavior are currently and what is predicted in the future allowing for vegetation regrowth.

Spatial and Temporal Context for Effects Analysis

The spatial context for the effects analysis is the geographic treatment area boundary, which includes the Ragged Ruby planning area as well as 235 acres outside of the planning area boundary. The time period for indirect and cumulative effects analysis is 30 years, regardless of the alternative. Project implementation would begin following signing the project's decision and may continue for about 20 years; however, vegetation would continue to grow and maintenance would be needed to maintain the desired condition.

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

Documented past, present, or foreseeable future activities that were considered for their cumulative effects include the County Road 18 Healthy Forest Restoration Act Project, the existing transportation system, plantation maintenance treatments, livestock grazing, and firewood cutting.

Alternative 1 – No Action

Direct and Indirect Effects

Alternative 1 would not authorize fuels reduction, leaving the planning area at risk of an uncharacteristically severe fire as surface and ladder fuels would continue to increase over time. Although competition would naturally thin the stand, shade-intolerant species would continue to grow in the understory. This would keep height-to-live crown low and crown density high. As time progresses, the conifer stands would produce heavier understories of shade-tolerant, fire-intolerant trees (fuel ladders). The large fire-resistant trees in the stand would remain as long as they compete for limited resources, but these trees would continue to be competition-stressed and at risk from insects, disease, and wildfire.

Alternative 1 would not change expected fire behavior under 90th percentile weather conditions, which are expected to result in control problems and high tree mortality. Current average flame lengths are expected to exceed 4 feet. It is expected that some fires would continue to escape initial attack under increasingly severe weather conditions over the next 20 to 30 years. With continued surface fuel accumulation, it is likely that surface fire intensity and crown fire potential would increase over the long-term, and would constitute a potential uncharacteristically severe wildfire threat, not only for the planning area, but also for adjacent lands. Fire effects under alternative 1 would result in higher stand loss than what was experienced under historical conditions (typically low intensity with less than 20 percent of the stand being killed by fire).

There would be no change to the road system under alternative 1; therefore, the use of strategic fuelbreaks along roads as ingress or egress routes during a wildfire would remain as they are currently; generally unsuitable for safe egress or as a fire suppression tool or safety area for firefighters. Custodial activities would continue, such as routine maintenance and response to emergencies, including wildfire suppression.

Cumulative Effects

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

Alternatives 2 and 3

Direct and Indirect Effects

Upland restoration and fuels treatments would have the effect of increasing the height-to-live crown and retaining the largest trees, which would reduce crown fire initiation. Crown density would also be reduced, lowering active crown fire potential. Surface fuel treatments would change the size and arrangement of available fuel and/or reduce the amount of fuel that is available to burn, reducing flame lengths, fireline intensities, and crown fire activity.

Treatments would reduce the horizontal and vertical fuel loading. Direct attack with hand tools would be sufficient to contain fires. Fire could be reintroduced into the planning area. The strategic fuelbreaks along roads would allow safe travel for the public and suppression forces should the need arise to escape from an emerging wildland fire.

Thinning trees from below would raise canopy base heights, thereby reducing crown fire initiation which would increase the likelihood that fires would stay as surface fires and not become crown fires. Surface treatments should lower fireline intensities and lower flame lengths. Suppression forces could enter these areas and take appropriate actions as needed to manage fires (Brown et al. 2003). The treatments in alternatives 2 and 3 are expected to slow horizontal and vertical fire movement in 90th percentile weather conditions.

Creating and maintaining strategic fuelbreaks to break up large expanses of continuous fuels would provide for firefighter access and safety, increase suppression opportunities, increase ingress and egress safety for communities, and provide pre-existing control points to contain fires.

Under alternatives 2 and 3, crown fire activity on average would be kept to surface fires and flame lengths would average 4 feet in height. These lower flame lengths, fireline intensities, and surface fires are a direct result of lower fuel loadings, lower canopy bulk densities, and higher canopy base heights. Fires burning in stands under 90th percentile weather conditions in alternatives 2 and 3 can generally be attacked at the head or flanks by persons using hand tools. Fire behavior and effects would be similar to historical conditions within fire regime I allowing for fire to burn naturally within the planning area. The effect on fire suppression forces would depend on the continued maintenance of the stands. Stands that are maintained and managed to achieve the desired condition would not adversely impact future suppression.

Impacts from the upland restoration actions, and watershed, fisheries, and wildlife habitat restoration treatments would be similar to those described above in terms of reducing flame lengths, fireline intensities, crown fire activity, and suppression actions. Additionally, a healthy riparian area acts as a natural fuel break to slow and help stop a wildfire. Underburning in the riparian areas would stimulate the growth of hardwoods and reduce conifer encroachment.

Planned road activities would have little effect on fire suppression efforts or fuel loading. Many of the roads in the planning area would remain open; however, some roads would be closed but available for fire suppression activities. The roads planned for decommissioning would not have a major affect for fire suppression access. Roads proposed for decommissioning were evaluated and determined to be not needed for suppression activities.

Recreation system changes would not affect fuel loading because the changes do not contribute to added fuel loadings. However, increased opportunities for recreation in the planning area may have an indirect effect as additional recreationists utilizing the area could lead to more human-caused fires.

Under wildfire conditions, wildlife connectivity corridors would burn similar to alternative 1 as fuels treatments would not occur in these corridors. Managed fires would have to be suppressed in these areas as the resource benefits could not be achieved. Prescribed fire would be hard to accomplish in these areas as the timing of the burn would be very short to achieve resource benefits.

Cumulative Effects

Treatments from this project when combined with the County Road 18 Healthy Forest Restoration Act Project, plantation maintenance, and firewood cutting activities would improve stand survivability during a wildfire event by reducing canopy bulk density, canopy base heights, and fuel loading. Treatments would complement the planning area by reducing fire behavior and fire effects, as well as creating safe travel routes along a main road within the project boundary. In the event of a wildfire, the planning area would be conducive to allow a fire to be a natural disturbance and move across the landscape as a surface fire within its historical fire regime.

Roads are commonly used as control points for containing wildfire and are often used as the fireline. Fuels treatments would provide a continual break in the fuel profiles across the planning area. This fuels treatment, when combined with existing projects, would further break up fuel continuities in the area, creating more opportunities for future suppression actions. As managers continue to move the Forest toward the desired condition, fire would be able to resume its natural role in developing and sustaining these ecosystems. Continued management practices can and will alter the effects of wildland fire (Agee and Skinner 2005).

Plantation maintenance is occurring throughout the planning area treatments include precommercial thinning and hand piling on approximately 3,640 acres. The treatments will complement the project area by reducing fire behavior and fire effects. Flame lengths are expected to be below four feet, fire activity would be a surface fire, and large tree mortality would be reduced. As there are less fuels, there would be lower emissions which would increase health and safety as well as not contribute significantly to climate change.

Grazing is occurring within approximately 37,750 acres of the project boundary. Grazing will continue to affect fine fuels. This can impact the implementation of prescribed fire and meeting objectives if it removes the fuel (grasses) to carry fire. During a wildfire event grazing reduces fire spread and flame lengths since it removes fine fuels.

Firewood cutting is occurring throughout the planning area. The removal of dead trees and dead large wood reduces fire behavior and fire effects.

Comparison of Flame Length, Crown Fire Activity, and Tree Mortality by Alternative

Alternatives 2 and 3 are similar in fuels treatments and fuels objectives. The difference is in the acres treated in each alternative. Alternative 2 would have prescribed fire on 34,000 acres while alternative 3 would implement prescribed fire on 31,500 acres. The 2,500 acres not being prescribe burned in alternative 3 would be the proposed wildlife connectivity corridor areas. There would be a sizable reduction in flame length and crown fire activity within the planning area with alternatives 2 and 3 compared to alternative 1.

Table 76. Approximate acre comparison of flame length by alternative

Flame length (feet)	Alternative 1 (acres)	Alternative 2 (acres)	Alternative 3 (acres)
0-4	18,321	34,938	30,113
4-8	16,187	3,671	2,169
8-11	4,135	930	596
11+	1,187	291	443

Table 77. Approximate acre comparison of crown fire activity by alternative

Crown fire activity	Alternative 1 (acres)	Alternative 2 (acres)	Alternative 3 (acres)
Surface fire	15,070	33,854	27,282
Passive crown fire	24,759	5,974	6,040

Table 78. Approximate acre comparison[1] by alternative of predicted large tree mortality by species and diameter at breast height in inches under 90th percentile weather conditions

Species and expected large tree mortality from wildfire	Alternative 1 (no treatment)	Alternative 2 (post-treatment)	Alternative 3 (post-treatment)
Aspen restoration acres in planning area	0	10	10
Acres of aspen ≥12 diameter at breast height mortality after wildfire	10	4	4
Percentage of aspen ≥12 diameter at breast height mortality after wildfire	99	40	40
Dry pine restoration treatment acres in planning area	0	3,980	3,570
Acres of ponderosa pine ≥21 diameter at breast height mortality after wildfire	3,184	398	685
Percentage of ponderosa pine ≥21 diameter at breast height mortality after wildfire	80	10	20
Acres of western larch ≥21 diameter at breast height mortality after wildfire	1,075	108	119
Percentage of western larch ≥21 diameter at breast height mortality after wildfire	27	10	20
Mixed conifer restoration treatment acres in planning area	0	3,780	3,080
Acres of grand fir ≥21 diameter at breast height mortality after wildfire	3,780	378	1,134
Percentage of grand fir ≥28 diameter at breast height mortality after wildfire	100	10	30
Acres of Douglas-fir ≥21 diameter at breast height mortality after wildfire	3,704	370	1,111
Percentage of Douglas-fir ≥21 diameter at breast height mortality after wildfire	98	10	30

1. Table displays actual treatment acres; however, approximate tree mortality percentages are calculated equally across each alternative using the highest number of treatment acres (from alternative 2). The untreated acres in alternative 3 were assumed to have similar tree mortality rates as untreated acres in alternative 1.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Alternative 1 is not in compliance with the Malheur Forest Plan or other regulatory framework because it would not allow fire to play a natural role in the planning area. Fire behavior would not be a low intensity surface fire over the majority of the planning area. Alternative 1 would not manage residue profiles, and fire would have the potential to be an uncharacteristically severe wildfire. Alternative 1 would not use prescribed fire to reduce encroachment of non-fire-tolerant species, stocking levels, and fuel loading; this would change the natural fuels strata in riparian, big game, and old growth areas, potentially losing key features in these areas should a wildfire occur. Alternative 1 would not use fuels treatments in developed recreation sites and visual corridors; this would potentially create safety concerns from high fuel loadings and decreased site distances. Alternative 1 would not preserve, protect, and enhance the air quality during wildfire events. Alternative 1 does not meet the Grant County Community Wildfire Protection Plan goals to reduce hazardous fuels.

Air Quality

Regulatory Framework

The framework for controlling air pollutants is mandated by the 1970 Clean Air Act, as amended, which regulates air emissions from stationary and mobile sources. This law authorizes the Environmental Protection Agency to establish national ambient air quality standards to protect public health and welfare and to regulate emissions of hazardous air pollutants. State implementation plans are developed to implement provisions of the Act, resulting in stringent requirements are established for areas designated as class 1 airsheds. The Regional Haze Rule requires States to establish goals for improving visibility in class 1 airsheds and to develop long-term strategies for reducing emissions of air pollutants that cause visibility impairment, including emissions from prescribed fire activities. Oregon Smoke Management Plan attempts to minimize any smoke that impairs visibility inside the class I areas or smoke sensitive areas, which include John Day and the Strawberry Mountain Wilderness.

Resource Indicators

Smoke emissions contribute to public health concerns and climate change. Over 90 percent of emissions from fires are small enough to enter the respiratory system. Inhaling carbon monoxide decreases the body's oxygen supply. Fine particles in the air are able to travel deep into the respiratory tract and cause shortness of breath or worsen pre-existing medical conditions such as asthma. Exposure can depress the immune system and damage the layer of cells in the lungs that protect and cleanse the airways. Smoke emissions also contain greenhouse gasses which are a contributor to climate change.

Table 79. Resource elements, indicators, and measures for assessing air quality effects

Resource element	Resource indicator	Measure	Source
Smoke emissions	Particulate matter ($PM_{2.5}$ and PM_{10}), methane (CH_4), carbon monoxide (CO), carbon dioxide (CO_2), nitrous oxide (N_2O)	Tons released	EPA (2017)

Smoke Emissions

Affected Environment

Methodology

The Clean Air Act lists 189 hazardous air pollutants to be regulated. Some components of smoke, such as polycyclic aromic hydrocarbons (PAH) are known to be carcinogenic. Probably the most carcinogenic component is benzo-a-pyrene (BaP). Other components, such as aldehydes, are acute irritants. In 1994 and 1997, 18 air toxins were assessed relative to the exposure of humans to smoke from prescribed and wildfires. Specific compounds most commonly found in smoke emissions that contribute to health concerns and climate change are particulate matter ($PM_{2.5}$ and PM_{10}), methane (CH_4), carbon dioxide (CO_2), carbon monoxide (CO), and nitrous oxide (N_2O). See Ragged Ruby Fire, Fuels, and Air Quality Report for descriptions.

Existing Condition

According to the Environmental Protection Agency Green Book updated September 30, 2017, the closest designated nonattainment area is the city of Klamath Falls, Oregon which is 223 air miles from the Ragged Ruby planning area (EPA 2017). The community of John Day is listed in the Oregon Smoke Management Plan as a smoke-sensitive receptor area, and thus protected by the highest standard in the plan. The Strawberry Mountain Wilderness is a class 1 airshed within 20 air miles of the planning area.

Air quality current conditions in surrounding sensitive areas is limited to short-term impacts resulting from wood burning, prescribed burning, and field burning. The greatest impact to the wilderness area is from field burning in the Willamette Valley and central Oregon and from summer wildfires that occur to the south and west. These sources contribute to haze and can last for several days in spring and summer.

Environmental Consequences

Methodology

Smoke emissions, including greenhouse gas emissions, were calculated for machine pile burning, jackpot burning, understory burning, and wildfires.

Emissions were calculated using the formula [Ei (tons) equals (A multiplied by FL multiplied by percent C multiplied by EFi) all divided by 2000 to convert pounds to tons]; where:

- Ei equals emissions in tons for the emission type (for example, $PM_{2.5}$, NOx, or CH_4);
- A equals area in acres;
- FL equals fuel loading in tons per acre;
- Percent C equals percent fuel consumed; and,
- EFi equals emission factor for the type (in pounds per ton of dry fuel consumed).

Additionally, it is assumed that:

- Combustion under pile burning would be 100 percent.
- Combustion under jackpot burning would be 50 percent.
- Combustion with understory burning would be 50 percent.
- Jackpot burns are similar to understory burns.

- Emission factors for pile, understory burns, and jackpot burns were derived from Hardy et al. (2001a, 2001b): PM_{10} equals (12.4, 25), $PM_{2.5}$ equals (10.8, 22), CH_4 equals (11.4, 8.2), NMHC equals (8, 6.4), CO equals (153, 178), CO_2 equals (3271, 3202), NOx equals (6, 6), and SOx equals (2.4, 2.4).
- Climate change potential factor for greenhouse gas conversion to CO_2 tons is derived from Solomon et al. (2007).
- Wildfire emissions were based on a wildfire burning under 90th percentile weather conditions at year 20 for all scenarios.

Data sources used for assessing the effects to air quality are derived from the first order fire effects monitoring program (Reinhardt et. al. 1997), EPA (2017), Solomon et al. (2007), and Springsteen et al. (2011).

Spatial and Temporal Context for Effects Analysis

This analysis considers potential impacts to communities within 20 miles of the planning area as these are the communities that would be most impacted by any activities within the alternatives. The temporal bounds are limited to the implementation phase of the project, during which proposed activities would occur.

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

Currently, several large landscape projects, and a number of smaller projects within or adjacent to the Ragged Ruby planning area may have prescribed burning as part of their proposed actions, or fuels reduction treatments (for example, thinning) that could affect the amount and duration of smoke emissions. These include the Camp Lick, Galena, Big Mosquito, Magone, Balance, Austin, County Road 18 Healthy Forest Restoration Act, and plantation maintenance projects.

Alternative 1 – No Action

Direct and Indirect Effects

Alternative 1 would have the least immediate impact on air quality, as there would be no prescribed burning or pile burning. All biomass would remain available for consumption by wildfires and would continue to accumulate, increasing the potential for large amounts of wildfire smoke during the summer months, when diurnal inversions can concentrate smoke at low elevations. Because wildfires tend to occur at the driest time of the year, fuels are more completely consumed and typically produce three to five times more emissions than early or late season prescribed fires. There is a potential during a wildfire for approximately 3.1 tons per acre of particulate matter emissions. These smoke concentrations can have high particulate levels that can cause health problems, or violate summertime class 1 air quality visibility standards for wilderness areas. The communities of Long Creek, Fox, Galena, Prairie City, Unity, and John Day would be impacted by smoke from a wildfire in this area.

Cumulative Effects

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

Alternatives 2 and 3

Direct and Indirect Effects

Prescribed burning would follow the guidance provided by the Oregon Smoke Management Plan and all other applicable federal, state, and local air quality regulations. Emissions from a wildfire are generally three to five times greater than from prescribed burning. Emissions from pile burning would be during a different time of year than the underburning. There would be short-term impacts to communities and residences downwind and in drainages adjacent to prescribed fire. There would also be short-term impacts along County Road 20. The low elevation communities of Galena, Austin, and Bates would be impacted by smoke from prescribed burning. Past experience of prescribed burning in this area has shown that diurnal winds settle smoke in low areas and valley bottoms. During the night, air follows drainages in the valley toward Galena. During the day, diurnal heating forces air up through the valley and up the slope out of the valley toward Bates and Austin.

Prescribed burning would likely impact highway visibility, and potentially impact driver safety. Signing would reduce the risk, lasting for around three to four days. If driving conditions warrant, the Oregon Department of Transportation or Grant County Road Department would be contacted to flag traffic or use pilot cars.

Emissions produced from burning under alternatives 2 and 3 would maintain air quality standards. Smoke sensitive areas including John Day (approximately 20 air miles southwest of the planning area), the La Grande Basin (approximately 45 air miles to the northeast of the planning area) and the north half of Ada County, Idaho (approximately 160 air miles southeast of the planning area) may be affected by prescribed burning because of transport winds, but it is expected to be minimal because of smoke dilution over time and space. Weather forecasts would be obtained prior to burning to ensure the Strawberry Mountain Wilderness would not be affected by prescribed burning during the visibility protection periods of July 1 to September 1.

Cumulative Effects

There is a potential for cumulative effects from prescribed burning occurring at the same time from nearby units. Total emissions produced from concurrent projects on National Forest System lands would meet air quality standards. It is likely that only a few projects, in isolated areas, would undergo burning at the same time. The dilution of smoke over time and space from concurrent burning would limit the cumulative effects. All burning would be coordinated to reduce cumulative effects and meet all applicable laws and regulations. Therefore, the cumulative effects of multiple prescribed burning projects would not cause air quality to decline outside of standards.

Comparison of Alternatives

The following tables compare greenhouse gas emissions by alternative during wildfire event (post treatment, in the case of alternatives 2 and 3), during prescribed fire, and in total.

Table 80. Approximate comparison of greenhouse gas emissions by alternative during wildfire event post treatment

Greenhouse gas emissions	Alternative 1 (tons)	Alternative 2 (tons)	Alternative 3 (tons)
CH_4 (methane)	29,529	1,496	3,789
CO_2 (carbon dioxide)	4,415,053	524,364	842,600
N_2O (nitrous oxide)	3,349	731	945
Total	4,447,931	526,592	847,334

Table 81. Approximate acre comparison of greenhouse gas emissions by alternative during prescribed fire

Greenhouse gas emissions	Alternative 1 (tons)	Alternative 2 (tons)	Alternative 3 (tons)
CH_4 (methane)	N/A	6,752	3,755
CO_2 (carbon dioxide)	N/A	1,808,001	958,615
N_2O (nitrous oxide)	N/A	3,366	1,804
Total	N/A	1,818,119	964,174

Table 82. Approximate comparison of total greenhouse gas emissions by alternative

Greenhouse gas emissions	Alternative 1 (tons)	Alternative 2 (tons)	Alternative 3 (tons)
CH_4 (methane)	29,529	8,248	7,544
CO_2 (carbon dioxide)	4,415,053	2,332,365	1,801,215
N_2O (nitrous oxide)	3,349	4,097	2,749
Total	4,447,931	2,344,710	1,811,508

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Oregon smoke management regulates the amount of smoke that can be produced daily and the direction that smoke can travel. Prescribed burning would be meeting the Clean Air Act by controlling the amount and direction of emissions. During a wildfire event the emissions would exceed regulations and potentially be in smoke sensitive areas. The difference between the action alternatives is that alternative 2 would create more emissions during prescribed fire events than alternative 3. Alternative 3 would create more emissions during a wildfire event because less emissions would have been created during prescribed burning. Alternative 3 would potentially send emissions into smoke sensitive areas at higher quantities than alternative 2.

Climate Change

This proposed action would affect approximately 34,000 acres of forest by implementing varying levels of upland restoration activities; watershed, fisheries, and wildlife restoration; and prescribed burning and unplanned ignitions, including dry pine restoration, mixed conifer restoration, dry meadow and scabland flat bunchgrass restoration, whitebark pine and western white pine restoration, and biomass removal. Thinning would reduce forest density and improve the health and vigor of remaining trees, especially during periods of summer drought. In addition, treatments specifically targeted toward riparian habitat restoration include conifer reduction in aspen stands. A forest that is better adapted to handle disturbances, such as wildfire or disease, would be more resilient in the face of potential climate change in the future.

The Ragged Ruby planning area encompasses approximately 34,000 acres, or approximately 4.8 percent of the Blue Mountain Ranger District, approximately 2.0 percent of the Malheur National Forest, and approximately 0.13 percent of all National Forest System lands in Oregon and Washington (the Pacific Northwest Region). This scope and degree of change would be minor relative to the amount of forest land in the region as a whole. Climate change is a global phenomenon because major greenhouse gasses mix well throughout the planet's lower atmosphere (IPCC 2013). Considering emissions of greenhouse gasses in 2010 was estimated at 49 ± 4.5 gigatonnes[32] globally (IPCC 2014) and 6.9 gigatonnes nationally (EPA 2015), a project

[32] A gigatonne is one billion metric tons of CO_2; equal to about 2.2 trillion pounds.

of this magnitude makes an infinitesimal contribution to overall emissions. Therefore, at the global and national scales, the action alternatives' direct and indirect contribution to greenhouse gasses and climate change would be negligible.

In addition, because the direct and indirect effects would be negligible, the action alternatives' contribution to cumulative effects on global greenhouse gasses and climate change would also be negligible.

The Intergovernmental Panel on Climate Change has summarized the contributions to climate change of global human activity sectors in its Fifth Assessment Report (IPCC 2014). In 2010, anthropogenic (human-caused) contributors to greenhouse gas emissions came from several sectors:

- Industry, transportation, and building – 41 percent
- Energy production – 35 percent
- Agriculture – 12 percent
- Forestry and other land uses – 12 percent.

There is agreement that the forestry sector contribution has declined over the last decade (IPCC 2014; Smith et al. 2014; FAOSTAT 2013). The main activity in this sector associated with greenhouse gas emissions is deforestation, which is defined as removal of all trees, most notably the conversion of forest and grassland into agricultural land or developed landscapes (IPCC 2000).

This landscape restoration project does not fall within any of these main contributors of greenhouse gas emissions. Forested land would not be converted into a developed or agricultural condition. In fact, forest stands are being retained and thinned to maintain a vigorous condition that supports trees, and sequesters carbon long-term. United States forests sequestered 757.1 megatonnes[33] of carbon dioxide after accounting for emissions from fires and soils in 2010 (EPA 2015). However, there is growing concern over the impacts of climate change on United States forests and their current status as a carbon sink. There is strong evidence of a relationship between increasing temperatures and large tree mortality events in forests of the western United States. There is widespread recognition that climate change is increasing the size and frequency of droughts, fires, and insect and disease outbreaks, which will have major effect on these forests' role in the carbon cycle (Joyce et al. 2014).

The project is in line with the suggested practice of reducing forest disturbance effects found in the National Climate Assessment for public and private forests (Joyce et al. 2014). Here specifically, the project proposes to maintain and improve landscape resiliency and resistance to disturbances such as wildfire, drought, insects, and diseases by managing for desirable forest composition, stocking levels, and patterns through restoration thinning and underburning activities. Treatments are also aimed at promoting western white pine, ponderosa pine, western larch, and aspen in their appropriate habitat locations.

The release of carbon associated with this project is justified given that the overall change in condition increases forest resistance to release of much greater quantities of carbon from wildfire, drought, insects and diseases, or a combination of these disturbance types (Millar et al. 2007). This project falls within the types of options presented by the Intergovernmental Panel on Climate Change for minimizing the impacts of climate change on forest carbon, and represents a potential synergy between adaptation measures and mitigation. Actions aimed at enhancing forest resilience to climate change by reducing the potential for large-scale, catastrophic

[33] A megatonne is one million metric tons of carbon dioxide (CO_2); equal to about 2.2 billion pounds.

disturbances such as wildfire also prevents release of greenhouse gasses and enhances carbon stocks (Smith et al. 2014). The action alternatives reflect the rationale behind these recommendations because they would trend the landscape pattern of stand structures toward those which fall within the historical range of variability, and promote stand vigor by managing stand density, resulting in improved forest vigor and increased resistance to insect attack and uncharacteristic wildfire (see Forest Vegetation, Fire and Fuels, and Air Quality sections for more detailed analysis).

Timber management projects can influence carbon dioxide sequestration in four main ways: (1) by increasing new forests (afforestation), (2) by avoiding their damage or destruction (avoided deforestation), (3) by manipulating existing forest cover (managed forests), and (4) through transferring carbon from the live biomass to the harvested wood product carbon pool. Land-use changes, specifically deforestation and regrowth, are by far the biggest factors on a global scale in forests' role as sources or sinks of carbon dioxide, respectively (IPCC 2000). Projects like Ragged Ruby that improve forest conditions and capacity to grow trees are positive factors in carbon sequestration.

Transportation System

Regulatory Framework

Project-level roads analysis strives to meet long range road density goals established in the Malheur Forest Plan by identifying opportunities to reduce both open road densities and total road densities, while balancing needs for public and administrative access. Efforts focus on reducing the amount of funding needed for road maintenance, reducing road related impacts to fish and wildlife, and reducing the spread of non-native invasive plants. The documents used in making the determination were based on the guidelines included in the 2005 Forest Level Roads Analysis and in the 2015 Malheur National Forest-wide Travel Analysis as part of the minimum road system. Other relevant law, regulation, and policy is described in greater detail in the Ragged Ruby Roads Report.

Resource Indicators

The resource indicator in Table 83 is used for assessing the effects to the transportation system.

Table 83. Resource element, indicator, and measures for assessing effects to the transportation system

Resource element	Resource indicator	Measure	Source
Access and travel management	Roads open for public access	Miles of open and closed road	Malheur National Forest Roads Analysis (USDA Forest Service 2004); Malheur National Forest, Forest-wide Travel Analysis (USDA Forest Service 2015c)

Motorized Access

Affected Environment

Methodology

Each road in the planning area was field checked and the road condition was recorded to reflect existing conditions. Information sources for transportation analysis include the transportation geographic information system records which house the spatial data for road locations. An inventory of road attributes for National Forest System roads is maintained on the National Forest through the infrastructure application database. A complete list of road attributes and definitions of these attributes is located in the project record.

The Ragged Ruby interdisciplinary team reviewed each road in the planning area to provide recommendations on whether to open, close, or decommission that road based on the road's condition, the access it provides, and how the road is impacting forest resources. This determination was based on the guidelines included in Forest Level Roads Analysis (USDA Forest Service 2004), the Forest-wide Travel Analysis (USDA Forest Service 2015c), Forest Service Handbook 7709.55 Transportation System, and Forest Service Manual 7700. These analyses were designed to provide the decision-maker with the information needed to develop road systems that are safe and responsive to public needs and desires, are affordable and efficiently managed, have minimal adverse ecological effects on the land, and are more in balance with available funding for needed management actions.

Existing Condition

The transportation system within the Ragged Ruby planning area consists of 342 roads totaling 216.5 miles, under Forest Service jurisdiction. The Ragged Ruby planning area encompasses approximately 34,000 acres or approximately 53.1 square miles. The existing total road density is 4.1 miles per square mile for maintenance level 1, 2, and 3 roads. Table 84 lists the current number and total mileage of roads, by maintenance level, in the planning area.

Maintenance level 3 roads are open and maintained for travel by a prudent driver in a standard passenger car. Roads in this maintenance level are typically low speed with single lanes and turnouts. There are 2 roads totaling 0.3 miles that are maintenance level 3 roads.

Maintenance level 2 roads are open for high clearance vehicles. Traffic is normally minor, usually consisting of one or a combination of administrative uses, permitted, dispersed recreation, or other specialized uses. Most of the roads in the Ragged Ruby planning area would need to receive maintenance to meet current road maintenance objectives and classification standards. Approximately 6 percent of open roads are physically closed on the ground by natural vegetation overgrowth or no sign of design roadway. Approximately 151 roads totaling 115.5 miles are maintenance level 2 roads.

Maintenance level 1 roads are roads that have been placed in storage between intermittent uses. Basic custodial maintenance is performed to prevent damage to adjacent resources and to perpetuate the road for future resource management needs. These roads are not open to traffic. In the planning area an estimated 11.6 percent of maintenance level 1 roads are considered not effective closures and are being used. When road closure efforts are not effective at eliminating motorized use, it results in detrimental resource impacts to wildlife habitat and security, soil, timber productivity, and water quality, and increases the need for maintenance and associated funding. These roads would be closed as specified in the past National Environmental Policy Act decisions, and closure could be implemented during this project or in the future depending on funding availability. There are 38 road segments totaling 25.3 miles that are shown as maintenance level 1 in the road system infrastructure application database; they were closed with previous administrative decisions and a signed decision National Environmental Policy Act document was not found in project-level research. These roads were discussed by the interdisciplinary team and are proposed to remain closed, with the exception of one road which would be re-opened. Approximately 189 roads totaling 100.8 miles are maintenance level 1 roads.

Table 84. Existing transportation system in the Ragged Ruby planning area

Maintenance level	Number of road segments	Miles of road
Maintenance level 1 – closed road	189	100.8
Maintenance level 2 – open road	151	115.5
Maintenance level 3 – open road	2	0.2
Total	342	216.5

Environmental Consequences

Methodology

Effects to the transportation system are determined by the existing conditions of similar roads and the occurrence of past maintenance and management activities similar to those proposed for the project. Effects to individual roadways can vary depending on the maintenance level, site conditions, traffic volumes, and extraordinary events. The only activities expected to have an effect on the roads are the road maintenance activities and road proposed actions. Therefore, no other activities will be discussed in this analysis.

Spatial and Temporal Context for Effects Analysis

Spatial Boundary

The analysis area for considering the cumulative effects on the transportation system is defined by the planning area boundary. In addition, there would be a small portion of the existing road system used for log haul that is outside the planning area boundary.

Temporal Boundary

The time period for measuring cumulative effects is 20 years forward to encompass the time needed to implement and realize the effects of the road actions completed for the project. The time period for measuring cumulative effects includes considerations for the restoration and vegetation of temporary roads and landings. Current environmental conditions reflect the aggregate impact of prior human actions and natural events that have affected the environment and might contribute to cumulative effects, and are a proxy for the impacts of past actions.

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

Past, present, and foreseeable activities relevant to the cumulative effects analysis for the transportation system include use and maintenance of National Forest System roads, which includes road blading, brushing, cleaning ditches and culverts, and aquatic restoration work.

Alternative 1 – No Action

Direct and Indirect Effects

Open Roads – Maintenance Levels 2 and 3
All existing open roads (maintenance level 2 and 3) would remain open in their current condition. Access would be provided at existing levels; however, there would be no opportunity to open, close, and decommission roads. Road maintenance and motorized access would continue at current levels. Maintenance would not get done, there would be increased deferred maintenance and risk of road failure. This alternative has the least impact on current access, but in the future, access would be reduced due to funding for road maintenance being spread thin across a large road system. Alternative 1 would not bring this area closer to meeting Malheur Forest Plan standards and guidelines for road densities.

Closed Roads – Maintenance Level 1
There would be no direct or indirect effects on closed roads, and all existing closed roads would remain closed in their current condition. Miles of closed road would remain unchanged. The outcome of alternative 1 would be continued sediment delivery into streams at the current level or higher, and continued maintenance costs to the federal government to meet road maintenance standards. Alternative 1 would not provide opportunities to fund road maintenance, and miles of deferred maintenance on the Forest would continue to grow in magnitude.

Cumulative Effects
Alternative 1 would have no direct or indirect effects on the total miles of road within the Ragged Ruby planning area; therefore, there would be no cumulative effects. There are currently approximately 216.5 total miles of road in the Ragged Ruby planning area. The total miles of road after-effects from past, present, and foreseeable projects would be approximately 213.6 miles inside the planning area. Effects from future actions would be short-term where re-contouring, water barring, and culvert removal would occur. Outcomes related to road maintenance costs for the entire road system would remain the same.

Alternatives 2 and 3

Direct and Indirect Effects

Open Roads – Maintenance Levels 2 and 3
Implementation of alternatives 2 and 3 would result in a temporary increase in miles of open road in and adjacent to the planning area during timber haul and other project activities. The condition of haul routes would be improved by maintenance activities associated with timber harvest. Direct beneficial effects from alternatives 2 and 3 would include improved road drainage and surface conditions. Maintenance activities would have limited adverse effects on the use of roads, as roads would remain open during project activities. To bring the roads up to a standard needed for commercial haul, road maintenance activities are proposed on approximately 93.4 miles (alternative 2) or 89.1 miles (alternative 3) of road. There are approximately 11.5 miles (alternative 2) or 12.5 (alternative 3) of alternate haul routes that may also receive road maintenance.

Approximately 12.4 miles (alternative 2) or 11.7 miles (alternative 3) of temporary roads would be constructed. Temporary roads would be restored to ensure soil productivity is reestablished, the road has adequate drainage and ground cover to prevent erosion, the road is no longer drivable, and the road is not highly visible after approximately 5 years following completion of project activities.

There are approximately 2.9 miles of road proposed to be opened, 7.3 miles of road proposed to be closed, and 0.3 miles of road proposed to be decommissioned under both alternatives 2 and 3. There would be approximately 111.0 miles of maintenance level 2 and 3 roads in the planning area following implementation of alternatives 2 or 3.

Closed Roads – Maintenance Level 1

Approximately 57.7 miles (alternative 2) or 54.1 (alternative 3) of closed roads would be utilized for project activities, including log haul. There are approximately 0.2 miles of alternate haul routes that may also receive road maintenance under both alternatives 2 and 3. Closed roads opened for project activities would be re-closed long-term with the same type of closure devices that were present before, using earthen berms or gates and roadway slash. Closed roads that were never effectively closed prior to implementation would be effectively closed post log haul, utilizing the same closure methods described above.

Upland restoration activities; watershed, fisheries, and wildlife habitat restoration; prescribed burning and unplanned ignitions; and recreation system changes would not directly affect the road system. However, these activities could indirectly affect road condition through use of the roads during implementation of the project activities.

There are approximately 7.5 miles of existing road reconstruction, 1.4 miles of road proposed to be decommissioned, and approximately 1.0 mile of road conversion to trail under this alternative. In order to provide recreation and public access, approximately 2.9 miles of road is proposed to be re-opened permanently in both alternatives 2 and 3. There would be approximately 103.0 miles of maintenance level 1 roads in the planning area following implementation of alternatives 2 or 3.

Cumulative Effects

The direct and indirect effects of alternatives 2 and 3 when combined with past, present, and reasonably foreseeable activities would result in a more effective and better-maintained transportation system throughout the entire planning area.

The cumulative effects of the proposed road maintenance, closures, opening, and decommissioning combined with foreseeable annual road maintenance activities and closures, would be fewer roads to maintain, less money needed for maintenance, and improved road conditions on open roads for all forest users. Three road segments (totaling approximately 0.5 miles) would be relocated under an Aquatic Restoration Decision checklist, and would total approximately 0.4 miles following relocation. In addition, approximately 1.1 miles of maintenance level 1 road would be decommissioned under an Aquatic Restoration Decision checklist. The total miles after effects from alternatives 2 or 3 and from past, present, and foreseeable projects would be approximately 212.7 miles (111.0 miles of maintenance level 2 and 3 roads and 101.8 miles of maintenance level 1 roads) inside the planning area.

Comparison of Road Activities by Alternative

Several road-related activities are proposed in the planning area, including road maintenance, construction of temporary roads, road decommissioning, road closure, and roads opening (Table 85). The difference between the alternatives is that approximately 6.9 more miles of road would receive road maintenance and 1.0 more miles of temporary road would be used under alternative 2, as compared to alternative 3.

Table 85. Summary of proposed road activities and road system changes

Activities	Alternative 1 (no action)	Alternative 2	Alternative 3
Road maintenance for haul inside and outside the planning area	0 miles	151.1 miles	143.2 miles
Alternate haul routes, road maintenance for haul inside and outside the planning area	0 miles	11.5 miles	12.5 miles
Temporary roads	0 miles	12.4 miles	11.7 miles
Closed roads to be temporarily used for haul	0 miles	57.7 miles[1]	54.1 miles[1]
Road decommissioning	0 miles	1.5 miles	1.5 miles
Road conversion to trail	0 miles	1.0 mile	1.0 mile
Road closures	0 miles	7.3 miles	7.3 miles
Road closures no National Environmental Policy Act decision	0 miles	25.3 miles	25.3 miles
Closed roads to be opened	0 miles	2.9 miles	2.9 miles
Miles of open (maintenance level 2 and 3) roads	115.7 miles	111.0 miles	111.0 miles
Miles of closed (maintenance level 1 roads)	100.8 miles	103.0 miles	103.0 miles

[1] Miles of closed roads to be temporarily used for haul are included in the miles of road maintenance for haul.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

The specific Malheur Forest Plan standard that would be met is:

- Forest-wide standard 157 – To maintain roads and trails to the minimum level required to meet integrated land management objectives; and minimize tie-through roads (USDA Forest Service 1990a, page IV–42).
    - Alternatives 2 and 3 would maintain roads to the minimum level required to meet objectives.

Heritage Resources

Regulatory Framework

Section 106 of the National Historic Preservation Act of 1966, as amended, is the foremost legislation that governs the treatment of cultural resources during project planning and implementation. Implementing regulations that clarify and expand upon the National Historic Preservation Act include 36 Code of Federal Regulations 800 (Protection of Historic Properties), 36 Code of Federal Regulations 63 (Determination of Eligibility to the National Register of Historic Places), and 36 Code of Federal Regulations 296 (Protection of Archaeological Resources).

The Pacific Northwest Region of the Forest Service, the Advisory Council on Historic Preservation, and the Oregon State Historic Preservation Office, signed a programmatic agreement regarding the management of cultural resources on National Forest System lands (USDA Forest Service 2004). The agreement outlines specific procedures for the identification, evaluation, and protection of cultural resources during proposed activities. Other relevant law, regulation, and policy is described in greater detail in the Ragged Ruby Heritage Report.

Resource Indicators

Cultural resources are prehistoric, historic, archaeological, or architectural sites, structures, places, objects, and traditional cultural properties. The spectrum of cultural resources also includes historic properties, which are cultural resources considered eligible or potentially eligible for listing on the National Register of Historic Places.

The resource element used in analyzing the effects of the proposed alternatives on historic properties is the assessment of natural and cultural impacts to those qualities of historic properties that contribute to eligibility for listing on the National Register of Historic Places. Analysis methods are directed by Section 106 of the National Historic Places Act and its implementing regulation 36 Code of Federal Regulations 800. Section 106 directs all agencies to take into account the effects of their undertakings (actions) on properties included on, eligible, or potentially eligible for listing on the National Register of Historic Places.

Table 86. Resource element, indicator, and measure for assessing effects to heritage resources

Resource element	Resource indicator	Measure	Source
Historic property condition	Extent of observable impacts	Is the impact to an eligible or potentially eligible site affecting qualities that contribute to eligibility for listing on National Register of Historic Places?	National Historic Places Act, 36 Code of Federal Regulations 800, USDA Forest Service 2004, Stipulation V. A & B

Historic Property Condition

Affected Environment

Methodology

Information for analysis is drawn from existing cultural resource site records and inventory reports from previous inventories in the planning area. Cultural resource identification efforts in the vicinity of the planning area have focused on two primary types of resources: pre-contact archaeological and historic period archaeological sites. Places that may support resources of contemporary tribal interest (such as culturally significant plant locations) were also considered.

A pre-field investigation and subsequent archaeological survey was performed for the Ragged Ruby Project in an attempt to locate all visible cultural resources that may be eligible for nomination to the National Register of Historic Places and could potentially be impacted by the undertaking. The Forest uses a geographic information system-based probability model based on the criteria provided in the inventory plan.

Existing Condition

A total number of 72 sites have been previously identified during the 25 previous inventories (surveys) that have been completed in the planning area. Of the 72 total sites, 23 are prehistoric, 45 are historic, and 4 are multi-component. See Ragged Ruby Heritage Report for a full description.

There is very little published data concerning the archaeology of the Central Blue Mountains area. The two cultural history chronologies often cited are the Northern Great Basin and Southern Columbia Plateau. Archaeological evidence from the Northern Great Basin indicates people have lived in this area for over 13,000 years. Generally, material culture suggests hunting-gathering and seasonal migrations were common practices. Migrations were based on seasonally available food sources, often plant materials, fish, and game (Aikens 1993). The tool types found in conjunction with their surrounding environments suggest that hunter-gatherer activities in the analysis area were focused on the extraction of food and industrial resources such as big game species, fish, and root crops.

The known historic sites within the planning area demonstrate the use of the planning area for mining, ranching, Forest Service administration, transportation, timber harvest, and recreational opportunities. Also located within the planning area are sites that include potential evidence of immigrant Chinese communities.

Environmental Consequences

Methodology

This section of the report consists of a non-quantitative analysis of the direct, indirect, and cumulative effects of the proposed project activities on cultural resources in the planning area.

Incomplete and Unavailable Information

Cultural resource surveys are designed to evaluate areas most likely to contain historic properties. Those areas are identified through predictive modeling (Thomas 1991). The ability to identify cultural resources can be limited by environmental factors and ground visibility. In addition, the model cannot account for all past human behavior, and cultural resources are occasionally found in low probability areas. There likely are cultural resources within the planning area that have not been identified. If these cultural resources are identified during project implementation they would be documented, evaluated, and protected.

Spatial and Temporal Context for Effects Analysis

Under the National Historic Preservation Act, the area of potential effect for this undertaking includes the entire planning area. The area of potential effect will be used as the boundary for analysis of direct, indirect, and cumulative effects. Cultural resources are localities within the Forest utilized by people in the past, present, and future. Due to the nature of cultural resources, the temporal context for direct, indirect, and cumulative effects analysis is long-term. Cultural resources are nonrenewable and effects to these resources are permanent in nature.

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

All of the past, present, and reasonably foreseeable activities disclosed have or had the potential to affect cultural resources in the planning area. The most significant past activities affecting cultural resources include grazing, logging, mining, and fire suppression, which occurred before implementation of the National Historic Preservation Act and National Environmental Policy Act in the mid-1970s. Current activities affecting cultural resources include grazing, logging, fire suppression, and aquatic restoration activities. Current actions and reasonably foreseeable future actions would be mitigated by utilizing project design criteria to avoid adverse effects. Additionally, potential mitigation alternatives would be developed in coordination with the affected resource specialist, District heritage staff, and the Oregon State Historic Preservation Office.

Alternative 1 – No Action

Direct and Indirect Effects

By definition, direct and indirect effects (40 Code of Federal Regulations 1508.8), and cumulative effects (40 Code of Federal Regulations 1508.7) result from the action alternatives, and thus are not germane to the no action alternative.

Alternative 1 would not reduce fuel loads across the planning area. This would result in the continued threat of an uncharacteristically severe or moderately severe wildfire, which would not contribute to the long-term stability of cultural resources. Severe wildfire would likely have negative consequences to cultural resources, including contact with flames, severe heat, smoke, or suppression activities (Gassaway 2011). This would potentially alter, destroy, and otherwise negatively affect cultural resources. Additional consequences might include erosion, unstable watersheds, increased tree mortality, increased burrowing rodent and insect populations, and increased possibilities for looting, which would potentially alter, destroy, relocate, remove, and otherwise negatively affect cultural resources.

Cumulative Effects

Because there would be no direct or indirect effects, no cumulative effects would occur.

Alternatives 2 and 3

Direct and Indirect Effects

The majority of the proposed activities, including upland restoration activities; watershed, fisheries, and wildlife habitat restoration; prescribed burning and unplanned ignitions; road activities; and recreation system changes are expected to have no or minimal direct effects on all known cultural resources within the planning area as long as the project design criteria are followed. In most cases, eligible or potentially eligible (unevaluated) historic properties would be avoided or properly mitigated throughout the lifetime of any of the proposed activities.

Under alternatives 2 and 3, there is potential to cause minor effects to documented prehistoric sites that are subjected to low-intensity heat during implementation of prescribed burning activities (Keyser 1988). Proposed activities (exposure to low and high intensity heat) may also have the potential to cause minor and major effects to previously undocumented cultural resources. If during project activities cultural material is encountered, all activities would cease immediately and a Forest Service heritage specialist would be contacted to evaluate the discovery.

Unanticipated discoveries or known cultural resources may be protected before implementation occurs by rerouting if it is determined there is potential to adversely affect the historic property. Consultation with the State Historic Preservation Office, Indian tribes, and other interested parties is required to determine measures to avoid, minimize, or mitigate the adverse effect according to the 2004 Programmatic Agreement or 36 Code of Federal Regulations 800 regulations.

Potential habitat for plants of historic importance to regional groups of American Indians (such as huckleberry) would likely be enhanced by treatments as the fuel load is reduced via specific silviculture and fuels treatments.

An additional indirect effect may result by reducing accumulations of fuels through commercial harvest and other proposed fuel reduction activities associated with this project. This would reduce the severity of potential wildfires and would enhance the long-term stability of cultural resources within areas in and adjacent to the Ragged Ruby Project.

Cumulative Effects

With the implementation of project design criteria there is minimal risk of additional effects to cultural resources associated with alternatives 2 and 3, or these effects would be mitigated. Potential impacts might occur from ongoing and foreseeable future actions, such as prescribed burning, thinning, livestock grazing, and wildfire suppression and rehabilitation activities.

Effects to areas important to regional groups of American Indians may be cumulative with past and future management of vegetation for the same reason discussed in alternatives 2 and 3 direct and indirect effects. Future actions designed to improve huckleberry habitat would have a positive effect on areas and traditional foods important to regional groups of American Indians.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Alternative 1 would continue to guide management of cultural resources in the planning area. Under alternative 1, effects to cultural resources would be considered but it is likely that no actions to improve the stability and resilience of cultural resources to uncontrolled wildfire would occur. Fuel accumulation would continue to occur and cultural resources would be susceptible to adverse effects due to uncontrolled wildfires.

Alternatives 2 and 3 would improve the stability and resilience of cultural resources in the planning area by addressing and treating the accumulation of fuels. Alternative 2 would include more treated acres than alternative 3. The effects analysis process also provides an opportunity to inventory and evaluate cultural resources and potential historic properties eligible for listing on the National Register of Historic Places, consider the effects of proposed actions on historic properties, and consult on potential effects with the State Historic Preservation Office.

Other Relevant Mandatory Disclosures

Many of the previously described laws, regulations, and directives instruct the Forest Service to consult with American Indian tribes, the State, and other interested parties on cultural resource management issues. This consultation is ongoing through the National Environmental Policy Act process and under the terms of existing agreements with American Indian tribes. To date, there have been no concerns raised during scoping regarding the effects of proposed activities on historic properties.

Rangeland Resources

Regulatory Framework

The authority to protect, manage, and administer National Forest System lands and other lands under Forest Service administration for range management purposes is found in the following two acts:

- Multiple Use Sustained Yield Act of 1960 established the policy and purpose of national forests to provide for multiple uses and sustained yield of products and services.

- Forest and Range Renewable Resources Planning Act of 1974 established public land policy and guidelines for management, protection, development, and enhancement of public lands.

The Malheur Forest Plan, as amended, provides general direction, objectives, goals, and standards for the management of forest resources related to rangeland management (USDA Forest Service 1990a, page IV–2).

Resource Indicators

The resource indicators detailed in Table 87, and described in the existing condition, are used for assessing the effects to rangeland resources in the Ragged Ruby planning area.

Table 87. Resource indicators and measures for assessing effects to range resources

Indicator	Resource Indicator	Measure	Justification
Riparian and upland conditions	Changes to riparian and upland conditions	Livestock use in riparian areas and vegetative community condition	USDA Forest Service 1990a
Range improvements	Changes to upland water developments and fences	Upland water development and fence presence, location, and condition	USDA Forest Service 1990a
Forage production	Changes to forage production	Available forage	USDA Forest Service 1990a
Range permittee operations	Changes to annual operations	Timing, duration, and number of livestock grazed.	USDA Forest Service 1990a

Riparian and Upland Conditions

Affected Environment

Methodology

Within the Ragged Ruby planning area, the Forest Service interdisciplinary team annually collects riparian monitoring data on the amount of utilization by permitted livestock. At regular intervals, the PACFISH/INFISH Biological Opinion Effectiveness Monitoring Program (Archer 2009) collects stream condition data relating to livestock use levels.

Existing Condition

Riparian Conditions within the Planning Area

Annual riparian monitoring has been conducted at the current PACFISH/INFISH Biological Opinion site on Sunshine Creek for the past 6 years. Standards have been met during each of the previous six times this site has been monitored. Monitoring on the PACFISH/INFISH Biological Opinion site on Wray Creek has not been completed by Blue Mountain Ranger District Staff.

Upland Conditions within the Planning Area

Throughout the planning area, upland utilization monitoring is collected annually using the landscape appearance method. Data for one plot is collected in each pasture of each allotment. Upland standards for these allotments are set at 45 percent utilization using the landscape appearance method. For the past 6 years, standards have been met in every pasture within the planning area except the Butte Pasture, which in 2014 exceeded by 2 percent.

Prior to European-American settlement of the area, fire played a dominant role in shaping the landscape. Forest Service fire suppression policies have altered the ecosystem. Many historically open ponderosa pine stands have been encroached upon by other species and provide less in the way of forage for grazing animals. Conifers have encroached upon areas that were once open meadows and dry rangeland. Densely-populated stands are reduced in vigor because of overcrowding, or have already succumbed to insects and diseases. In areas with high tree mortality, fallen trees restrict movement of wild ungulates and livestock, further limiting the amount of forage available.

Native grass and forb species are still predominant in many areas of the dry forest type; however, in some areas, non-native species were introduced to stabilize soils along roads, skid trails, and landing sites (intermediate wheatgrass, orchard grass, Timothy grass, yellow sweet clover, black medic, bird's foot trefoil, and Kentucky bluegrass). Some of these same disturbed locations now host populations of non-native invasive plant species.

Environmental Consequences

Methodology

Annual range vegetation monitoring has been conducted on the grazing allotments located within the planning area using the landscape appearance method. Range administration is conducted yearly by both the Forest Service range program and the permittees to meet terms and conditions of the grazing permit.

Other sources of information include:

- Grazing permits
- Malheur National Forest geographic information system database
- Malheur Forest Plan
- On-the-ground knowledge of the planning area
- Conversations and field visits with permittees

Spatial and Temporal Context for Effect Analysis

The spatial context for this analysis is the Ragged Ruby planning area, which lies within and across the boundaries of four grazing allotments within the Blue Mountain Ranger District of the Malheur National Forest. Spatially, per allotment, the effects of the proposed action would exist at a scale of the landscape that is 25 percent of the North Middle Fork allotment, 50 percent of the South Middle Fork allotment, 13 percent of the Camp Creek allotment, and 73 percent of the Balance allotment. The allotments within the planning area are spatially static and the effects from the proposed actions are expected to occur solely within the allotment boundaries.

The temporal context used for this analysis spans from immediately following the action, to 2 years following implementation (short-term effects), and from 2 to 10 years after the project is implemented (long-term effects). Project disturbance is expected to span 2 years, while the effects from the project would be analyzed from 2 to 10 years. It is expected that the effects of the project would be greatest during implementation. During the period following project implementation, it is expected that the adverse effects would diminish and the beneficial effects from the project would increase over time in comparison to the areas not proposed for treatment. These effects would be long term and generally from the indirect effects, such as changes in sunlight, hydrologic regimes, and changes in animal grazing patterns.

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

Past actions in or near the planning area include, but are not limited to: vegetation management, mining, wildland fuels management, fire suppression, grazing, recreation, firewood cutting, road and facilities construction and maintenance, aquatic restoration, fencing, development of upland water sources, and improving elk and mule deer habitat and forage.

Alternative 1 – No Action

Direct and Indirect Effects

With alternative 1, current grazing practices would continue on all allotments within the planning area.

Cumulative Effects

Because there would be no direct or indirect effects, there would be no cumulative effects.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Alternative 1 would have no overall direct or indirect impacts to riparian and upland conditions.

Alternatives 2 and 3

Direct and Indirect Effects

Upland Restoration Activities

Upland restoration activities would beneficially affect range conditions by reducing conifer density in stands, reducing fuel loads on the ground that restrict livestock movement, and decreasing overstory cover.

Watershed, Fisheries, and Wildlife Habitat Restoration

The amount of aspen enclosures and the area which would be excluded from livestock use is not expected to have a measurable effect on utilization rates throughout the rest of the planning area.

Bat gate installation would have no direct or indirect effects to riparian and upland conditions because these areas are not utilized by livestock.

Prescribed Burning and Unplanned Ignitions

Prescribed burning impacts on plant species in this planning area would vary in response to a variety of conditions such as weather, season of burning, plant morphology, current plant condition and vigor, accumulated litter, soil moisture, and fire intensity.

Low-intensity burning is expected where fuel loads are mostly herbaceous, and where there is little woody material (less than 1 ton per acre), such as in open grassland with only light shrub cover. When prescriptions call for broadcast burning of scattered fuels, the burning impacts would be widespread over the unit, with severe burning intensity creating cover voids, but with surviving plants interspersed throughout the unit. Bunched slash and piles burned at landings often kill understory species in the immediate vicinity and reseeding could be necessary.

Long-term impacts of prescribed burning are anticipated to be beneficial in terms of moving treatment units towards historical conditions and improving watershed conditions. Recovery of herbaceous species vigor and production is quickest for pine grass and elk sedge. For low-intensity fires, dry site bluebunch wheatgrass and Idaho fescue would be stimulated by the removal of decadent plant material and the flush of nutrients from burning. However, long-term maintenance of historical conditions may require follow-up treatments to ensure shrub cover does not reach pre-treatment levels or dominate the understory in the future. Historically, these sites did not have a heavy shrub component, since fire-return intervals thinned the shrub cover intermittently.

Road Activities

During project implementation, the increase in road use associated with implementation of project activities may detrimentally affect cattle distribution. The extent of this effect is unpredictable and is based on several fluctuating factors, such as the timing of the road activities in correlation with livestock management practices. Effects include, but are not limited to, potential fence damage or removal during implementation, potential gates left open, and increased traffic hindering the cattle from traveling back and forth across roads. Detrimental impacts are expected to last only until the project is complete.

Recreation System Changes

Increased recreational use due to recreation improvements may have adverse effects on range management. Recreational use increases the chance of cattle being harassed and moved to areas where resources are more limited; areas were resources are being managed under stricter guidelines due to threatened species habitat; or areas that are being rested, have already been grazed, or can be damaged by grazing (too sensitive to be grazed by livestock). Typically this occurs by gates being left open to access recreational sites. Additionally, it is anticipated that as trails are improved, more types of transportation would use the trails, further increasing the likelihood of harassment of livestock away from upland areas, or for riparian exclosure fences being cut for access.

Cumulative Effects

Potential upland water developments implemented under the Aquatic Restoration Decision would increase the total number of upland water sources, which would beneficially affect cattle distribution and decrease the concentration of livestock in the riparian areas. Approximately 21 new water developments throughout the planning area may be developed.

Alternatives 2 and 3 would move the planning area towards a healthier, resilient, diverse, and sustainable ecosystem. The action alternatives would increase the amount of available forage for livestock, as well as increase the amount of open area accessible by livestock. This increase in forage and space, along with an increase in functioning upland water developments as discussed above, would lead to an overall increase in the distribution of livestock and decrease the concentrations of use by livestock and wildlife. After implementation is completed it is likely that an increased abundance of forage in the planning area may increase options for Forest land management to continue toward increased multiple use, as described in the Forest Service's mission.

However, the increased opportunity for recreation in the area may also increase the use of the area by hunters. The placement of salt licks and other supplements by hunters near surface water has been increasing in recent years. Permittees are instructed to place salt licks in the uplands at a minimum of one-quarter mile from surface water. When hunters place them at or near water sources, livestock and wild ungulates tend to congregate at an increased level at these water sources. Due to the increased pressure, increased impacts occur to the water source as well as the surrounding area. The integrity of this site becomes compromised, decreasing the viability of native plant populations and increasing the chances for invasive plants to become established.

There would be expected beneficial effect from watershed and fisheries restoration activities accomplished under the Aquatic Restoration Decision in the Ragged Ruby planning area, including riparian vegetation and large wood treatments, by decreasing livestock access to stream channels and increasing the amount of time livestock could potentially stay in a pasture without adversely impacting riparian systems. Although the potential for isolated impacts would increase, riparian restoration actions would likely be beneficial overall to the riparian system, as well as the rangeland.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Alternatives 2 and 3 are consistent with the following Malheur Forest Plan goal and standard:

- Forest goal 21: Manage rangelands to meet the needs of other resources and uses at a level that is responsive to site-specific objectives (USDA Forest Service 1990a, page IV-2).

  Managing rangeland resources to meet the needs of the other resources creates long-term benefits. If other resources are not infringed on by rangeland impacts, each resource improves and creates a mutualistic benefit for the ecosystem.

- Forest-wide standard 88: Design and implement structural and nonstructural range improvements to maintain productivity and range condition in addition to benefiting both wildlife and livestock. Locate range structural and nonstructural improvements to encourage livestock movement away from riparian areas (USDA Forest Service 1990a, page IV-35).

  Alternatives 2 and 3 would increase the productivity and benefit of the structural improvements for both livestock and wildlife through increased water availability. The actions in alternatives 2 and 3 would also increase forage production and availability. Through improved forage production and availability, cattle would more evenly distribute throughout the allotment, which would increase the vigor and integrity of native plant communities by decreasing the intensity of grazing on specific communities.

Range Improvements

Affected Environment

Methodology

Existing range improvements were identified using the Malheur National Forest geographic information system database and on-the-ground validation by a range technician.

Existing Condition

Throughout each allotment, a number of structural improvements are maintained by the range permittees on a regular basis. These improvements include allotment boundary and pasture fences, small enclosure fences, watering troughs, and ponds. Fences on the allotments are maintained annually and troughs and ponds are maintained on an as-needed basis, typically once every 5 years.

There are currently 19 upland water developments within the planning area with varying levels of functional life remaining, including 12 ponds and 7 water troughs. The distribution of the current water developments are generally located throughout the planning area. Developing additional waters where distance between developments is more than one-half of a mile would benefit distribution and utilization throughout the planning area.

There are approximately 53.5 miles of range fence in the planning area, which is generally in fair condition.

Environmental Consequences

Methodology

The methodology; spatial and temporal context for effect analysis; and past, present, and foreseeable future activities are the same as described for the Riparian and Upland Conditions section.

Alternative 1 – No Action

Direct and Indirect Effects

Alternative 1 would have no direct or indirect effects, because no management activities associated with the Ragged Ruby Project would take place. One environmental consequence of taking no action is that the existing upland water developments and fence lines would require slightly more maintenance. Fence maintenance costs would increase as snags increase and fall into the fence right-of-way, requiring removal. Increased tree density would decrease access to upland water developments by the permittee in order to keep them in proper functioning condition.

Permittees within the planning area use the road systems daily throughout the grazing season to assist with management of their grazing allotments. As conifer encroachment continues, traversing the landscape on horseback would become more difficult and dangerous.

Cumulative Effects

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

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Alternative 1 would have no overall direct or indirect impacts to rangeland resources.

Alternatives 2 and 3

Direct and Indirect Effects

Upland Restoration Activities

Upland restoration activities would beneficially affect range conditions by reducing conifer density in stands, reducing ground fuel loads that restrict livestock movement, and decreasing overstory cover, which would increase ease of access to upland water developments and fence lines.

Watershed, Fisheries, and Wildlife Habitat Restoration

Aspen treatments would not have a significant effect on the rangeland improvements.

Bat gate installation would have no direct or indirect effects to range improvements because these areas do not have range improvements located on or directly adjacent to them.

Prescribed Burning and Unplanned Ignitions

Prescribed burning and unplanned ignitions would potentially have short term adverse effects to fences through burning up of wooden fence material. A project design criterion states that if structures are damaged throughout the project, the responsible parties are to fix them. If this is followed, there would be no long-term effect on structural improvements.

Road Activities

Permittees with term grazing permits are allowed limited off-road use in order to administer their grazing permits pursuant to 36 Code of Federal Regulations 261.5. In addition, any existing closed road that is needed for access for the administration of grazing permits within Malheur National Forest System lands is available for use even if closed to public motorized use. As such, the decrease of open roads would likely not affect livestock management activities, including access to and maintenance of upland water developments and fence lines.

Recreation System Changes

Recreation improvements may have an adverse effect on range management if increased recreational use in the planning area increases the chances that gates would be left open or that fences may be cut to gain access.

Cumulative Effects

Alternatives 2 and 3 in conjunction with past, present, and reasonably foreseeable future actions, such as upland water developments and fencing authorized under the Aquatic Restoration Decision, would increase the amount, condition, and effectiveness of range improvements. Potential upland water developments implemented under the Aquatic Restoration Decision would increase the total number of upland water sources, which would beneficially affect cattle distribution and decrease the concentration of livestock in riparian areas. Approximately 21 new water developments throughout the planning area may be developed.

Firewood cutting and hunting are common activities that have an adverse impact on range improvements. Fences are often cut, broken, or destroyed by people accessing trees and hunting areas. This allows livestock to access areas that have already been grazed, are at a higher risk for impact, or are being protected for another resource.

Additionally, the increased opportunity for recreation in the area may increase use of the area by hunters. As discussed in the Riparian and Upland Conditions section, the placement of salt licks and other supplements by hunters near surface water can put increased pressure on these areas by livestock, potentially compromising the integrity of these water sources. This may limit or preclude future development of these sites for the benefit of rangeland management.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Alternatives 2 and 3 are consistent with the following Malheur Forest Plan standards:

- Forest-wide standard 84: Schedule cost-efficient range improvements to improve range condition when and where needed (USDA Forest Service 1990a, page IV-35).

  Alternatives 2 and 3 would not include structural range improvements, but this work would likely occur under the 2014 Aquatic Restoration Decision (USDA Forest Service 2014b).

- Forest-wide standard 85: Design improvements to protect tree regeneration and/or to distribute livestock use (USDA Forest Service 1990a, page IV-35).

Alternatives 2 and 3 would not include structural range improvements, and non-structural range improvements would occur through upland restoration activities and prescribed burning.

- Forest-wide standard 88: Design and implement structural and nonstructural range improvements to maintain productivity and range condition in addition to benefiting both wildlife and livestock. Locate range structural and nonstructural improvements to encourage livestock movement away from riparian areas (USDA Forest Service 1990a, page IV-35).

  Alternatives 2 and 3 would decrease the canopy cover, improving the forage base and increasing the acres available for grazing.

Forage Production

Affected Environment

Methodology

Within the Ragged Ruby planning area, the Forest Service interdisciplinary team annually collects riparian monitoring data on the amount of utilization by permitted livestock. At regular intervals, the PACFISH/INFISH Biological Opinion Effectiveness Monitoring Program (Archer 2009) collects stream condition data relating to livestock use levels. In addition, annual monitoring measures the utilization of upland species by livestock.

Existing Condition

Prior to European-American settlement of the area, fire played a dominant role in shaping the landscape. Forest Service fire suppression policies have altered the ecosystem. Many historically open ponderosa pine stands have been encroached upon by other species and provide less in the way of forage for grazing animals. Conifers have encroached upon areas that were once open meadows and dry rangeland. Densely-populated stands are reduced in vigor because of overcrowding, or have already succumbed to insects and diseases. In areas with high tree mortality, fallen trees restrict movement of wild ungulates and livestock, thereby further limiting available forage.

Fire suppression since the early 1900s and lack of recent timber harvest has increased canopy density within the planning area, which reduces the amount of sunlight reaching the forest floor, consequently changing the forage composition and decreasing the acres available for grazing by wildlife and cattle. This has decreased the overall productivity of the allotments in terms of palatable herbaceous plant products. In addition, as tree density has increased, springs and seeps have decreased flow as additional water is utilized to support the increased number of trees.

The allotments within the planning area contain diverse ecosystems, including south-facing slopes with grassland type environments that contain moderate amounts of Idaho fescue and bluebunch wheatgrass, with a ponderosa pine/Douglas-fir overstory and meadow environments. These meadow systems were historically private agricultural land, used extensively by Civilian Conservation Corps crews during the 1930s to 1940s for the conservation and development of natural resources. Additionally, within these allotments there are upland Cool Moist plant associations comprising limited amounts of forage dominated by forbs and shrubs, and riparian ecosystems comprising sedges and rushes with an alder, willow, and dogwood-dominant canopy.

Native grass and forb species are still predominant in many areas of the dry forest type; however, in some areas, non-native species were introduced to stabilize soils along roads, skid trails, and landing sites (intermediate wheatgrass, orchard grass, Timothy grass, yellow sweet clover, black medic, bird's foot trefoil, and Kentucky bluegrass). Some of these same disturbed locations now host populations of non-native invasive plant species.

Environmental Consequences

Methodology

Within the Ragged Ruby planning area, the Forest Service interdisciplinary team annually collects riparian monitoring data on the amount of utilization by permitted livestock, using multiple indicator monitoring. This monitoring is focused on measurements that are affected by cattle (stubble height, bank alteration, and browse). At regular intervals, the PACFISH/INFISH Biological Opinion Effectiveness Monitoring Program (Archer 2009) collects stream condition data relating to livestock use levels. Condition and trend monitoring is used in the uplands to establish current conditions of the site as well as trend. Trend can only be established if multiple years of data collection from each site are available.

The spatial and temporal context for effect analysis, and past, present, and foreseeable future activities are the same as described for the Riparian and Upland Conditions section.

Alternative 1 – No Action

Direct and Indirect Effects

Alternative 1 would have no direct or indirect effects, because no management activities associated with the Ragged Ruby Project would take place. One environmental consequence of taking no action is decreased forage availability due to increased resource competition and overstory shading caused by ongoing conifer encroachment. Decreases in forage availability would likely adversely affect livestock distribution within the allotments.

Under alternative 1, the existing forage base would decline in vigor, abundance, and diversity as canopy cover continues to close. Tight canopies reduce available sunlight on the forest floor, increase the duff layer, and reduce soil moisture and nutrients. Carrying capacity would decline as grasses, forbs, and shrubs are crowded out by shade-tolerant species with less forage value to livestock and wild ungulates, resulting in a reduction of available forage. If more suitable rangeland is not created by future management projects or natural disturbance, the number of livestock permitted to graze in this planning area may decrease in the future to avoid unacceptable levels of damage to ecosystems by livestock.

With alternative 1, no ground disturbance would occur, so grasses and grass-likes[34] are not as likely to be infested by non-native invasive plants. Aspen stands would continue to decline, as increased competition from conifers outcompete them for nutrients, water, and sunlight. Declining resource conditions and increased canopy cover would also favor larger, high-intensity wildfires in the long term. With more intense fire regimes, less palatable or non-native invasive plant species would likely increase. Invasive plants readily establish in high-intensity burns areas and can prevent reestablishment of native forage.

[34] Grasses are from the family Poaceae. Grass-likes are the variety of plants with long, narrow leaves that sheath the stem (like a grass). Some are hollow or have compartments with air spaces. They resemble grasses or sedges, but do not have a perigynium (female part of the flower) like sedges, or flowers arranged in spikelets as in true grasses.

Cumulative Effects

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

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Alternative 1 would have no overall direct or indirect impacts to forage production.

Alternatives 2 and 3

Direct and Indirect Effects

Upland Restoration Activities

Upland restoration activities would beneficially affect range conditions by reducing conifer density in stands, reducing ground fuel loads that restrict livestock movement, and decreasing overstory cover, which would increase available forage.

Watershed, Fisheries, and Wildlife Habitat Restoration

The amount of aspen enclosures and the area which would be excluded from livestock use is not expected to have a measurable effect on utilization rates throughout the rest of the planning area.

Bat gate installation would have no direct or indirect effects to forage production because these areas are not utilized by livestock.

Prescribed Burning

Prescribed burning that consumes light herbaceous material would have a beneficial effect on range management. By burning decadent fuels, more plant material would come into contact with the soil surface, which would increase the rate of decay of the material. This would allow the incorporation of organic matter into the soil which would increase the nutrients available to the plant, as well as increase the water-holding capacity of the soil. All of these factors would combine to increase the forage production of the area.

Prescribed burning is proposed in areas predominately composed of elk sedge and pine grass. These fire-tolerant herbaceous species are less desirable forage by livestock, thus the impacts of prescribed burning are unlikely to affect the forage base necessary to manage these allotments for livestock use.

Generally, spring burns have the fewest undesirable effects to forage species, perhaps due to higher soil moistures. However, bluebunch wheatgrass has a higher mortality if burned in the spring, compared with fall burning. In the elk sedge/pinegrass communities, low- to moderate-severity fire may result in rapid rhizome extension and greater palatability to livestock and wild ungulates.

Burning impacts on plant species in this planning area would vary in response to a variety of conditions such as weather, season of burning, plant morphology, current plant condition and vigor, accumulated litter, soil moisture, and fire intensity. Fire intensity likely has the most influence on individual plants and forage production. The wide variation in burning intensity across treatment units (unburned to light to moderate) would create wide variability in results and recovery. Low-intensity fires would have low plant mortality and would stimulate plant vigor. Plants with increased vigor produce more leaf matter and set more seed, resulting in an increase in forage production. Increased plant mortality is expected with heavier fuel loading. In these areas, reseeding with native plant seed mixes would be necessary.

Low-intensity burning is expected where fuel loads are mostly herbaceous, and where there is little woody material (less than 1 ton per acre), such as in open grassland with only light shrub cover. When prescriptions call for broadcast burning of scattered fuels, the burning impacts would be widespread over the unit, with severe burning intensity creating cover voids, but with surviving plants interspersed throughout the unit. Bunched slash and piles burned at landings often kill understory species in the immediate vicinity and reseeding could be necessary.

Long-term impacts of prescribed burning would likely be beneficial in terms of moving treatment units towards historical conditions, improving watershed conditions, promoting better livestock distribution due to improved quality and distribution of forage, and increasing the production of rangeland resources. Recovery of vigor and production in herbaceous species is quickest for pine grass and elk sedge. For low-intensity fires, dry site bluebunch wheatgrass and Idaho fescue would be stimulated by the removal of decadent plant material and the flush of nutrients from burning. However, long-term maintenance of historical conditions may require follow-up treatments to ensure shrub cover does not reach pre-treatment levels or dominate the understory in the future. Historically, these sites did not have a heavy shrub component, since fire-return intervals thinned the shrub cover intermittently.

Road Activities

Road activities under alternatives 2 and 3 would likely not affect the amount of forage available.

The roadbeds in this planning area provide an inconsequential amount of forage, so if vegetation is cleared for road maintenance, it would have an insignificant effect on the available forage for livestock.

Recreation System Changes

Recreation improvements may have an adverse effect on forage production if recreational use of the area increases. See description in the Riparian and Upland Conditions section.

Cumulative Effects

The allotment and pasture boundaries do not directly follow the watershed boundaries of the Ragged Ruby Project or past projects such as Camp Lick, Big Mosquito, and Galena. As a result, portions of the allotments within this planning area have been treated or have proposed treatments under these other project decisions. The completed treatments have had similar effects to range management as described in the Alternatives 2 and 3 section, above.

Public firewood cutting has a negligible effect on forage production within the planning area.

Aquatic restoration accomplished under the Aquatic Restoration Decision would in the short term (1 to 2 years post-treatment) have an adverse effect on the available forage for grazing. However, in the long term, as we have seen in past planning areas that have been treated, the aquatic restoration work can limit cattle access to sensitive stream banks, increase the amount of stored water within a riparian area, and increase the amount of forage available for livestock. This in turn, can potentially increase the amount of time cattle can graze in a pasture without affecting sensitive riparian areas. Thus in the long term, the aquatic restoration processes would benefit grazing within the planning area.

In particular, large wood treatments within the riparian areas (in an effort to collect sediment, reconnect the floodplain, increase hardwoods, and increase overall ecological processes provided by the riparian systems) are likely to decrease the amount of available forage for livestock within the planning area in the short term. This is due to the soil disturbance associated with large equipment in riparian areas (1 to 2 years post treatment).

Fire suppression has increased canopy cover and thus decreased available forage on the forest floor, creating an adverse effect on range management. Alternatively, uncontrolled wildland fire would have short-term adverse effects to range management since the intensity can often decrease microbial activity in the soil, harm the root structures of desired native plants, and offer increased chances of non-native invasive plant infestations due to the increase of bare soil.

Grazing has a beneficial effect to rangeland plant species. Grass has evolved with grazing and is physiologically designed to respond positively to the effects of properly managed grazing. Adaptive management allows permittees to graze after seed production has been completed as a way to increase the abundance of the species, since grazing helps incorporate seeds into the soil through micro sites that are created by livestock hoofs. Grass can be grazed prior to seed emergence and, through the natural process of nutrient cycling, can be fertilized prior to seed production—the time in a plant's maturity which takes the most nutrients to complete.

Overall, the Ragged Ruby project, in conjunction with past, present, and reasonably foreseeable future actions, would move the planning area towards a healthier, resilient, diverse, and sustainable ecosystem. The project would increase the amount of available forage for livestock, as well as increase the amount of open area accessible by livestock. Combining more available forage with the current trend of increased vegetation conditions in the Ragged Ruby planning area (as well as the adjacent Galena, Big Mosquito, and Camp Lick planning areas) may increase the options for National Forest System land management to continue toward increased multiple use, as described in the Forest Service's mission.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Alternatives 2 and 3 are consistent with the following Malheur Forest Plan goal and standards:

- Forest goal 20: Provide a sustained production of palatable forage for grazing by livestock and dependent wildlife species (USDA Forest Service 1990a, page IV-2).

  Alternatives 2 and 3 would decrease canopy cover and improve forage production.

- Forest-wide standard 82: Manage residues to facilitate the use of forage by domestic livestock (USDA Forest Service 1990a, page IV-34).

  Alternatives 2 and 3 would decrease canopy cover and improve forage production.

Range Permittee Operations

Affected Environment

Methodology

Within the Ragged Ruby planning area, the Forest Service interdisciplinary team annually collects riparian monitoring data on the amount of utilization by permitted livestock. At regular intervals, the PACFISH/INFISH Biological Opinion Effectiveness Monitoring Program (Archer 2009) collects stream condition data relating to livestock use levels. In addition, annual monitoring measures the utilization of upland species by livestock.

Existing Condition

Within the planning area are four grazing allotments: North Middle Fork, South Middle Fork, Camp Creek, and Balance (Table 88). Currently, all four allotments within the planning area have 10-year term grazing permits (Table 89).

Table 88. Allotments in the Ragged Ruby planning area

Allotment	Total acres	Acres within planning area	Percentage of allotment within planning area
North Middle Fork	64,048	16,197	25
South Middle Fork	33,737	16,975	50
Camp Creek	745	94	13
Balance	152	111	73

Table 89. Allotment livestock grazing numbers, animal unit months, and permitted dates of use

Allotment	Livestock numbers (cow/calf pairs)	Animal unit months[1]	On date	Off date
North Middle Fork	627	4,128	June 1	October 31
South Middle Fork	278	1,845	June 1	October 31
Camp Creek	50	330	June 1	October 30
Balance	9	59	June 1	October 30

1. Animal unit month: The amount of forage required by one mature (1,000 pound) cow or its equivalent for one month (based upon average forage consumption of 26 pounds of dry matter per day).

The allotments within the planning area contain diverse ecosystems, as described in the Forage Production section.

Currently, all the allotments within this planning area are under 10-year term grazing permits. Permit information is listed in tables above.

Environmental Consequences

Methodology

The methodology; spatial and temporal context for effect analysis; and past, present, and foreseeable future activities are the same as described for the Riparian and Upland Conditions section.

Alternative 1 – No Action

Direct and Indirect Effects

Alternative 1 would have no direct or indirect effects, because no management activities associated with the Ragged Ruby Project would take place. Ongoing fire suppression would continue to change the forage composition, decreasing the acres available for grazing by wildlife and cattle, and decreasing the overall productivity of the allotment in terms of palatable herbaceous plant products. As conifer encroachment continues, traversing the landscape on horseback would become more difficult and dangerous. If encroachment continues, decreased forage production would increase the difficulty of permit administration and in turn decrease number of livestock the allotments could sustain.

No changes would be made in road densities, thus there would be no impact permittee operations or access to improvements.

Cumulative Effects

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

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Alternative 1 would have no overall direct or indirect impacts to range permittee operations.

Alternatives 2 and 3

Direct and Indirect Effects

Upland Restoration Activities

Upland restoration activities would beneficially affect range conditions by reducing conifer density in stands, reducing ground fuel loads that restrict livestock movement, and decreasing overstory cover, which would increase available forage and ease of access to water developments, increasing the ability of permittees to effectively manage their allotments.

Watershed, Fisheries, and Wildlife Habitat Restoration

Aspen restoration treatments would have a negligible effect on permittee operations.

Bat gate installation would have no direct or indirect effects to range permittee operations because these areas are not utilized by livestock.

Prescribed Burning

Short-term impacts from prescribed burning may occur; however, the effects are not expected to decrease the ability of permittees to effectively manage their allotments.

Following implementation of the proposed actions, the predominant vegetation would recover quickly after prescribed burning, and rest periods from grazing are not anticipated in most pastures, therefore impacts to permittee operations are not anticipated.

Coordination with a district range specialist and permittees is required prior to prescribed burning activities (see Appendix C – Project Design Criteria). Grazing management adjustments would be developed in coordination with the allotment permittee and incorporated into the annual grazing strategies. After prescribed burning is initiated, grazing management practices would be implemented to achieve desired use levels. These practices may include deferment or electric fencing, adjustment of livestock placement in pastures, and use of salt blocks or other management practices that would promote livestock use of pastures away from treatment areas. The proposed actions are consistent with the Malheur National Forest Post-Fire Interim Grazing Guidelines (USDA Forest Service 2003) which state that vegetation types such as elk sedge and pine grass require little recovery time after a low-intensity burn.

As discussed in the Forage Production section, heavier fuel loadings and bunched slash and piles burned at landings could require reseeding of these areas, which may have a temporary (short term) impact to permittee operations due to decreased forage within the burn scars for the current grazing season.

Prescribed burning has an indirect effect of promoting better livestock distribution due to improved quality and distribution of forage. Indirect effects related to management of grazing permits include loss of control of livestock if gates are left open or fences are rendered ineffective due to fire activity. The loss of control of livestock due to these indirect effects increases the complexity of the management strategies and could result in decreased management effectiveness.

Unplanned ignitions throughout the planning area would be managed with the involvement of the range program and permittees.

Road Activities

Access to much of the planning area by livestock permittees is by horseback. As such, decreasing road densities is unlikely to adversely affect livestock management.

Permittees with term grazing permits are allowed limited off-road use in order to administer their grazing permits pursuant to 36 Code of Federal Regulations 261.5. In addition, any existing closed road that is needed for access for the administration of grazing permits within Malheur National Forest System lands is available for use even if closed for use by the general public. As such, the decrease of open roads as proposed by the Ragged Ruby Project would likely not adversely affect livestock management activities or access.

Recreation System Changes

As recreation opportunities are improved with alternatives 2 and 3, increased recreational use may increase the likelihood for the harassment of livestock, or increase risks of fences being cut for access, which would incur additional time and costs by permittee to effectively manage their livestock.

As recreation opportunities in the area increase, chances for gates to be left open also increase, allowing cattle to access areas that were previously grazed or rested. This increases the complexity of livestock management. Additionally, cattle distribution may be affected due to increased activity putting pressure on cattle. This has the potential to decrease the distribution of the cattle, in turn increasing the utilization in isolated areas. This could potentially cause move triggers to be met prior to scheduled pasture moves.

Cumulative Effects

Grazing

Adaptive management allows permittees to graze after seed production has been completed as a way to increase the abundance of the species, since grazing helps incorporate seeds into the soil through micro sites that are created by livestock hoofs. Grass can be grazed prior to seed emergence and, through the natural process of nutrient cycling, can be fertilized prior to seed production—the time in a plant's maturity which takes the most nutrients to complete. Using this method allows flexibility of the grazing strategy in a way that allows managers to utilize the resources effectively and sustainably.

Firewood Cutting

Firewood cutting is a common activity that has an adverse impact on range management. Fences are often cut, broken, or destroyed by people accessing trees. This allows livestock to access areas that have already been grazed, are at a higher risk for impact, or are being protected for another resource. This can cause permittees to spend additional time and resources fixing fences that had already been maintained that season, and gathering cattle out of pastures that had previously been cleared.

Aquatic Restoration

Potential upland water developments implemented under the Aquatic Restoration Decision would increase the total number of upland water sources, which would beneficially affect cattle distribution and decrease the concentration of livestock in the riparian areas. Approximately 21 new water developments throughout the planning area may be developed, which would benefit permittee operations by increasing distribution of cattle throughout the pasture, decreasing the likelihood that move triggers on riparian areas would be met prior to scheduled season of use.

There would be an expected beneficial effect from watershed and fisheries restoration from activities authorized under the Aquatic Restoration Decision, by decreasing livestock access to stream channels and increasing the amount of time livestock could potentially stay in a pasture without adversely impacting riparian systems. Although the potential for isolated impacts is increased, aquatic restoration actions are expected to be beneficial overall to the riparian system as well as to the rangeland.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Alternatives 2 and 3 are consistent with the following acts:

- Multiple Use Sustained Yield Act (1960) established the policy and purpose of national forests to provide for multiple uses and sustained yield of products and services.
- Forest and Range Renewable Resources Planning Act (1974) established public land policy and guidelines for management, protection, development, and enhancement of public lands.

  Range permittees were contacted during collaboration and the scoping period to solicit and incorporate comments on project activities.

Recreation Resources

Regulatory Framework

Regulatory framework for recreation includes the Malheur Forest Plan Forest-wide standards 7, 11, 157, and 166; management area standards: management area 1 standard 1, management area 2 standard 1, management area 4A standards 1 and 2, management area 7 standards 1 through 6, management area 9 standards 1 through 3, management area 13 standard 1, management area 14 standard 1, and management area 21 standard 1 (USDA Forest Service 1990a). It also includes the Umatilla Forest Plan A8 standards and guidelines for recreation (UDSA Forest Service 1990d).

Resource Indicators

The measurement indicators detailed in Table 90 and described below are used for assessing the effects to recreation from the Ragged Ruby Project.

Table 90. Resource elements, indicators, and measures for assessing effects to recreation

Resource element	Resource indicator	Measure	Source
Recreation opportunities	Recreation opportunity spectrum	Recreational opportunity spectrum class	Malheur Forest Plan (pages IV-13, IV-42), USDA Forest Service 1982
Public access to recreation	Safety at trailhead locations, maintenance of road system	Trailhead reconstruction and maintenance of open roads in system	Malheur Forest Plan (page IV-42)

Recreation Opportunities

Affected Environment

Methodology

The recreation opportunity spectrum is a description of various attributes that contribute to a particular recreational setting in terms of the "combination of physical, biological, social, and managerial conditions that give value to a place" (Clark and Stankey 1979). This analysis will use the recreation opportunity spectrum classes defined by the Malheur Forest Plan as the basis of this assessment: roaded natural, roaded modified, and semi-primitive motorized (see Ragged Ruby Recreation Report for description).

Geographic information system information was used to query and analyze data and create maps displaying location of dispersed campsites, trails, big game management units, fuelwood gathering, and analysis of forest plan recreation opportunity spectrum mapping and proposed treatments. It was also used to analyze and develop the potential locations of re-routed trails and trailhead locations. Field work and observed visitor activities from the recreation specialist were incorporated to confirm geographic information system analysis, and to provide perspective on local forest activities. Trail locations were field checked by recreation technicians. Existing and proposed trailhead locations and trails were visited by the recreation planner, recreation technician, and interdisciplinary team.

Existing Condition

Recreation on the Malheur National Forest is focused where there is water or access to trails for dispersed recreation. The most popular recreation activities on the Forest are driving for pleasure, hunting, hiking and walking, viewing wildlife, relaxing, primitive camping, and viewing natural features (USDA Forest Service 2010).

Recreation opportunities within the Ragged Ruby planning area are diverse and include hiking, motorized trail use, hunting, equestrian trails, and camping. Peak use periods are late May to early September for hiking, mountain biking, equestrian riding, and off-highway vehicle use, and from August through November for hunting. Camping, fishing, driving for pleasure, and other dispersed activities such as woodcutting or mining, will often continue beyond the typical seasons unless snow makes motorized access to the area impractical. During deer and elk hunting seasons, hunting and related camping become the dominant recreational activities in the planning area.

Undeveloped Recreation

The undeveloped recreation in the area consists of 59 known dispersed campsites (4 of which are within the Greenhorn Mountain Inventoried Roadless Area). Undeveloped recreation includes hunting, fishing, wildlife viewing, and driving for pleasure. The planning area includes portions of the Green Mountain and Dixie Butte inventory roadless areas.

During the hunting season (October through November) dispersed camping is at higher levels in the Forest, including in the Ragged Ruby planning area. The planning area lies within two of Oregon Department of Fish and Wildlife's wildlife management units, Northside and Desolation.

Developed Recreation

Developed recreation in the planning area consists of one recreation rental (Sunshine Guard Station and associated Romtec vault toilet) and five trails with a total mileage of 8 miles within the Ragged Ruby planning area (and a total of 18.7 miles when including the segments of these trails outside of the planning area). The trails and their current designations are:

- Davis Creek Trail: motorized, hiking, biking, and equestrian
- Blackeye Trail: hiking, biking, and equestrian
- Princess Trail: hiking
- Sunrise Butte Trail: hiking and equestrian
- Tempest Mine Trail: hiking

The recreation opportunity spectrum for the existing trails are described in Table 91.

Table 91. Recreational opportunity spectrum of trails in the Ragged Ruby planning area

Trail	Roaded natural (percent)	Roaded modified (percent)	Semi-primitive motorized (percent)
Davis Creek Trail	45	0	55
Blackeye Trail	30	0	70
Princess Trail	20	0	80
Sunrise Butte Trail	30	0	70
Tempest Mine Trail	15	0	85

Environmental Consequences

Methodology

In order to determine the environmental consequences, the same methodology as described in the affected environment section was used.

Spatial and Temporal Context for Effects Analysis

The spatial context for this analysis is the Ragged Ruby planning area. The effects to the recreation resources can be short term and long term. Short term is usually less than 5 years, and long term is 5 to 50 years.

Past, Ongoing, and Reasonably Foreseeable Actions Relevant to Cumulative Effects Analysis

Past, ongoing, and future projects and activities that may impact a visitor's opportunity for solitude or contribute impacts to recreation include: 60 miles of new trails constructed across the Forest within the next few years, dispersed camping, existing trails, dispersed recreation, vegetation management projects with recent or foreseeable decisions bordering the planning area (including Galena, Big Mosquito, and Camp Lick), prescribed burning and wildfire suppression, and recreation activities associated with this project (including increase of recreational mechanized use inside the planning area, changes to trailheads, and updates to existing trail systems).

Alternative 1 – No Action

Direct and Indirect Effects

With alternative 1, there would be no direct or indirect effects. Seasonal usage patterns and developed recreation would remain about the same, including dispersed camping opportunities and hunting. Activities related to upland restoration activities; watershed, fisheries, and wildlife habitat restoration; prescribed burning and unplanned ignitions; road activities; and recreation system changes would not occur, thus would not directly or indirectly affect recreationists in the Ragged Ruby planning area.

Impacts such as soil compaction from user-created trails, sanitation issues, and vegetation removal would continue at current rates.

Environmental consequences of taking no action (alternative 1), include the compounding effects of decades of fire suppression. Over the next decade, vegetation would continue to depart from historical conditions. The increasing understory vegetation and ground fuels would diminish the viewshed, obstruct cross-country travel for recreationists, and diminish ecological resilience. The effects to recreational values due to insect infestations would be similar to that of fire. Study results indicate that less intense fires may have beneficial economic effects, whereas intense fires may have detrimental effects on recreation values (Vaux et al. 1984). By not taking action, legacy effects would be compounded, and the opportunity to mitigate the effects of severe wildfire could be missed. Trail systems would be left in conditions that do not meet the needs of Forest users, or that perpetuate resource degradation including: erosion, use beyond the designated uses, and adverse effects to water quality and fish (see Watershed and Aquatic Species sections).

Cumulative Effects

Because there would be no direct or indirect effects, there would be no cumulative effects.

Alternatives 2 and 3

Direct and Indirect Effects

Upland Restoration Activities

Under alternative 2, there would be approximately 9,200 acres treated, and under alternative 3, there would be approximately 8,210 acres treated. The direct effects to vegetation from the upland restoration activities in the planning area are detailed in chapter 2. Thinning would open up the understory, which would facilitate cross-country hiking through the forest and enhance viewing opportunities for some recreationists. Alterations to the forest structure would also affect the movement of wildlife. Recreationists would find increased opportunities for wildlife viewing due to a more open forest structure. Ground fuel and fuel ladder reductions would improve the safety of recreationists at developed and dispersed recreation sites during the summer season.

Alternatives 2 and 3 would have direct effects on scenery and noise levels from activities such as cutting trees, skidding and decking logs, piling and burning of non-commercial woody material and logging slash, and operations involving heavy machinery within the vicinity of the trails and dispersed campsites. The upland restoration activities under alternatives 2 and 3 would affect users of the trails and dispersed campsites during and shortly after the time activities take place (within 6 to 12 months). Visitors to the area may be inconvenienced by these activities when they occur.

The direct effects of the upland restoration activities include associated noise, recreation area closures due to the activities, and the immediate evidence of ground disturbances, each of which could detract from the recreation experience. The upland restoration activities that would occur adjacent to the dispersed campsites during the hunting season (October through November) could detract from the recreation experience of camping and hunting. However, the long-term effects of a cleaner and more open forest floor and enhanced grass growth are expected to benefit the recreation experience. By 2 to 3 years after the primary mechanical activities occur, changes in vegetation would likely go unnoticed by many forest visitors. The ground disturbance from the activities, including skid trails, would be even less evident after 2 to 5 years. Thus, the effects to vegetation and forest structure from the upland restoration activities would have minimal impacts on the number of visitors to the area.

Watershed, Fisheries, and Wildlife Habitat Restoration

Aspen treatments in the planning area would, in the long term, benefit recreation. These treatments are good for the wildlife in the area and can provide for more opportunities for wildlife viewing.

Bat gate installation in the planning area would enhance the safety of Forest users.

Prescribed Burning and Unplanned Ignitions

Through fuel reduction treatments, alternatives 2 and 3 would reduce the wildfire risk to developed and dispersed recreation and the surrounding recreational setting. Although prescribed burning may have short-term adverse impacts on the recreational experience, severe wildfire could considerably alter the viewshed and recreational opportunities, which would have a long-term impact on the corresponding recreational experiences. The activities under these alternatives would help restore historical forest structure, composition, and density, and create more resistant and resilient vegetative conditions. Instead of deferring treatments, which would increase the risk of insect and disease infestations and high-severity wildfire, alternatives 2 and 3 would address the need for restoration and enhance the recreational setting.

Planned ignitions would take place on up to 34,000 acres with alternative 2, and 31,500 acres with alternative 3, which includes all of the burn units in the planning area. The ignitions could occur during the spring or fall. The direct effect of these actions would be primarily on visuals (see Visual Resource section); however, there would be indirect effects through enhanced vegetation, improved wildlife habitat, and increased safety through fuels reduction. Spring or fall burning may impact recreationists by creating smoke and restricting access to prescribed burn areas. If burning occurs in the fall season, there may be effects to hunters and campers who want to access prescribed burning areas. Hunting and camping opportunities and experiences could be adversely impacted by the presence of smoke. The smoke and activity in the area could deter big game species. The Sunshine Guard Station rental and immediately surrounding area are not included in the ignition units. However, smoke from the burning would have a short-term impact on recreationists in the area when prescribed fire operations take place nearby (burn blocks 4 and 8, and upland restoration unit 72).

Road Activities

Recreational use of National Forest System roads would be minimally impacted by road activities, because the affected roads are no longer contributing to integrated land management objectives. Recreational driving would generally benefit from road maintenance accomplished to implement upland restoration activities. See the Public Access to Recreation section for more information.

Recreation System Changes

The trail and trailhead improvements described in chapter 2 are designed to correct existing issues with the trail network by reestablishing trailheads in locations better suited to meet the needs and capacity of the trail system, including extending trails to the proposed new trailheads. This would meet Malheur Forest Plan objectives by relocating designated system trails (Forest-wide standard 11), and redesigning trails and roads to allow for better management of trails (Forest-wide standard 157). Relocating the Davis Creek Trail meets the Malheur Forest Plan because it allows the Forest to manage the trail for motorized access on designated roads and trails (management area 21 standard 1). All of the proposed trail and trailhead relocations allow the Forest to better manage for recreation opportunities that are "designed to take advantage of scenic opportunities, encourage and disperse use, provide varying (mostly easy, but some challenging) opportunities, and meet area objectives" (Forest-wide standard A8). The relocation and development of the Princess, Blackeye, Tempest Mine, and Sunrise Butte trails would also favor nonmotorized use and would be managed to maintain the "opportunities for visitors to get away and achieve a feeling of remoteness from sights and sounds of others" (Forest-wide standard A8).

Alternative 3 differs from alternative 2 in that it would exclude bicycle use on the trails that provide access to the North Fork John Day Wilderness (which include, but are not limited to: Princess, Blackeye, and Sunrise Butte trails). The potential impacts to the Wilderness in alternative 3 would be less than alternative 2, because trail access would be limited to foot and equestrian traffic only.

Cumulative Effects

Partial relocation of a popular motorized trail along Davis Creek would be accomplished as discussed in chapter 2 and above in order to facilitate restoration of streams being adversely impacted by the trail. Restoration activities along Butte Creek would be accomplished under the Aquatic Restoration Decision (see Appendix E – Past, Ongoing, and Reasonably Foreseeable Actions, Table E-2). Due to the trail's location along Butte Creek and common usage by off-highway vehicle users (despite being originally designed as a single-track motorized trail), it is in constant need of trail stabilization. The proposal to relocate the trail to higher ground and rehabilitate the current location for better habitat and watershed would create cumulative effects on scenery and noise levels from activities such as cutting, large woody debris placement, and operations that may involve heavy machinery within the vicinity of the trail and dispersed campsites. The aquatic restoration activities accomplished under the Aquatic Restoration Decision would affect users of the trail and dispersed campsites during and after the time activities take place. Visitors to the area may be inconvenienced by these activities when they occur, and by the change in location of the trailhead.

Potential effects of the aquatic restoration activities would include associated noise, recreation area closures due to the activities, and the immediate evidence of ground disturbances, each of which could detract from the recreation experience. Activities occurring adjacent to the dispersed campsites during the hunting season (October through November could detract from the recreation experiences of camping and hunting. However, the long-term effects of a restored riparian area along Butte Creek, Vinegar Creek, Middle Fork John Day River, Little Boulder Creek, Davis Creek, Deerhorn Creek, Little Butte Creek, and Placer Gulch are expected to benefit the recreation experience. By 2 to 3 years after the primary activities occur, the changes in the trailhead and trail location, vegetation, and watershed would likely go unnoticed by many Forest visitors. The ground disturbance from the activities would be even less evident after 2 to 5 years. Thus, the effects to vegetation and forest structure from aquatic restoration activities would have minimal impacts on the number of visitors to the area.

Sights and sounds created by future forest thinning projects or prescribed burning activities, combined with the sights and sounds created by the Ragged Ruby Project implementation, would not have a cumulative effect on recreation because they would be unlikely to overlap in time and space. However, the resulting open forest structure resulting from those activities, combined with those implemented as part of the Ragged Ruby Project, would provide increased opportunities for viewing wildlife and other natural features, and create safer recreation opportunities by creating larger swaths of open forest. Creating larger swaths of open forest in the same area could enhance hiking, driving for pleasure, and other recreational opportunities. The road maintenance that would occur under alternatives 2 and 3, combined with future adjacent projects, could also enhance driving for pleasure opportunities by contributing to a more attractive road network. The effects are cumulative because more extensive recreation attractions are more conducive to recreation opportunities than those that are smaller and more isolated (Stensland 2013).

Trail developments have been proposed west of the planning area (in the Magone planning area), and additional trail developments could take place in other adjacent planning areas. If trails in adjacent planning areas connect with those in the Ragged Ruby planning area, the effect could be a more extensive and attractive trail network. Attracting more visitors to the area could change the timing and intensity of recreational use of the Ragged Ruby planning area. It is expected that attracting more forest visitors to the local area would have a beneficial economic effect on the local communities (Barthlow and Moore 1998).

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Recreation under all alternatives would meet the objectives of the Malheur Forest Plan (USDA Forest Service 1990a), because proposed treatments for the planning area fall below the recreation opportunity spectrum threshold defined in the recreation resource element standard in the Malheur Forest Plan, for each of the management areas that the proposed developments would affect, as listed above in the Regulatory Framework section.

Public Access to Recreation

Affected Environment

Methodology

Geographic information system information was used to analyze the Malheur Forest Plan recreation opportunity spectrum mapping and proposed treatments, and to develop the potential locations of rerouted trails. After completed, trail locations were field checked by recreation technicians. Existing and proposed trailhead locations and trails were visited by the recreation planner and technician and interdisciplinary team. During the field visits, the recreation planner and members of the interdisciplinary team were able to assess public access needs for passenger vehicle roads; foot, off-highway vehicle, equestrian, and mountain bike trails; and other recreational uses.

Existing Condition

The primary public access roads through the planning area are County Road 20, and National Forest System roads 45, 2045, 2050, 4550, 4555, 4560, and 4559. The developed facility (Sunshine Guard Station) and trailheads within the planning area are accessed via these roads.

Environmental Consequences

Methodology

This analysis uses the recreation opportunity spectrum classes defined by the Malheur Forest Plan as the basis of this assessment.

Geographic information system information was used to query and analyze data and create maps displaying the location of dispersed campsites, trails, big game management units, fuelwood gathering, and analysis of forest plan recreation opportunity spectrum mapping and proposed treatments. In addition, field work and observed visitor activities from the recreation specialist were incorporated to confirm geographic information system analysis, and to provide perspective on local forest activities.

Spatial and Temporal Context for Effects Analysis

The spatial context for this analysis is the same as described for Recreation Opportunities.

Past, Ongoing, and Reasonably Foreseeable Actions Relevant to Cumulative Effects Analysis

Past, ongoing, and reasonable foreseeable actions relevant to cumulative effects are the same as described for Recreation Opportunities.

Alternative 1 – No Action

Direct and Indirect Effects

Alternative 1 would not directly or indirectly affect public access to recreation in the planning area. However, one environmental consequence would be the continued buildup of fuel loads, which would decrease safety in the Ragged Ruby planning area by increasing the risk of uncharacteristic wildfire along these roads.

Recreational use of National Forest System roads would not be immediately affected, as there would be no changes to the existing road system. However, continued deferred maintenance would eventually impact recreational users in the following ways:

- Maintenance would not get done, there would be increased deferred maintenance, and there would be a risk of road failure, which could increase public safety risk.
- Alternative 1 has the least impact on current access, but in the future, access would be reduced due to funding for road maintenance being spread thin across a large road system.
- Alternative 1 would not provide opportunities to fund road maintenance, and miles of deferred maintenance on the Forest would continue to grow in magnitude. (see Transportation System section.)

The area surrounding the Ragged Ruby planning area would continue to be classified as roaded natural, roaded modified, and semi-primitive motorized under the recreation opportunity spectrum.

Cumulative Effects

Because there would be no direct or indirect effects, there would be no cumulative effects.

Alternatives 2 and 3

Direct and Indirect Effects

During implementation of upland restoration activities, public access to recreation in the planning area (including access to the Sunshine Guard Station) may be impacted by possible road access restrictions during the duration of active thinning operations or timber sales, or by the presence of log haul trucks or other heavy equipment operating on open roadways.

Watershed, fisheries, and wildlife habitat restoration activities are expected to have no effect on public access to recreation, because these activities would not take place on public access roadways, nor are they expected to obstruct such roadways.

Prescribed burning and unplanned ignitions may temporarily impact recreation access to the planning area, due to potential road closures associated with active burning operations, or because of smoke obscuring roadways. Spring or fall burning may be especially impactful due to higher numbers of recreationists attempting to access the Forest.

Road activities would cause a small reduction of access to the Ragged Ruby planning area (with the open road system changing from 115.7 to 111.0 miles of open road as part of alternatives 2 and 3; see chapter 2). However, the affected roads in their current conditions are no longer contributing to integrated land management objectives. Public access to recreation would generally be improved by road maintenance accomplished to implement upland restoration activities. Closed roads would be re-closed after haul, and temporary roads would be rehabilitated, thus the impacts to public access to recreation due to the utilization of closed roads for haul and construction of temporary roads would be minimal and brief in duration. These impacts during project implementation could include, but are not limited to, reduced access to areas, increased noise, increased traffic, reduced feelings of solitude, increased dust, and temporary dispersal of wildlife.

Recreation system changes would have minor short-term impacts on public access to recreation, during the construction of new trailheads, parking areas, or pullouts; however, these temporary effects to the associated recreation would improve the access to the opportunities and other Forest users in the long-term by eliminating congestion or roadside parking that can currently impede access along those roads.

The Davis Creek Trail and trailhead would be effected by recreation system changes, as part of the trail would be rerouted to create a more sustainable trail. The trail and trailhead would be removed from the current location along National Forest System Road 2050 and relocated to National Forest System Road 2050302. In its current location, the trail is being impacted by Butte Creek, Vinegar Creek, Middle Fork John Day River, Little Boulder Creek, Davis Creek, Deerhorn Creek, Little Butte Creek, and Placer Gulch and is causing constant maintenance needs, such as retreading the trail surface and re-creating armored creek crossings. The relocation of the trail would provide a better recreation experience for users, due to creating a trail in a location that is sustainable, provides better scenic views of the area, and is less hazardous (would relocate some of the trail from a co-designated road to a trail only). Access to known dispersed campsites along the current location of the Davis Creek Trail would not be impacted, as access would still be available on National Forest System Road 2050666.

Alternative 3 differs from alternative 2 in that it would exclude bicycle use on the trails that provide access to the North Fork John Day Wilderness (which include, but are not limited to: Princess, Blackeye, and Sunrise Butte trails). This alternative would reduce potential mechanized equipment incursions into the wilderness area.

Cumulative Effects

The road maintenance that would occur under alternatives 2 and 3, combined with adjacent projects, could also enhance access to recreation opportunities by contributing to a larger and more attractive road network. The effects are cumulative because more extensive recreation attractions are more conducive to recreation opportunities than those that are smaller and more isolated (Stensland 2013).

The effects to the trail developments proposed in the Ragged Ruby planning area combined with trail developments in other planning areas (such as Magone), could be a more extensive network of trails, which would grant additional access to the forest. These additional visitors could increase the potential for both economic and environmental impacts due to increased forest visits and facility usage.

Past actions including fire suppression, timber harvest, and grazing have contributed to the current conditions of fuels and the potential for high-severity fire. The proposed activities would reduce canopy fuels, ladder fuels, and surface fuels, reducing the potential for a high-severity fire that would impact recreation access, if roads were closed due to fire suppression efforts or for public safety post-wildfire.

All past, ongoing, and reasonably foreseeable future actions have been considered for their cumulative effects on public access to recreation. Past timber harvest constructed roads into the area, though projects since then have closed, opened, relocated, and decommissioned some of these roads, changing public access to portions of the Forest. As stated in the Ragged Ruby Roads Report, the cumulative effects of Ragged Ruby road system changes "combined with foreseeable annual road maintenance activities and road closures, would be fewer roads to maintain, less money needed for maintenance, and improved road conditions on open roads for all forest users."

The proposed Malheur National Forest Access Travel Management Plan may result in changes to public access of the motorized transportation system (particularly in areas that have not had an accelerated restoration project reviewing the transportation system), which would contribute to cumulative effects to the transportation system on the Forest.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Recreation under all alternatives would meet the objectives of the Malheur Forest Plan (USDA Forest Service 1990a), because proposed treatments for the planning area fall below the recreation opportunity spectrum threshold defined in the recreation resource element standard in the Malheur Forest Plan, for each of the management areas that the proposed developments would affect, as listed above in the Regulatory Framework section.

Visual Resources

Regulatory Framework

Regulatory framework for visuals includes Forest goals 9 and 10, Malheur Forest Plan objectives for Visuals, and Forest-wide standards 25, 27. In addition, management area standards for visual resources include management area 14 standards 2, 6, 9, 11, 12, 14, 16, 17, 28, and management area 7 standard 7. See Ragged Ruby Visuals Report for more information.

This analysis also applies current National Forest Scenery Management methodology in conjunction with existing Malheur Forest Plan direction (USDA Forest Service 1990a). This includes scenery sustainability concepts described in Landscape Aesthetics, A Handbook for Scenery Management, Agriculture Handbook 701 (USDA Forest Service 1995d) and Recommended Scenery Management System Refinements (USDA Forest Service 2007a, Appendix J).

Resource Indicators

The analysis indicators for assessing effects of each alternative and for comparing alternatives are included in Table 92.

Table 92. Resource elements, indicators, and measures for assessing effects to visual resources

Resource element	Resource indicator	Measure	Source
Visual resources	Scenic integrity (see description below)	Qualitative discussion on degree of change	USDA Forest Service 1974, 1990a
Visual resources	Scenic stability (see description below)	Qualitative discussion on the degree of change	USDA Forest Service 1990a, 1995d, 2007a

See Ragged Ruby Visuals Report for definitions.

Scenic Integrity and Stability

Affected Environment

Methodology

This analysis relies on field studies and photography from the Ragged Ruby planning area, as well as coordination with project interdisciplinary team members and consideration of public preferences for scenic quality. Cumulative scenic quality was evaluated within the geographic scope of roadways and other sensitive public viewpoints within and adjacent to the planning area. Integration of this scenery analysis will assure the Ragged Ruby Project is consistent with scenery-related Malheur National Forest direction, Forest Service policies, and applicable elements of Forest Service Visual Management and Scenery Management Systems.

Scenic integrity is measured from sensitive viewpoints inventoried by the Malheur Forest Plan, and as supplemented by project level analysis. The project's thresholds for scenery disturbance (Malheur Forest Plan visual quality objectives) apply only to views from these locations.

The Ragged Ruby Project scenic stability evaluation addresses current ecosystem conditions and stresses identified by field observation, data on vegetation and fire history, and interdisciplinary input from the Ragged Ruby Project silviculture and fuels specialists. It is guided by methods described in Appendix J—Recommended Scenery Management System Refinements (USDA Forest Service 2007a).

Existing Condition

The overall planning area provides a mostly natural appearance. Roads, landings, logging residues, and openings created by natural geologic activity, previous harvesting, and historical and modern mining are noticeable to the casual visitor traveling within the planning area.

The existing planning area is characterized by scattered ponderosa pine, Douglas-fir, western larch, grand fir, and lodgepole pine trees, of which the grand fir is the most dominant in the planning area. Ponderosa pine and Douglas-fir trees tend to be larger and are typically older than the other tree species in the area. Snags and dying trees are also visible in portions of the planning area.

See Ragged Ruby Visuals Report for more information.

Scenic Integrity

The Ragged Ruby planning area's existing scenic integrity as viewed from these sensitive viewpoints typically meets the partial retention and modification levels. There are occasional disturbances such as localized stumps, clearings, and roadways; however, the overall landscape appearance from the sensitive viewpoints is "slightly altered." Existing scenic integrity viewed from the Ragged Ruby planning area and County Road 20 is largely undisturbed foreground scenery that cumulatively meets the partial retention level, with some minor or unnoticed contrasts such as existing roads, old skid roads, and scattered stumps that may individually meet partial retention or modification. The less frequent and more distant 0.5 to 4 mile middleground views available are largely natural appearing, overall meeting the modification level. See Ragged Ruby Visuals Report for more information.

Scenic Stability

Many decades of fire exclusion have allowed grand fir to intrude on aspen, meadow, and pine vegetation, transforming these diverse vegetation scenery attributes into much more uniform patterns. Continued stress from grand fir encroachment would further impair and eliminate socially valued scenery attributes. Other stressors such as pests, disease, drought, wildfire, and climate change are currently less significant, but also have potential to further impair valued scenery. Collectively, current ecosystem stress upon scenery attributes is considered to be at the high end of moderate for the planning area, within a potential range of minor, moderate, or severe.

Because the Ragged Ruby planning area's two major scenic attributes (diverse forest canopy with large trees, and meadows and aspen) share a typically moderate risk based on their condition and ecosystem stress, the scenic stability of these major vegetation scenery attributes correlates best with the low scenic stability level definition below:

- **Low stability** – Some dominant scenery attributes of the valued scenic character are present and are likely to be sustained. Known scenery attribute conditions and ecosystem stressors may seriously threaten or have already eliminated the others.

Numerous trends in the Ragged Ruby planning area indicate scenic stability is in decline or could be rated low. The coniferous forest is generally overstocked in both ponderosa pine and mixed fir types, with an excess of ground and ladder fuels. Natural processes associated with fire exclusion are obvious. These conditions will make it difficult to keep wildfire starts from expanding rapidly and burning intensely. Fire suppression has resulted in a change in species and structural stage composition. These conditions pose a high risk of losing key components of the ecosystem and dominant scenic attributes such as the open, park-like stands of ponderosa pine, and minor scenic attributes such as the aspen stands.

See Ragged Ruby Visuals Report for more information.

Environmental Consequences

Methodology

The Malheur National Forest uses visual quality objectives and scenic stability to develop management direction for visuals for the different management areas on the Forest. This analysis will use the visual quality objectives and scenic stability defined by the Malheur Forest Plan as the basis of this assessment (see Existing Condition section for description).

Geographic information system information was used to analyze proposed treatments against different visual quality objectives and scenic stability for the planning area. It was also used to create maps displaying overlapping management areas, including special areas. In addition, field work and observed visitor activities from the recreation specialist were incorporated to confirm geographic information system analysis, and to provide perspective on local forest activities. Proposed treatment areas and recreation development sites were visited by the recreation planner and the interdisciplinary team.

Indicators of effects of the Ragged Ruby Project on scenery include: (1) a description of changes to scenic integrity and (2) a determination of scenic stability (changes in the sustainability of scenery attributes). To determine these effects, Forest Service Scenery Management System (USDA Forest Service 2007a) methods are applied to indicate changes in scenic character and its sustainability (scenic stability). Changes in scenery disturbance (scenic disturbance) are measured using criteria established by the Forest Service Landscape Aesthetics, A Handbook for Scenery Management, Agriculture Handbook 701 (USDA Forest Service 1995d) and Forest Service Visual Management System (USDA Forest Service 1974) as visual quality objectives.

Spatial and Temporal Context for Effects Analysis

The Ragged Ruby planning area (and 0.5 miles surrounding it) is the spatial analysis area for scenic character and scenic stability because these apply to the entire area. Views from the sensitive recreation and public use roads or areas in or near the planning area boundary are the spatial analysis area for scenic integrity. Descriptions of short-term scenery effects apply to those lasting less than 10 years; long-term scenery effects span 10 to 100 or more years.

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

Past, present, and foreseeable activities that contribute cumulative effects to scenery resources range from regeneration harvests, thinning, prescribed fire, and grazing practices that overlap in space and time with Ragged Ruby Project proposed actions. The timeframe for which these effects overlap ranges from the time of the activity through the life of the effect. The life of the effect can vary depending on the activity; however, most effects are not noticeable to the average Forest visitor within 5 years after the activity occurs. The spatial bounding is the project boundary, as the activities are visible from commonly used routes.

Alternative 1 – No Action

Direct and Indirect Effects

There would be no direct effects to scenic integrity, stability, or character from the no action alternative. Alternative 1 would continue two trends: (1) scenic disturbance reductions through vegetation regrowth, and (2) scenic impairment through increased tree density and loss of attractive variety (conifer stand spatial and structural diversity with large tree character and fire-adapted vegetation such as western larch, ponderosa pine, and Douglas-fir) and impaired ecosystem resilience.

Scenic Integrity

Alternative 1 would not produce any short-term visual disturbances or directly change the planning area's existing disturbances viewed from the planning area's scenic visual corridors. Many of the existing scattered minor and moderate disturbances described in the Existing Condition section would be greatly diminished through vegetative renewal over the next 10 years. However, potentially strong and adverse indirect scenic disturbance effects could become increasingly more likely with alternative 1, since declines in fire-adapted vegetation and ecological resiliency would continue in future decades throughout the planning area. In the event of an uncharacteristic wildfire, many of the desirable elements of landscape character would be lost for an extended period of time.

The Ragged Ruby planning area's scenic integrity as viewed from sensitive viewpoints would continue to meet the retention, partial retention, and modification level.

Scenic Stability

Alternative 1 would cause no direct or indirect effects to the existing condition. The environmental outcomes of the no action alternative are related to increasing stand density, encroachment of less resilient species, increasing fuel loads, and high levels of tree mortality. This trend decreases the resiliency of the timber stands, causing the scenic stability to be continually reduced as conditions degrade.

Scenic stability effects are based on assumptions for a continuation of the existing adverse vegetation conditions (of overly dense, small sized, and uniform vegetation), resulting in continued low stability. This level of scenic stability would likely persist for decades, unless vegetation and climate conditions result in an exceptionally large and severe canopy-consuming disturbance event (for example, pests, insects, diseases, or wildfire), which could potentially lower the planning area's vegetation scenic attributes to the no stability level.

Cumulative Effects

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

Alternatives 2 and 3

Direct and Indirect Effects

Scenic Integrity

Upland restoration activities and prescribed burning: Upland restoration activities and prescribed burning would produce minor short-term scenery disturbances, including visible soil color; canopy, tree, or plant contrasts such as stumps, skid roads, burn piles, burn areas; and landings. A small portion of these effects would be visible from the planning area's scenic viewpoints and recreation trails.

Commercial timber harvest leaves stumps which are visible from an immediate foreground distance (300 feet). Commercial harvest would open up the stands and allow more sunlight into the forest floor, and provide longer viewing distances into the forest stands.

Tractor logging and skidding would create some soil disturbance along the skid trails, tearing up the topsoil and exposing the soils. Understory vegetation would also be torn up along these skid trails, which would be visible from an immediate foreground distance. These visual effects are usually an immediate impact that dissipates within a short period of time; impacts are usually not visible after one growing season to the casual viewer. Skyline logging would create similar effects as tractor logging, although skid trails associated with skyline logging are usually longer than those associated with tractor logging. These trails can oftentimes be visible from middleground viewing distances. However, the effects are also short term.

Non-commercial thinning would remove trees up to 11 inches diameter at breast height where these trees are in excess. This activity is usually a benefit to visual quality. Most viewers prefer views of large trees with open spacing.

Fuel treatments that would occur congruently with harvest treatments include mechanical thinning, prescribed burning of fuels, whole tree yarding, cut to length, grapple piling, and hand piling. These treatments would clean up the majority of slash created by harvest activities. The effects are primarily beneficial to visual quality, reducing the visual impacts of human activities with a natural-appearing landscape. Removal or burning of residual material (tree stumps, snags, limbs, and brush piles), removes the "clutter" that detracts from the remaining trees or other scenic attributes. Most visual preference surveys indicate dislike for "messy" landscapes (Bradley 1996).

Pile burning and underburning would create scorched and blackened underbrush, saplings, bark, grasses, and forbs. These effects would continue for 1 to 5 years. There is a possibility of the prescribed fire getting into the crowns of trees. This could cause clusters of dead or scorched trees. Following the growing season, the majority of the effects would no longer be visible as new growth of forbs and shrubs would quickly sprout. There may be some minimal long-term effects such as small patches of overstory tree mortality; however, these patches are not expected to detract from the landscape character.

Alternative 2 would authorize the most silvicultural treatments and activity fuels treatments within the Ragged Ruby planning area and have the greatest short-term effects to visual quality, followed by alternative 3. However, effects from these activities would be reduced under both alternatives by project design criteria.

Treatments would improve the long-term scenic integrity, by opening the stands up for increased visibility and visual diversity. Prescribed fire would improve conditions for fire-resistant species, which would indirectly improve the landscape character attributes of large tree character and open stands that can withstand low-intensity fires. This treatment would improve visuals into the forest understory from foreground views. Alternative 2 would see the greatest improvements with the most acres treated, followed by alternative 3.

Road activities: Temporary road construction and the use of closed roads (maintenance level 1) for log haul would be visible from some viewpoints. When these temporary roads are rehabilitated following use and maintenance level 1 roads (closed roads) temporarily used for log haul are effectively closed following logging, most of the visual impact would not be seen from open roads except for the berms and the first section of closed road. Alternative 2 would authorize the greatest number of temporary roads and the most temporary use of closed roads for log haul within the Ragged Ruby planning area and thus have the greatest visual affect, followed by alternative 3.

Recreation opportunity improvements: Some of the redesigned trails, the accessible trail development, trailhead redesign and relocation, and interpretive signs would take place within the Ragged Ruby planning area foreground. However, these proposed activities would take place in previously disturbed areas, such as previous closed roads or dispersed camping areas. Trails would be less visually evident to viewers due to their narrow width, designing with the contours of the area, and visually screening from vegetation in most areas. These activities would continue to meet the partial retention visual quality objectives, as activities would be evident to the viewer but visually subordinate to the surrounding landscape.

Alternative 2 would have the most visually evident recreation developments with the most miles of relocation of trails and trailhead construction and the most modifications or replacements. Alternatives 2 and 3 would also designate off-highway vehicle use on the Davis Creek Trail for the use of off-highway vehicles that are less than or equal to 50 inches wide. This is not expected to impact visual quality because it would be an additional authorized use on an already existing trail.

It is expected that all of the treatments proposed in the action alternatives would meet the visual quality objectives of the Malheur Forest Plan, and not exceed the limits of visual impacts defined by maximum modification, modification, partial retention, and retention.

Scenic Stability

The scenic stability of the area is dependent on the conditions that favor resiliency to disturbances. Currently, much of the area is outside of the historical range of variability in ways that put the forest at greater risk of uncharacteristic wildfire. Under all action alternatives the planning area would receive treatments that would enhance the spatial and species diversity, scenic character attributes, and resilience of the forest canopy. These enhancements would protect large trees and old forest characteristics, and would develop future large tree character and spatial and species diversity within the existing overly dense stands and plantations. Vegetation density within forest stands would be reduced through thinning and fuels reduction treatments that would create more attractive, open, and structurally diverse conditions, favoring historically dominant species such as Douglas-fir, ponderosa pine, and western larch. These more attractive, open, and diverse stand structure and species conditions would also considerably reduce the risk of scenery-damaging ecosystem disturbances (pests, insects, disease, wildfires, etc.). More historical wildfire functions of the ecosystem would better perpetuate the Ragged Ruby planning area's attractive and historical "natural" scenic character attributes. Reductions in ecosystem risk to the planning area's vegetation scenery attributes would transform the scenic stability level from low (most vegetation attributes are threatened or absent) to moderate (most vegetation attributes are present and likely to be sustained). Alternative 2 would contribute the most toward scenic stability within the planning area because it would authorize the most silvicultural treatments, activity fuels treatments, and prescribed burning. Alternative 3 would also improve scenic stability, although to a lesser extent with fewer acres treated.

Road activities and recreation system changes are not expected to contribute to or detract from scenic stability because they would not greatly alter the scenic character of the area.

Cumulative Effects

Mining played a large role in the Ragged Ruby planning area, along with grazing and trapping. Substantial timber harvesting that facilitated the removal of the large ponderosa pine, western white pine, western larch, and Douglas-fir (early seral species) in the Ragged Ruby area began in the 1930s. These past harvest activities have created long-term visual effects in the area that overlap in time and space with the Ragged Ruby planning area.

Fire suppression over the last century has altered the natural fire regime in the Middle Fork John Day River drainage. The ingrowth of susceptible tree species and increased stand densities have helped create conditions promoting insect outbreaks. Visuals in the planning area were further impacted with insect outbreaks in the 1960s, 1970s, mid-1980s and early 1990s, creating many dead and down trees, or live trees with poor crowns, reduced growth, and dead or forked tops. While perhaps not immediately apparent to the casual viewer, stands are denser and with a different species composition than would have been experienced historically.

Ongoing recreation activities, grazing, and invasive plant treatments are not expected to decrease the visual quality of the Ragged Ruby planning area; effects are accounted for in the existing visual quality objective.

Potential projects implemented under the 2014 Aquatic Restoration Decision would maintain or improve the scenic integrity and stability of the affected areas.

Foreseeable activities planned or implemented in the area would perpetuate a modified scenic expression of the landscape. It is expected that this expression would improve as the present and foreseeable actions are of a lighter or more sensitive management approach than those of the past. The resiliency of the scenic attributes is expected to improve as management activities are carried out to maintain the vegetation within the historical range of variation. These practices should improve scenic integrity and stability. See Ragged Ruby Visuals Report for more information.

Summary of Effects

Table 93 provides a summary of the effects to scenery in the Ragged Ruby planning area.

Table 93. Summary table of scenery effects for the Ragged Ruby Project

Indicator	Alternative 1	Alternative 2	Alternative 3
Scenic integrity	Scenic vegetation diversity is impaired, too dense, or lacks extent of historical large trees. No positive wildfire influences on vegetation structure/species.	Treatments would improve the long-term scenic integrity by opening the stands up for increased visibility and visual diversity. Prescribed fire would improve conditions for fire-resistant species, which would indirectly improve landscape character attributes of large tree character and open stands that can withstand low-intensity fires.	Scenic integrity benefits would not measurably vary from alternative 2.

Indicator	Alternative 1	Alternative 2	Alternative 3
Scenic stability	**LOW** Project-wide, most vegetation scenery attributes are impaired. Others are absent or not likely to be sustained due to ecosystem stress (wildfire imbalance or excess of grand fir).	**MODERATE** Project-wide, vegetation would shift towards historical conditions of fire-adapted scenery attributes, including meadows, aspen, or diverse conifer canopy with more large, fire-adapted species. Proposed actions would reduce risk of scenery impairment from ecosystem disturbance events.	**MODERATE** Scenic stability project-wide would not measurably vary from alternative 2.
Meeting visual quality objectives	**PARTIAL RETENTION OR MODIFICATION** Existing disturbance is minor and widespread. Meets Malheur Forest Plan thresholds for all sensitive views. No new impacts, but a growing risk for ecosystem disturbances. **RETENTION** Existing disturbance is minor and widespread. Meets Malheur Forest Plan thresholds for all sensitive views (Vinegar Hill-Indian Rock Scenic Area). No new impacts, but a growing risk for ecosystem disturbances.	**PARTIAL RETENTION OR MODIFICATION** Widespread new minor disturbances within sensitive viewsheds. Would meet Malheur Forest Plan's visual quality objective thresholds for all sensitive views. Reduced risk of ecosystem disturbance events. **RETENTION** Widespread new minor disturbances within sensitive viewsheds (Vinegar Hill-Indian Rock Scenic Area). Would meet Malheur Forest Plan's visual quality objective thresholds for all sensitive views. Reduced risk of ecosystem disturbance events.	**PARTIAL RETENTION OR MODIFICATION** Would not measurably vary from alternative 2. **RETENTION** Would not measurably vary from alternative 2.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Forest Plan Objectives (pages IV-15 to IV-16)

- Manage other specified forest and county roads with a lower emphasis on maintaining visual quality (sensitivity level II). Meet the visual quality objectives of foreground partial retention and middleground modification in these corridor viewsheds. The effects of management activities would be obvious in these middlegrounds. *This visual quality objective would be met in the County Road 20.*
- Emphasize horizontal diversity in the visual corridors (both sensitivity level I and II). This will be experienced as one moves through the corridor, not as vertical diversity on every acre. Create this by developing a sequence of visual experiences utilizing group selection harvest techniques applied to small treatment units (0.25 to 5 acres) in foregrounds… The effect is to have a multi-aged appearance… *Treatments proposed in sensitive visual areas would promote horizontal diversity.*

Forest-wide Standards (page IV-27)

- Forest-wide standard 25: The minimum visual quality objective for the Forest is maximum modification. *This visual quality objective would be applied and met in the General Forest areas. Evidence of proposed harvest activities would be visible including skid trails, skyline corridors, temporary roads, and landings. Activities would be characteristic of surrounding areas.*

- Forest-wide standard 27: Rehabilitate landscapes containing negative visual elements. *Sensitive visual areas were impacted by harvest activities prior to the 1990 Malheur Forest Plan. Encouraging large-tree components, gap and clump structure, reduced surface and ladder fuels, and a more historical species composition would improve landscape visual elements over time.*

Management Area Standards

- Project activities would meet a visual quality objective of retention, partial retention, or modification for the visible and potentially visible areas (management area 14 standard 2, page IV-108).
- Fish and wildlife improvement/maintenance projects are designed and would be implemented to meet visual quality objectives (see direct and indirect effects above) (management area 14 standard 6, page IV-108).
- Timber harvest and related activities are designed to accomplish visual resource management objectives (see Appendix C – Project Design Criteria) (management area 14 standard 9, page IV-109).
- Foreground areas would be managed to meet visual quality objectives (see direct and indirect effects above). Alternatives 2 and 3 would benefit the health, resiliency, and visual appearances of the Ragged Ruby planning area's visual corridors (management area 14 standard 11, page IV-109).
- No regeneration or overstory removal harvesting would occur in foreground of sensitivity level I and II corridors (management area 14 standard 12, page IV-109).
- All middleground areas would be managed to meet visual quality objectives (see direct and indirect effects above) (management area 14 standard 14, page IV-109).
- Horizontal diversity and multi-age appearance of vegetation would be maintained within visual corridors by maintaining a mix of thinned and unthinned areas (spatial complexity) and variable thinning densities (management area 14 standard 16, page IV-109).
- Project activities would meet a visual quality objective of retention in Scenic areas for the visible and potentially visible areas (management area 14 standard 17, page IV-110 and management area 7 standard 7, page IV-91).
- Residues (fuels) would be managed to provide a natural-appearing landscape in visual corridors and to minimize visual effects (see Appendix C – Project Design Criteria) (management area 14 standards 27 and 28, page IV-111).

Socioeconomics

Regulatory Framework

Multiple statutes, regulations, and executive orders identify the general requirement for the application of economic and social evaluation in support of Forest Service planning and decision making. These include, but are not limited to, the Multiple-Use Sustained Yield Act of 1960, National Environmental Policy Act of 1969, the Planning Act of 1974, the Council on Environmental Quality regulations for implementing the National Environmental Policy Act (40 Code of Federal Regulations 1500 to 1508), the Office of Management and Budget Circular A-94, Forest Service Manual 2430. Forest Service Handbook 2409.18, Handbook 2409.19, chapter 60, the Code of Federal Regulations for the National Environmental Policy Act (40 Code of Federal Regulations 1502.23), Executive Order 12898, the Civil Rights Act of 1964, and Title VI of the Act, Nondiscrimination in Federally Assisted Programs, as amended (42 United States Code 2000d through 2000d-6).

The Malheur Forest Plan includes Forest-wide management goals to:

- Forest goal 24: Provide a sustained flow of timber for lumber, fiber, and/or associated wood products at a level that will contribute to economic stability, while providing for regional and national forest management (USDA Forest Service 1990a, page IV-2).
- Forest goal 25: Provide and utilize wood fiber in the form of sawtimber, fiber, and/or associated wood products, while minimizing losses and maximizing outputs in a cost-effective manner, consistent with the various resource objectives and environmental standards (USDA Forest Service 1990a, page IV-2).
- Forest goal 26: Provide an economic return to the public (USDA Forest Service 1990a, page IV-2).
- Forest goal 42: Contribute to the social and economic health of communities, which are significantly affected by national forest management (USDA Forest Service 1990a, page IV-3).
- Forest-wide standard 103: Timber harvest is prohibited on lands classified as unsuitable for timber management except when necessary to accomplish multiple-use objectives other than timber production. Examples include, but are not limited to, timber removal for right-of-way clearings, research, public safety, improvement of administrative sites, wildlife needs, Christmas tree cutting, firewood cutting, control of insect and disease epidemics that threaten adjacent land suitable for timber management on non-National Forest lands, or removal of volume lost through catastrophic mortality (USDA Forest Service 1990a, page IV-38).

In depth information on the relevant laws, regulations, and policies is described in greater detail in the Ragged Ruby Socioeconomic Report.

Resource Indicators

The analysis indicators for assessing effects of each alternative and for comparing alternatives are included in Table 94.

Table 94. Resource elements, indicators, and measures for assessing effects to socioeconomics

Resource element	Resource indicator	Measure	Source
Market values	Project feasibility Economic efficiency Employment and income	Present net value, employment, income	Forest Service Manual 2430; Forest Service Handbook 2409; USDA Forest Service 1990a; USDA Forest Service 2015g
Environmental justice	Race and ethnicity Poverty	Discussion in text	Executive Order 12898; 1964 Civil Rights Act

Market Values

Affected Environment

Methodology

The analysis of economic effects considers market values in a project feasibility, economic efficiency analysis, as well as employment and income. White et al. (2015, 2016) was used to describe the existing economic condition of the area.

Existing Condition

In 2011, the Malheur National Forest, in collaboration with the Blue Mountains Forest Partners and Harney County Restoration Collaborative (collectively, the Southern Blues Restoration Coalition), applied to the Collaborative Forest Landscape Restoration Program and was awarded funding to treat approximately 272,000 acres by 2019. The goal of this program (the Southern Blues Restoration Program) is "science-based ecosystem restoration of forested landscapes," and also seeks to encourage economic and social sustainability, leverage local resources with national and private resources, and benefit local rural economies through the utilization of forest restoration byproducts[35] (White et al. 2015).

Monitoring for this program by the University of Oregon's Ecosystem Workforce Program during 2012 and 2013 showed an economic increase in job creation in Grant and Harney counties, especially in the categories of service contracts and lumber processing at the local mill (Malheur Lumber Company) (White et al. 2015). Researchers estimated that for every one job directly supported doing Collaborative Forest Landscape Restoration Program work or in the mill, another three-quarters of a job was supported in the local economy. They also found that businesses located in Grant and Harney counties were able to capture about two-thirds of the value of the service contracts for Collaborative Forest Landscape Restoration Program work. That was a larger share of local capture than had been occurring for other service contracts for restoration on the Malheur National Forest in recent years. Local businesses were especially successful at getting contracts to complete labor-intensive Collaborative Forest Landscape Restoration Program work (White et al. 2015).

Following these successes, the Southern Blues Coalition applied for and was awarded an expansion of Collaborative Forest Landscape Restoration Program funding to treat an additional 66,000 acres on the Malheur National Forest. Additional research by the University of Oregon's Ecosystem Workforce Program in 2014 found that timber harvesting and milling jobs, and the number of service contracts awarded per year have continued to increase relative to baseline conditions (2004 through 2013, minus 2010) (White et al. 2016). This expansion in jobs and income supported on the Malheur National Forest was a direct reflection of increased timber volume sold in the Malheur 10-year stewardship contract (designed to help keep jobs and forest products in the local economy) and the establishment of the Southern Blues Collaborative Forest Landscape Restoration Program. Furthermore, they also found that in places where there have been federal investments in accelerated restoration, businesses say their outlooks are improved and hiring has expanded. Businesses doing the restoration work reported that accelerated restoration afforded them the opportunity to expand their skills, hire additional workers, and ensure that pay met or exceeded federal contracting requirements (White et al. 2016).

[35] For an overview of the Collaborative Forest Landscape Restoration Program see: http://www.fs.fed.us/restoration/CFLRP/overview.shtml.

Currently, the Malheur National Forest is in the fifth year of the 10-year stewardship contract. Approximately 70 percent of the Malheur National Forest's fiscal year harvest volume target is to be included in the stewardship contract, and the remaining 30 percent is to be included in regular timber sale contracts. This ensures that forest products and the associated jobs would not only be available to local economy, but would also be available to potential outside bidders or mills that may be interested. Activities authorized in the Ragged Ruby Project could be included in regular timber sale contracts, stewardship contracts, and/or other service work contracts.

Environmental Consequences

Methodology

Project Feasibility

Project feasibility is used to determine if a project is feasible, that is, will it sell given current market conditions. The project is considered feasible if the stumpage value exceeds the base rate. If the feasibility analysis indicates that the project is not feasible (stumpage value is less than the base rate), the project may need to be modified. Infeasibility indicates an increased risk that the project may not attract bids and may not be implemented. Refer to the Ragged Ruby Socioeconomic Report for information on how project feasibility is determined.

Region 6's Transaction Evidence Appraisal system (TEA_ECON) was used to estimate the sale revenues based upon the estimated tentative advertised bid rates per hundred cubic feet. These bid rates indicate the economic viability of harvesting timber.

Economic Efficiency

The analysis of economic efficiency is a comparison of costs and benefits that can be quantified in terms of actual dollars spent or received in the impacted area. The economic efficiency measures discussed below, the Ragged Ruby Environmental Impact Statement, and other Ragged Ruby specialist reports provide a complete comparison of the alternatives.

The alternatives are compared using an economic efficiency measure called present net value. This measure is generated with the use of a program developed by the USDA Forest Service called Quicksilver and depends on a principle called the "time value of money." The idea is that money received now is worth more than the same amount received in the future (in other words, money received now could be put to some advantageous use or interest could accrue until the future date). Using this concept, benefits and costs occurring in the future must be discounted back to represent their current value. A 4 percent discount rate is commonly used for evaluations of long-term investments and operations in land and resource management by the Forest Service (Forest Service Manual 1971.21). This discount rate is used in the calculation of present net value.

According to Office of Management and Budget Circular A-94, present net value is the standard criterion for deciding whether a project is economically justifiable. Present net value is a way of comparing all monetarily valued costs and benefits, and is calculated by subtracting the discounted sum of costs from the discounted sum of benefits. A positive present net value suggests the discounted sum of benefits is greater than the discounted sum of costs, and a negative present net value suggests the opposite.

Management of the Forest is expected to yield positive benefits, but not necessarily economic benefits. Costs for restoration activities are based on recent experienced costs and professional estimates. Non-harvest related costs are included in the present net value analysis, but they are not included in appraised timber value.

Employment and Income

Timber-related job estimates are based on the assumption of a direct relationship between changes in harvest volumes and manufactured output (a percentage change in harvest volume would result in corresponding change in manufactured output and employment). In other words, a percentage change in harvest volume would result in corresponding change in manufactured output and employment. Job estimates include temporary, permanent full-time, and part-time employment. Employment effects from prescribed burning, aquatic and wildlife restoration, road system changes, and recreation system changes are not quantitatively analyzed due to lack of a program to run the analysis. The estimates provided by this analysis also do not include unpaid family workers or sole proprietors.

Levels of harvest volume by alternative would affect timber-related employment and income in several ways:

- Directly – employment associated with harvesting, logging, mills, and processing plants for sawtimber, pulp, chips, veneer, and plywood.
- Indirectly – industries that supply materials, equipment, and services to these businesses.
- Induced – personal spending by the business owners, employees, and related industries.

Several factors would influence the ability of any one county or community to experience the largest extent of the timber harvest-related employment and income effects. The financial viability of timber sale proposals would influence whether potential purchasers close to the planning area could compete with other purchasers to acquire the majority of the supply. Changes to bid rates would likely occur during appraisal, depending on actual market conditions at that time. Employment projections would depend on other factors such as market conditions, quality and quantity of the volume offered for sale, timing of the offerings, and financial conditions of local firms.

Agriculture, manufacturing (particularly wood products), and food processing are important sources of employment and income in this region. Reliance on timber and forage from federal lands is moderate to high in several counties in the zone of influence (Haynes and Horne 1997). Many communities in the economic impact zone are closely tied to the Forest in both work activities and recreation. Cattle production and forest products provide the core employment for Grant and Harney counties. The forest products industry includes two major lumber mills and several logging companies.

Assumptions

The following describes the assumptions utilized for analyzing the effects of implementing the alternatives based upon estimated contract investments needed to implement planned activities of the project.

Numerous contracts will be offered to accomplish the planned activities. The potential investments have been incorporated into an economic model that provides a relative comparison between alternatives in terms of potential economic effects to local communities. This analysis focuses on the potential investments to implement the ground activities associated with the project and compares modeled effects on employment, income, and economic impacts within communities.

Table 95 displays costing assumptions utilized to calculate potential investments.

Table 95. Contract investment assumptions and alternative comparison

Type of work	Economic transaction type	Price per unit[1]	Units	Alternative 2	Alternative 3
Sawtimber	Benefit	$29.96	CCF[2]	24,720	19,080
Non-commercial thinning (dry pine, mixed conifer, dry meadow and scabland flat bunchgrass, western white pine, and whitebark pine restoration)	Cost	$150	acres	8,140	7,140
Fuels reduction – piling or lop and scatter	Cost	$300	acres	8,140	7,140
Fuels reduction – pile burning of hand or machine piles	Cost	$50	acres	8,140	7,140
Fuels reduction – understory burn covering a larger area	Cost	$100	acres	34,000	31,500
Aspen restoration	Cost	$200	acres	10	10
Bat gate installation	Cost	$20,000	gates	2	2
Road maintenance	Cost	$1,900	miles	173	156
Road reconstruction	Cost	$10,000	miles	7.5	7.5
Temporary road construction	Cost	$3,500	miles	12.4	11.6
Road decommissioning – active	Cost	$3,000	miles	0.2	0.2
Road closure – earthen berm installation	Cost	$210	berms	16	16
Road closure – gate installation	Cost	$3,000	gates	2	2
Road closure (for example, stormproofing, etc.)	Cost	$3,500	miles	35	35
New trail construction	Cost	$2,000	miles	2.8	2.8
Trail maintenance with minor re-routing	Cost	$75	miles	18.7	18.7
Trailhead – erect signage	Cost	$3,500	sites	4	4
Trailhead – develop new parking area	Cost	$15,000	sites	3	3
Interpretive sign installation	Cost	$750	signs	2	2
Other sign installation (for example, to discourage bicyclists from going into the North Fork John Day Wilderness)	Cost	$750	signs	2	0

[1] Prices per unit are all approximate; actual costs and benefits during implementation would vary.

[2] CCF: one hundred cubic feet

Spatial and Temporal Context for Effects Analysis

Although individuals and communities over a wide geographic area use national forest resources, the residents and businesses of counties near the Forest depend most heavily on the availability of the resources. Consequently, the effects of forest management on economic factors are strongest within these areas. For this reason, the Malheur National Forest primary zone of influence for economic impact is defined as Baker, Crook, Grant, Harney, Malheur, and Wallowa counties in Oregon (USDA Forest Service 2016).

The temporal boundaries for analyzing the direct, indirect, and cumulative effects to market values is the next 10 years because that is the span of time that it is likely take to implement the project.

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

There are several ongoing and foreseeable projects in the six counties in various stages of planning that potentially may add to the Forest's annual timber sales, stewardship contracts, service contracts, and other opportunities for 2018 and beyond. Projects signed within the past few years could have timber products offered, with subsequent employment provided, or have the potential for contracting work awarded from fuels treatments, aquatic restoration projects, or recreation improvements in these planning areas. Other activities such as mining, special uses, and range allotments also provide market values in Baker, Crook, Grant, Harney, Malheur, and Wallowa counties. See the Ragged Ruby Socioeconomic Report for more detail about ongoing and foreseeable projects and activities contributing to market values on the Malheur National Forest. Ongoing and foreseeable projects on the Malheur National Forest are expected to cumulatively add to the employment and income of Baker, Crook, Grant, Harney, Malheur, and Wallowa counties during the life of the Ragged Ruby Project.

Alternative 1 – No Action

Direct and Indirect Effects

If the Ragged Ruby Project is not undertaken, no direct effects on the local economy would occur (for example, to employment or income). In addition, potential revenue from the sale of wood products would not be available. Indirect effects on local economic conditions could occur as a result of alternative 1; however, estimates of these changes are not available. For example, the lack of fuels treatments could increase wildland fire related costs such as property loss, lost revenues, and suppression costs. Fire suppression costs and risks to life and property should be less when wildland fires occur where hazardous fuels have been treated compared to areas where fuels have not been treated. This is commonly accepted since fires in non-treated areas generally burn hotter, flame lengths are higher, and fires in tree canopies are more likely. However, it is not possible to predict the level and costs of non-prescribed wildland fire under alternative 1.

Cumulative Effects

Because of the competitiveness of the market and its global nature, alternative 1 would not cumulatively affect prices, costs, or harvest viability of other present or future timber sales in the economic impact zone, unless there were no other timber sales offered on the Malheur National Forest.

The selection of the no action alternative would not contribute to the recent increase in timber-related employment in the rural communities of Baker, Crook, Grant, Harney, Malheur, and Wallowa counties, but may reduce employment in the short-term.

Alternative 2 and 3

Direct and Indirect Effects

Project Feasibility

The estimation of project feasibility is based on Region 6's Transaction Evidence Appraisal system (TEA_ECON), which is a residual value timber appraisal model that takes into account logging systems, timber species and quality, volume removed per acre, lumber market trends, costs for slash treatment, and the cost of specified roads, temporary roads, and road maintenance. The predicted stumpage rate from the feasibility analysis was compared to the base rate (revenues considered essential to cover regeneration plus minimum return to the Federal treasury). The stumpage rate and base rate are displayed in Table 96. The base rate of $1.33 per hundred cubic feet and the appraised stumpage rate of positive $107.78 per hundred cubic feet for alternative 2 and positive $109.78 per hundred cubic feet for alternative 3 indicate that alternatives 2 and 3 are feasible.

Table 96. Project feasibility and economic efficiency summary for alternatives 2 and 3 (2017 dollars)

Measure	Alternative 2	Alternative 3
Timber – Acres harvested	6,180	4,771
Timber – Sawtimber volume harvested (CCF[1])	24,720	19,080
Timber – Base rates ($/CCF)	$1.33	$1.33
Timber – Appraised stumpage rate ($/CCF)	$107.78	$109.78
Timber – Predicted high bid ($/CCF)	$29.96	$29.96
Timber – Total revenue ($)	$740,693	$571,695
Timber harvest and required design criteria PNV[2] ($)	-$27,091.69	-$28,865.03
All project activities PNV ($)	-$7,449,186	-$6,825,062

[1] CCF: one hundred cubic feet

[2] PNV: present net value

Economic Efficiency

As discussed above, the present net value is the discounted sum of benefits minus discounted costs associated with each scenario. The economic efficiency analysis is for both the timber harvest and other restoration activities associated with the project. Costs for sale preparation, sale administration, and ecosystem restoration are included; all costs, timing, and amounts were developed by the specialists on the project's interdisciplinary team (see Table 95). The expected revenue is usually the corresponding predicted high bid of $29.96 per hundred cubic feet, from the sale feasibility analysis times the amount of timber harvested. Present net value for all project activities was calculated using Quicksilver, a program for economic analysis of long-term, on-the-ground resource management projects.

This analysis is not intended to be a comprehensive benefit-cost or present net value analysis that incorporates a monetary expression of all known market and non-market benefits and costs that are generally used when economic efficiency is the sole or primary criterion upon which a decision is made. Many of the values and costs associated with natural resource management are best handled apart from, but in conjunction with, a more limited benefit-cost framework. Therefore, they are not described in financial or economic terms for this project, but rather are discussed in the various resource sections of the environmental impact statement and specialist reports. When evaluating trade-offs, the use of efficiency measures is one factor of many used by the decision maker in making the decision.

Table 96 summarizes the project feasibility and economic efficiency, including the base rate, stumpage rate, predicted high bid, total revenue, and present net value calculations. The first present net value indicates the economic efficiency of the timber sale or stewardship contract, including all costs and revenues associated with the timber harvest and required design criteria (information obtained from the sale administrator assigned to the project). The second present net value includes all costs for the proposed action, including other restoration activities (see

Table 95). A 4 percent discount rate was used over a period of 10 years (2018 to 2028), the estimated time required for full implementation of the project.

Table 96 indicates that alternatives 2 and 3 are economically inefficient for the timber harvest and required design criteria (-$27,091.69 for alternative 2 and -$28,865.03 for alternative 3), as well as for all restoration activities noted in Table 95 (-$7,449,186 for alternative 2 and -$6,825,062 for alternative 3), as indicated by the negative present net value.

Indirect effects on economic efficiency could occur as a result of alternatives 2 and 3, however, estimates of these changes are not available. It is anticipated that fuels treatments under this alternative would contribute to fuels conditions that would lead to more resiliency to wildland fire. This would tend to reduce the threat to human life and decrease wildland fire related costs such as property loss, lost revenues, and suppression costs.

Employment and Income

In general, the primary effect on timber harvest related employment would occur from commercial harvesting associated with alternatives 2 and 3 over the next 2 years. Financially viable sales would be necessary to provide opportunities for timber harvest-related employment. Non-commercial activities would also provide jobs through contracting; however, this is not estimated in the employment estimates in Table 97.

See Table 97 for total estimates (direct, indirect, and induced) of employment (full and part time) and labor income that may be attributed to the alternatives. Timber harvest would be responsible for the majority of the total jobs the total labor income. The distribution of economic impacts would depend on the location of the timber purchaser who was awarded the contracts at the time of the sale, the availability of equipment and skills in the economic impact zone, and the location and availability of wood processing facilities and related infrastructure. Processors outside of northeastern Oregon could potentially bid on the sales and distribute the jobs and income beyond the region.

Table 97. Summary of timber harvest employment (full- and part-time jobs) and income (2017 dollars)

Category	Alternative 2	Alternative 3
Employment	94	73
Income	$2,626,635	$2,027,354

Cumulative Effects

Estimates for tentative advertised sawtimber bid rates for alternatives 2 and 3 are within the range of rates experienced by the three Blue Mountain forests (Malheur, Umatilla, and Wallowa-Whitman) within the last 2 years. There are also residual effects from past timber sales within the subwatershed which would not have a detrimental effect on the viability of harvest of alternatives 2 and 3. These past actions are described in detail in Appendix E – Past, Ongoing, and Reasonably Foreseeable Actions.

Employment and Income

Alternatives 2 and 3 would provide some potential short-term economic relief by utilizing commercially thinned sawlogs. This material would potentially be used to support the sawmill operating in John Day. The amount of local economic activity would be determined by whether the purchaser is local or distant, which mill(s) local or distant get the lumber, and the price for the lumber. These cumulative economic effects could cause beneficial "quality of life" social effects, especially when combined with other ongoing Forest Service timber sales within Baker, Crook, Grant, Harney, Malheur, and Wallowa counties that are currently providing employment and income.

There are foreseeable projects in the six counties in various stages of planning that may potentially add to the Forest's annual timber offerings for 2018 and beyond. For example, the Camp Lick and Austin projects on the Blue Mountain Ranger District, Cliff Knox Project on the Prairie City Ranger District, and the Rattlesnake Project on the Emigrant Creek Ranger District. These ongoing and foreseeable projects are expected to add cumulatively to the employment and income of Baker, Crook, Grant, Harney, Malheur, and Wallowa counties during the life of the Ragged Ruby Project.

Economic Efficiency

The economic efficiency of past, ongoing, or foreseeable future activities would not affect, or be affected by any effects that have not already been described.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Alternatives 2 and 3 are consistent with the following Malheur Forest Plan objectives and standards, these alternatives would:

- Provide a sustained flow of timber for lumber and associated wood products that would contribute to economic stability (USDA Forest Service 1990a, Forest goal 24, page IV-2).
- Provide and utilize wood fiber in the form of sawtimber and associated wood products in a manner which will minimize losses and maximize outputs in a cost-effective manner, consistent with the various resource objectives and environmental standards (USDA Forest Service 1990a, Forest goal 25, page IV-2).
- Provide an economic return to the public (USDA Forest Service 1990a, Forest goal 26, page IV-2).
- Contribute to the social and economic health of communities which are significantly affected by National Forest management (USDA Forest Service 1990a, Forest goal 42, page IV-3).
- Timber harvest is prohibited on lands classified as unsuitable for timber management except when necessary to accomplish multiple-use objectives other than timber production (USDA Forest Service 1990a, Forest-wide standard 103, page IV-38).

Environmental Justice

Affected Environment

Methodology

Environmental justice refers to the fair treatment and meaningful involvement of people of all races, cultures, and incomes with respect to the development, implementation, and enforcement of environmental laws, regulations, programs, and policies. Executive Order 12898 requires Federal agencies to "identify and address the… disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations."

According to the Council on Environmental Quality's Environmental Justice Guidelines for the National Environmental Policy Act (1997) "minority populations should be identified where either: (a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis." The discussion below shows that the analysis area population is predominately white and significantly less diverse than the general United States population. Thus, the U.S. Census American Community Survey data suggest minority populations in the analysis area do not meet the Council on Environmental Quality's Environmental Justice criterion (USDC Census Bureau 2016).

Council on Environmental Quality guidance on identifying low-income populations states "agencies may consider as a community either a group of individuals living in geographic proximity to one another, or a set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effect." Grant and Harney counties have a higher percent of families below the poverty level than the United States. Therefore, the analysis area meets the Council on Environmental Quality's Environmental Justice criterion for low-income populations.

The emphasis of environmental justice is on health effects and/or the benefits of a healthy environment. The Council on Environmental Quality has interpreted health effects with a broad definition: "Such effects may include ecological, cultural, human health, economic or social impacts on minority communities, low-income communities or Indian Tribes …when those impacts are interrelated to impacts on the natural or physical environment" (CEQ 1997).

Spatial and Temporal Context for the Existing Condition

The spatial boundaries for analyzing the direct, indirect, and cumulative effects to environmental justice include Baker, Crook, Grant, Harney, Malheur, and Wallowa counties, because those are the counties economically associated with the Malheur National Forest (USDA Forest Service 2016).

Existing Condition

Race and Ethnicity

The analysis area population is predominately white (91.4 percent in Baker County, 88.6 percent in Crook County, 92.0 percent in Grant County, 87.2 percent in Harney County, 62.0 percent in Malheur County, and 93.7 percent in Wallowa County) and significantly less diverse than the general United States population (62.0 percent) (USDC Census Bureau 2016).

Poverty

Poverty is an important indicator of both economic and social well-being. Individuals with low incomes are more vulnerable to a number of hardships which may negatively affect their health, cognitive development, emotional well-being, and school achievement, and promote socially unacceptable behavior (Hopson 2011). In general, low income individuals tend to rely more heavily on natural resources and depend more directly on national forests for sustenance. Since these individuals would be more vulnerable to changes in the management of local resources, it is important for forest management to understand how these forest users may be affected by changing forest uses. Following the Office of Management and Budget's Directive 14, the Census Bureau uses a set of income thresholds that vary by family size and composition to detect who is classified as poor. If the total income of an individual or family falls below the relevant poverty threshold, the individual or family is classified as being below the poverty level.

Overall, 2015 estimates of the share of people living below the poverty level were higher in Crook (17.7 percent), Harney (16.4 percent), Malheur (24.8 percent), and Wallowa (18.9 percent) counties and equal to or lower in Baker (15.1 percent) and Grant (14.9 percent) counties than at the national level (15.1 percent) (USDC Census Bureau 2016).

Environmental Consequences

Methodology

Impacts to environmental justice factors of Baker, Crook, Grant, Harney, Malheur, and Wallowa counties from the proposed actions of this project are qualitatively described in the analysis below.

Spatial and Temporal Context for Effects Analysis

The spatial boundaries for analyzing the direct, indirect, and cumulative effects to environmental justice include Baker, Crook, Grant, Harney, Malheur, and Wallowa counties, because those are the counties economically associated with the Malheur National Forest (USDA Forest Service 2016).The temporal boundaries for analyzing the direct, indirect, and cumulative effects to environmental justice are from 2015 (most recent U.S. Census Bureau data; USDC Census Bureau 2015), until 2028 (likely duration of project implementation).

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

There are several ongoing and foreseeable projects in the two counties in various stages of planning that potentially may contribute to employment opportunities and impact firewood cutting and hunting opportunities (for example, the Galena and Big Mosquito projects).

Alternative 1 – No Action

Direct and Indirect Effects

As indicated in the Existing Condition section above, low-income populations exist in the analysis area. While alternative 1 is not expected to have a disproportionately high and adverse human health or environmental effects on these communities, increased susceptibility to wildfire could result. Consequently, additional unmeasurable indirect economic effects associated with increases in wildland fire-related costs are possible, which could result in impacts to local communities. However, there is no reason to suspect that any impacts would disproportionately affect low income populations.

Cumulative Effects

Because there are no direct or indirect effects, no cumulative effects would occur.

Alternatives 2 and 3

Direct and Indirect Effects

Alternatives 2 and 3 would have no known adverse effects that would be disproportionately high to any ethnic minorities, people with disabilities, and low-income groups. Low income communities would mainly be affected by economic impacts connected with contractors implementing project activities, providing jobs associated with project activities. The actions would occur in a remote area, and nearby communities would mainly be affected by economic impacts related to contractors implementing project activities. Racial and cultural minority groups are often well represented in the workforce that would implement project activities.

Contracts contain clauses that address worker safety. The primary services needed by the workers would be food and shelter. Local businesses that can supply food (grocery stores and restaurants) and other services would capture most of the money being spent by the workers in the area. Since these businesses have supported similar workforces in the past, capital expansion would likely not be required. Effects on civil rights, including those of minorities and women, would be minimal. Activities associated with alternatives 2 and 3 would be governed by Forest Service contracts, which are awarded to qualified purchasers regardless of race, color, sex, religion, etc. Such contracts also contain nondiscrimination requirements. Some contracts are reserved for award to minority businesses under the USDA Office of Small and Disadvantaged Business Utilization and the Small Business Administration. While the proposed activities would create jobs and provide consumer goods, no quantitative output, lack of output, or timing of output associated with these projects would affect the civil rights, privileges, or status quo of consumers, minority groups, or women.

Firewood cutting and hunting are popular activities on the Malheur National Forest, engaged in by many members of the public. Concerns have been raised regarding continued motorized access to engage in these and other activities on the Forest. Alternatives 2 and 3 would reduce the miles of open (maintenance level 2 and 3) National Forest System roads in the planning area from 115.7 to 111.0 miles. This reduction in open roads is balanced with the resource needs of wildlife and fisheries habitat, consistent with the multiple-use objectives for National Forest System lands and the Malheur Forest Plan. Open roads would continue to be available for cutting firewood, hunting, and other activities. A wide variety of hunting opportunities are enjoyed in the area with the appropriate state-issued licenses and permits. Opportunities include multiple seasons for big game species like mule deer, whitetail deer, elk, and bear. Hunters also pursue upland game birds like turkeys, ruffed grouse, and blue grouse in the area. Many of the routes proposed for closing are redundant roads with alternative access into the same areas. The reduction of 4.7 miles of open roads, or approximately 4.1 percent, would not only expand big game security and help address resource concerns in the area, but would also further enhance the quality of hunting by offering more opportunity for those who like to hunt in less motorized areas, while continuing to provide adequate access to motorized users. Access would be maintained to developed recreation sites, trail access points, and popular dispersed campsites (see Ragged Ruby Wildlife and Recreation reports).

Cumulative Effects

Ongoing and foreseeable projects on the Malheur National Forest are expected to cumulatively add to forest management employment opportunities in Grant and Harney counties during the life of the Ragged Ruby Project. These projects include (but are not limited to) the Galena, Big Mosquito, Magone, and Camp Lick projects. Many of these ongoing projects also include a reduction in open road miles, which would cumulatively increase big game security habitat and reduce motorized road access.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

This analysis follows Executive Order 12898 by identifying that the project would not have any disproportionately high and adverse human health or environmental effects on minority and low-income populations.

Special Areas

Regulatory Framework

Wilderness is defined as Federal land retaining its primeval character and influence without permanent improvements or human habitation as defined under the 1964 Wilderness Act.

Inventoried roadless areas were identified in the 2001 Roadless Area Conservation Rule (36 Code of Federal Regulations 294.11). These areas were set aside through administrative rulemaking and have provisions for the protection of inventoried roadless areas.

Potential wilderness areas (or areas with wilderness characteristics) – The inventory process for areas with wilderness characteristics is identified as a forest planning level analysis and is not intended to be conducted on a project-level basis. The Malheur National Forest is current undergoing forest plan revision, and the June 2018 Final Environmental Impact Statement for the Malheur, Umatilla, and Wallowa-Whitman National Forests Land Management Plans (USDA Forest Service 2018c) includes an analysis to identify areas with wilderness characteristics and identified two preliminary administratively recommended wilderness areas on the Malheur National Forest.

Areas identified as **other undeveloped lands** have no history of harvest activity, do not contain forest roads, and are not designated as a wilderness area, identified as an inventoried roadless area, or included in the areas with wilderness characteristics inventory. They are stand-alone polygons of 1,000 to 5,000 acres in size. There are no forest-wide or management area standards specific to other undeveloped lands in the Malheur Forest Plan; however, there are sometimes overlapping management areas that emphasize a non-motorized condition or prohibit harvest of timber. All lands, including other undeveloped lands, are managed consistent with Forest-wide standards and guidelines and by designated Malheur Forest Plan management area allocations.

Resource Indicators

The resource indicators in Table 98 are used for assessing the effects to special management areas. The majority of the indicators are essentially the same as disclosed elsewhere in chapter 3 and are not reiterated in this section.

Table 98. Resource indicators for special management areas

Resource element	Resource indicator	Measure	Source
Wilderness	Presence of noticeable human activity	• Smoke (air quality) • Noise	1964 Wilderness Act
Inventoried roadless areas	Roadless area characteristics	Qualitative discussion of impacts to: • High quality or undisturbed soil, water, and air • Sources of public drinking water • Diversity of plant and animal communities • Habitat for threatened, endangered, proposed, candidate, and sensitive species and for those species dependent on large, undisturbed areas of land • Primitive, semi-primitive, non-motorized and semi-primitive motorized classes of dispersed recreation • Reference landscapes • Natural appearing landscapes with high scenic quality • Traditional cultural properties and sacred sites • Other locally identified unique characteristics	Forest Service Roadless Area Conservation Rule (36 Code of Federal Regulations 294)

Resource element	Resource indicator	Measure	Source
Potential wilderness areas	Presence of noticeable human activity	• Smoke (air quality)	1964 Wilderness Act; Forest Service Handbook 1909.12 chapter 70
Other undeveloped lands	Undeveloped character	• Change in acres of other undeveloped lands • Intrinsic physical and biological resources (soil, water, wildlife, recreation, fisheries, etc.) • Intrinsic social values (apparent naturalness, solitude, remoteness)	Public comment

Wilderness

Affected Environment

Methodology

Geographic information system layers were used to identify the proximity of wilderness areas to the planning area.

Existing Condition

There are no designated wilderness areas within, nor directly adjacent to the Ragged Ruby planning area. The closest designated wilderness is the North Fork John Day Wilderness on the Umatilla National Forest, located approximately 0.5 miles to the northeast of the planning area. In addition, the Strawberry Mountain Wilderness is located approximately 16 miles south of the planning area and the Monument Rock Wilderness is located approximately 20 miles southeast of the planning area.

Environmental Consequences

Methodology

Impacts to wilderness areas were assessed using the methodologies described for air quality in the Air Quality section, and for noise in the Recreation Resources section.

Information sources included analysis contained in the Silviculture; Soils; Watershed; Fire, Fuels, and Air Quality; Botanical Resources; Wildlife; Aquatics; Recreation; and Heritage reports. Geographic information system layers were also used to compare wilderness to proposed activities (for example, upland restoration activities; watershed, fisheries, and wildlife habitat restoration; prescribed burning; road activities; and recreation system changes).

The spatial boundaries for analyzing the indirect and cumulative effects to wilderness are the North Fork John Day, Monument Rock, and Strawberry Mountain wilderness areas, because these areas are all located relatively close to the Ragged Ruby planning area. There would be no direct effects to wilderness areas because none are located within the Ragged Ruby planning area. The temporal boundaries for analyzing the indirect and cumulative effects are short term during project implementation (approximately 1 to 10 years), because that is when implementation of project activities could occur that would impact air quality and noise levels.

Alternative 1 – No Action

Alternative 1 would have no direct, indirect, or cumulative effects on wilderness character, including solitude, because no activities would occur adjacent to or within any designated wilderness.

Alternatives 2 and 3

Direct and Indirect Effects

Alternatives 2 and 3 would have no direct effects on wilderness character because no project activities would occur within any designated wilderness area.

There would be no indirect effects from heavy equipment use (upland, watershed, fisheries, and wildlife restoration, and road activities) creating noise heard in the southern part of the North Fork John Day Wilderness because of the topography in the Vinegar Hill-Indian Rock Scenic Area that is located between the nearest treatment area and the wilderness. There would be no indirect effects from the recreation system changes because work would be minor re-routing using primarily hand tools, which would not cause noise heard in the North Fork John Day Wilderness.

There may be indirect effects from the prescribed burning causing short-term views of smoke in the North Fork John Day, Strawberry Mountain, or Monument Rock wilderness areas.

Alternative 2 may have some indirect effects due to the proposed extensions of the Princess and Tempest Mine trails, which would connect to the Blue Mountain, Lost Creek, and South Fork Desolation trails (which access the North Fork John Day Wilderness). There is some potential that bicyclists could continue on from the Princess and Tempest Mine trails to access this wilderness area where their use is prohibited. However, this potential would be minimized by signage at the junction of the Princess and Tempest Mine trails and further down the Princess Trail notifying trail users where bicycle use is not allowed.

Cumulative Effects

There may be short-term cumulative effects from smoke in the North Fork John Day, Strawberry Mountain, or Monument Rock wilderness areas if prescribed burning implemented on the Malheur, Umatilla, or Wallowa-Whitman national forests; nearby agency lands; or nearby private lands overlaps in time. However, as stated above, all burning activities on the Forest would comply law, regulation, and policy to minimize smoke impacts.

There would be no cumulative effects from the upland, watershed, fisheries, and wildlife restoration; road activities; and recreation system changes because there would be no direct or indirect effects.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Alternatives 1, 2, and 3 would be in compliance with the 1964 Wilderness Act because project activities would not impact the nearby wilderness areas' natural conditions.

Inventoried Roadless Areas

Affected Environment

Methodology

Geographic information system layers were used to identify past and current activities within the inventoried roadless areas.

Existing Condition

There are portions of the Dixie Butte and Greenhorn Mountain inventoried roadless areas within the Ragged Ruby planning area. The Dixie Butte Inventoried Roadless Area encompasses approximately 12,110 acres, with approximately 3,100 acres located within the Ragged Ruby planning area (approximately 9 percent of the planning area). The Greenhorn Mountain Inventoried Roadless Area encompasses approximately 16,197 acres, with approximately 4,600 acres located within the Ragged Ruby planning area (approximately 14 percent of the planning area).

Timber harvest, firewood gathering, livestock grazing, fire suppression, mining, and dispersed recreation (for example, hunting and camping) has occurred within the planning area and surrounding vicinity for over 100 years. Over the past several decades, fire suppression has altered natural ecological processes and helped create the stand composition and structure now present.

Whitebark pine (a candidate for federal listing) is located at high elevations within the Dixie Butte and Greenhorn Mountain inventoried roadless areas. Decreased vigor due to white pine blister rust and increased competition from subalpine fir (due to fire suppression) makes whitebark pine susceptible to tree mortality from mountain pine beetle. Most of the recent whitebark pine tree mortality in the inventoried roadless areas is attributed to mountain pine beetle, which is slowly killing the larger trees.

Western white pine is found in cooler, moister areas of the Middle Fork John Day River drainage and within the Dixie Butte. It is currently infected with low levels of white pine blister rust, has increased competition due to fire suppression, and is being killed by mountain pine beetle. Mountain pine beetle activity in the Dixie Butte Inventoried Roadless Area over the last 10 years has killed groups and small pockets of western white pine each year, resulting in a significant level of tree mortality in the larger/older trees. Although western white pine is regenerating in small openings, many of these openings are not large enough to allow vigorous tree growth, due to competition for resources and this species' limited shade tolerance.

Higher elevation dry meadows and scabland flats within the Dixie Butte Inventoried Roadless Area are characterized by shallow, rocky soils. Vegetation in these scablands includes native bunchgrasses, mountain mahogany and other large shrubs, old growth pine trees, and in some cases legacy Douglas-fir. Due to historical grazing and other management activities, these scablands soils are often eroded and experience accelerated surface water runoff. Due to fire suppression practices they have also been encroached upon by western juniper, many small ponderosa pine and Douglas-fir trees, and non-native invasive plants. Excess juniper and small conifers within these water-limited sites shade out and compete with native bunchgrass and shrub communities that provide unique vegetation communities and wildlife habitat within the surrounding dense mixed conifer forest.

Motorized off-highway vehicle use on designated trails, existing Forest Service roads, and within the inventoried roadless areas is apparent. Opportunities for a feeling of solitude, the spirit of adventure and awareness, serenity, and self-reliance are limited by the size and shape of the inventoried roadless areas. Nearby, non-conforming sights and sounds of roads and timber harvest may be heard and seen from within the inventoried roadless areas.

The Dixie Butte Inventoried Roadless Area provides semi-primitive motorized (2,100 acres) and roaded natural (1,000 acres) recreation opportunities and the Greenhorn Mountain Inventoried Roadless Area provides semi-primitive motorized (2,100 acres) and roaded natural (1,800 acres) recreation opportunities. See Appendix B – Maps, Map 23.

- **Semi-Primitive Motorized** – Area is characterized by a predominately natural or natural-appearing environment of moderate to large size. Concentration of users is low, but there is often evidence of other users. The area is managed in such a way that minimum onsite controls and restrictions may be present but would be subtle. Motorized recreation use of local primitive or collector roads with predominantly natural surfaces and trails suitable for motor bikes is permitted.
- **Roaded Natural** – Area is characterized by predominately natural-appearing environment with moderate evidences of the sights and sounds of humans. Such evidence usually harmonizes with the natural environment. Interaction between users may be moderate to high with evidence of other users prevalent. Resource modification and utilization practices are evident but harmonize with the natural environment. Conventional motorized use is allowed and incorporated into construction standards and design of facilities.

Environmental Consequences

Methodology

The spatial boundaries for analyzing the direct, indirect, and cumulative effects to inventoried roadless areas are the Dixie Butte and Greenhorn Mountain inventoried roadless areas, because those are the only lands where the Roadless Area Conservation Rule applies in the planning area. The temporal boundaries for analyzing the direct, indirect, and cumulative effects to inventoried roadless areas vary by resource (see the direct, indirect, and cumulative effects boundaries sections in the Aquatic Resources; Fire, Fuels, and Air Quality; Heritage; Rare Plants; Recreation; Soils; Visuals; Watershed; and Wildlife reports).

Alternative 1 – No Action

Direct and Indirect Effects

There would be no direct or indirect effects to the Dixie Butte or Greenhorn Mountain inventoried roadless areas under alternative 1 because no activities would occur in the planning area. The existing condition would remain unchanged, except by natural processes and ongoing management activities. Biological and ecosystem functions would continue. Growth rates of trees would continue to decline, and natural processes that affect tree vigor and changes in stand structure would continue. The landscape would likely continue developing complex fuel loads. A wildfire may burn more extensively and kill more trees within forest stands which would result in larger acreages of blackened landscapes compared to prescribed burning. Some forest visitors may avoid blackened landscapes until green vegetation returns after 3 to 5 years. Fire is a natural occurrence and expected disturbance process in this landscape. Impacts from insects and diseases would also increase (see Ragged Ruby Silviculture Report).

Cumulative Effects

Because there would be no direct or indirect effects under alternative 1 due to taking no action, there would be no cumulative effects to inventoried roadless areas.

Alternatives 2 and 3

Direct and Indirect Effects

Table 99 lists the activities proposed in the Dixie Butte Inventoried Roadless Area and Table 100 lists the activities proposed within the Greenhorn Mountain Inventoried Roadless Area.

Table 99. Proposed activities within the Dixie Butte Inventoried Roadless Area

Project activity	Alternative 2	Alternative 3
Dry meadow and scabland flat bunchgrass restoration	330 acres	330 acres
Whitebark pine restoration	50 acres	50 acres
Western white pine restoration	410 acres	410 acres
Prescribed burning and unplanned ignitions	3,200 acres	2,700 acres
Road haul	0.8 miles (access to units outside the Inventoried Roadless Area)	0.8 miles (access to units outside the Inventoried Roadless Area)
Change the designation of roads from maintenance level 2 to 1 (road closure)	0.1 miles	0.1 miles
Decommission maintenance level 1 (closed) roads	0.9 miles	0.9 miles
Confirmation of past administratively closed roads	2.1 miles	2.1 miles
Recreation system changes	Modify managed use and trail re-construction of 4.5 miles of Davis Creek Trail Un-designate 0.2 miles of the Davis Creek Trail	Modify managed use and trail re-construction of 4.5 miles of Davis Creek Trail Un-designate 0.2 miles of the Davis Creek Trail

Table 100. Proposed activities within the Greenhorn Mountain Inventoried Roadless Area

Project activity	Alternative 2	Alternative 3
Whitebark pine restoration	330 acres	330 acres
Bat gate closure of mine adits	2 mine adits	2 mine adits
Prescribed burning and unplanned ignitions	4,650 acres	4,650 acres
Change the designation of roads from maintenance level 2 to 1 (road closure)	0.7 miles	0.7 miles
Convert maintenance level 1 (closed) road to trail	1.0 mile	1.0 mile
Confirmation of past administratively closed roads	<0.1 miles	<0.1 miles

Project activity	Alternative 2	Alternative 3
Recreation system changes	Construct 1.7 miles of new trail (Blackeye, Princess, and Tempest Mine trails) Co-designate 1.7 miles of trail on existing roads (Sunrise Butte and Tempest Mine trails) Co-designate 15.6 miles of the Blackeye, Dupratt, Princess, Sunrise Butte, and Tempest Mine trails for bicycle use Un-designate 2.3 miles of trail (Princess and Tempest Mine trails)	Construct 1.7 miles of new trail (Blackeye, Princess, and Tempest Mine trails) Co-designate 1.7 miles of trail on existing roads (Sunrise Butte and Tempest Mine trails) Un-designate 2.3 miles of trail (Princess and Tempest Mine trails)

The effects to the nine inventoried roadless area characteristics would be:

High Quality or Undisturbed Soil, Water, and Air
Soil – The effects on soils by alternatives 2 and 3 are expected to be indistinguishable in all respects, save the amount of acres and miles impacted. The actions in each alternative are essentially the same, differing only in their amount and location, and thus the amount and location of expected ground disturbance from dry meadow and scabland flat bunchgrass restoration, whitebark pine restoration, western white pine restoration, bat gate closure, prescribed burning and unplanned ignitions, road haul, road closure, road decommissioning, conversion of road to trail, and recreation system changes. Alternatives 2 and 3 would have negligible impacts to soil quality, soil erosion, and organic matter and nutrients. Alternative 2 is likely to result in slightly more detrimentally affected soils and effects to soils from disturbance related to approximately 500 more acres of prescribed burning in the Dixie Butte Inventoried Roadless Area than alternative 3, and co-designating 15.6 miles of the Blackeye, Dupratt, Princess, Sunrise Butte, and Tempest Mine trails for bicycle use (which would not occur with alternative 3). All activities under alternatives 2 and 3 would be mitigated to result in compliance with standards and guidelines. See Ragged Ruby Soils Report.

Water –

<u>Both inventoried roadless areas</u> – Retaining limbs and boles from scabland thinning on shallow soils or filling in open woodlands would promote recovery of watershed function in these areas by slowing overland flow and enhancing infiltration. Live ground cover on eroded scablands would be expected to increase after about 5 years. Prescribed burning in riparian habitat conservation areas is not expected to expose mineral soil because it would be expected to burn with low intensity (and not fully consume organic matter on the soil surface). Low-intensity fire is not expected to burn wetter riparian vegetation; fires would likely die out in the inner riparian habitat conservation areas. Consequently, prescribed burning is not expected to contribute to watershed hazard nor detrimentally affect streams or riparian conditions. However, it would reduce fuel loading where prescribed fire is able to carry, resulting in riparian areas that are more resilient to future fire and a slightly reduced hazard following some wildfires. Effects would be slightly greater under alternative 2, as more acres would be impacted by prescribed burning.

Watershed hazard is likely to rise during road haul, then decrease after post-haul maintenance occurs, during which drainage for running surfaces would be re-installed. Road closure and decommissioning of several roads in the inventoried roadless areas would reduce composite watershed hazard. Impacts would be the same under alternatives 2 and 3 as the same mileage of road haul would occur within the Dixie Butte Inventoried Roadless Area under both alternatives.

Dixie Butte Inventoried Roadless Area – Alternatives 2 and 3 proposed activities are not expected to alter watershed hazard in this inventoried roadless area.

Greenhorn Mountain Inventoried Roadless Area – Under alternative 2, the change in watershed hazard from trail work is expected to be neutral but with slightly different changes in the Granite Boulder Creek subwatershed compared to the connected Big Boulder subwatershed. The new construction of the upper Tempest Mine Trail #256 segment in the upper West Fork Granite Boulder drainage is expected to slightly increase local watershed hazard. Watershed hazard in the Wray Creek drainage of Big Boulder subwatershed is expected to decline slightly when the segment of National Forest System Road 4555 is decommissioned and stormproofed as it is converted to the Sunrise Butte Trail #255 with a narrower footprint. The proposed trail changes are the same for alternative 3 as for alternative 2 except that trails would not be improved to allow bicycle access, and certain trail re-alignments would not occur. Effects are expected to be the same, as the sustainable trail practices, project design criteria, and best management practices would be adjusted and would control overland flow concentration and sediment mobilization. See Ragged Ruby Watershed Report.

Air Quality – Smoke from prescribed fire treatments under alternatives 2 and 3 would comply with the State of Oregon Smoke Management Implementation Plan and would be implemented following the guidelines in this plan. Alternative 2 would produce more greenhouse gas emissions (2,344,710 tons) from prescribed burning and wildfire events post-treatment than alternative 3 (1,811,508 tons). See Ragged Ruby Fire, Fuels, and Air Quality Report.

Sources of Public Drinking Water

There are no public drinking water sources identified in the Ragged Ruby planning area.

Diversity of Plant and Animal Communities; Habitat for Threatened, Endangered, Proposed, Candidate, and Sensitive Species and For Those Species Dependent on Large, Undisturbed Areas of Land

Plants – There are no known populations or potential habitat for any federally listed, candidate, or proposed plant species in the planning area. Therefore, this project would have no effect to any federally listed, proposed, or candidate plant species. All known populations of sensitive plants would be buffered from all ground-disturbing activities. Some populations may be subject to prescribed burning. However, the project design criteria prescribe that a botanist be consulted before burning occurs in areas with known sensitive plant populations. Alternatives 2 and 3 may detrimentally impact, but would not lead to a trend toward federal listing for rare plants associated coniferous forest, aspen, lithosols, sagebrush, shrublands, grasslands, and riparian habitat and would have no impact to rare plants associated with cliffs, outcrops, and talus habitat. The potential spread of invasive plants would be minimized under alternatives 2 and 3 with the implementation of project design criteria and mitigation measures described in Appendix C – Project Design Criteria. See Ragged Ruby Rare Plants Report.

Terrestrial Wildlife Species – The action alternatives have similar activities proposed, with similar levels of treatment. As proposed treatments intensify, the level of expected associated effects would also intensify.

Implementation of upland restoration activities under alternatives 2 and 3 would transition stands towards species composition and stand structure reflective of historical conditions, particularly in the drier forest types. These treatments would facilitate an increase in the size of remaining trees, which in the long term could become large snags. Wildlife dependent on open mature pine-dominated habitat would benefit from increased stand health. Conversely, wildlife dependent on denser forest conditions, post-fire habitat, or insect outbreaks may experience a mid- to long-term reduction in habitat within the planning area. Variable density thinning, prescriptions retaining higher tree densities, blocks of no treatment, skips within units, and a network of connectivity corridors (denser forest areas) are all designed to retain heterogeneity within the planning area, and ultimately at the landscape level, provide for a diversity of habitat types across the landscape, and retain existing snags.

Prescribed burning can alter or remove vertical and horizontal stand structure including snags and downed wood. Prescriptions using only prescribed burning would exhibit the largest number of snags recruited from direct tree mortality, but burning activities have the potential to both consume existing snags and downed wood and to create new snags. Any snag creation as a result of fire would benefit post-fire-dependent species like the black-backed woodpecker. Although this pulse of snags would provide foraging for numerous woodpecker species, most snags would likely be too small to provide suitable nesting habitat. Design features are included to minimize consumption of existing habitat, especially large trees, snags, and downed wood. Although some snags are expected to be lost as a result of implementation, losses are expected to be minor across the landscape.

Effective road closures or decommissioning would secure potential habitat from vehicle access and disturbance. Scarifying roadbeds and seeding with native seed would rehabilitate bare ground to forage in the short term, and allow conifer recruitment in the mid to long term. Disturbances to wildlife would be expected to decrease the longer roads are effectively closed.

Increased and improved recreation infrastructure (for example, hiking trails, or trailhead developments) and potential subsequent increased recreational use would increase disturbance and displacement to wildlife. Displacement would occur during construction and implementation, and longer term as trails and facilities receive use and maintenance. Increasing recreation would also result in an increasing need for safety and maintenance, which could lead to a larger deficit of snags as more snags would be identified and removed as a hazard to recreationists. Increased interactions between recreationists and wildlife such as elk, deer, and nesting birds and raptors could increase stress and potentially lower survival of affected species when interactions occur in critical habitats or during specific periods (for example, in winter range, or in nesting, roosting, or fawning seasons or habitat). Overall, proposed increases and improvements to recreation infrastructure are minimal across the planning area and would be expected to have little effect to species populations.

Aquatic Species – The Ragged Ruby planning area contains Columbia River bull trout, Middle Columbia River steelhead, and redband trout spawning, rearing, and migration habitat. At certain times and under various conditions it is possible for recreation system changes to directly affect one or more of these species. Direct effects to Middle Columbia River steelhead, Columbia River bull trout, and redband trout from the remaining project elements are not expected. Project design criteria for recreation system changes include those specified in the Aquatic Restoration Biological Opinion. See Ragged Ruby Aquatic Resources Report.

Primitive, Semi-Primitive Non-Motorized, and Semi-Primitive Motorized Classes of Dispersed Recreation

As described above, most of the Dixie Butte and Greenhorn Mountain inventoried roadless areas within the Ragged Ruby planning area are designated for providing semi-primitive motorized recreation opportunities. The primary recreational uses are for hunting, hiking, and viewing scenery.

Effects to semi-primitive classes of recreation, including isolation from the sights and sounds of man, would be affected by the increase of human presence and activity during the time of proposed treatments (upland restoration, prescribed burning, and bat gate installation) under alternatives 2 and 3. Upland restoration and fuels treatments would have a short-term effect on scenic values and use of dispersed hunting campsites. Smoke may reduce the quality of the experience short term for recreationists that may be in the area. Sights and sounds of human activity would increase as mechanical timber harvest treatments and prescribed burns are implemented. However, this increase of activity would be short-term, and at the conclusion of treatments, the sights and sounds of human activity would revert back to pre-project levels. The short-term effects to semi-primitive classes of recreation would be increased human presence, sights and sounds of timber harvest machinery, and road improvements.

Under alternatives 2 and 3, the motorized Davis Creek Trail in the Dixie Butte Inventoried Roadless Area would continue to provide semi-primitive motorized recreation opportunities. Several maintenance level 1 (closed) roads would be decommissioned and several past administratively closed roads would be confirmed as closed in the inventoried roadless areas; however, these roads are already closed to motorized use so this change would not impact current motorized recreation activities. In the Greenhorn Mountain Inventoried Roadless Area, approximately 0.652 miles of National Forest System Road 4559283 would be changed from maintenance level 2 (open) to 1 (closed). This road is currently drivable by high clearance vehicles, so this would be a small decrease in the motorized recreation opportunities in this inventoried roadless area.

In the Greenhorn Mountain Inventoried Roadless Area, the Blackeye, Princess, Sunrise Butte, and Tempest Mine trails would be improved, which would benefit mountain biking, horse-riding, hiking, and Americans with Disabilities Act accessible recreational opportunities in the area.

Natural Appearing Landscapes with High Scenic Quality; Reference Landscapes

Under alternatives 2 and 3 there would be some visual effects to the landscape. Stumps would be visible in upland restoration units within the inventoried roadless areas. However, the objectives and guidelines associated with the visual quality objectives for each management strategy intersecting a treatment area would be met. The upland restoration (dry meadow and scabland flat bunchgrass, western white pine, and whitebark pine restoration) proposed under alternatives 2 and 3 would move these habitat types towards their historical conditions (pre-fire suppression). Short-term acceptable effects from treatments are recognized and long-term enhancement to the visual landscape is expected (see Ragged Ruby Visuals Report).

Prescribed burning within these areas would change vegetation composition and structure (see Ragged Ruby Silviculture Report). For a few years, burned areas would display a blackened color until grasses, brush, and herbaceous species recover. Dead trees, particularly small trees (saplings to poles) would be evident over a 5 to 10-year period. Few overstory trees are expected to be killed. Outside the burned areas, the conditions described in the existing condition for the inventoried roadless areas would remain unchanged except by natural processes and ongoing management activities such as grazing and hunting. Landscape prescribed burning would require the construction of handline which would include the cutting of some small-diameter trees, snags that pose a hazard to workers, and the limbing-up (pruning) of other trees incidental to prescribed burning activities. The sight of some random tree stumps left after handline construction incidental to prescribed burning activities could affect the natural appearing landscape and sense of solitude for some. This activity would not affect natural integrity because fire is a natural condition on the landscape and influenced the development of the forest community. Effects on apparent naturalness would be minimal and of short duration during implementation of the prescribed fire.

Traditional Cultural Properties and Sacred Sites

All traditional cultural properties and sacred sites would be avoided under alternatives 2 and 3. Therefore, there would be no direct or indirect effects to traditional cultural properties and/or sacred sites.

Other Locally Identified Unique Characteristics

The Ragged Ruby planning area features one of the most extensive existing outcrops of the Greenhorn Subterrane. The Greenhorn Subterrane is part of the Baker Terrane, which is a Paleozoic and Mesozoic serpentinite-matrix and argillite-matrix mélange. This underlying geology interacts with surface ash layers and local microclimates to create soils and a wide variety of growing conditions in the planning area. See the High Quality or Undisturbed Soil, Water, and Air section above and chapter 3, Soils section. Construction of new segments of the Princess Trail #251 and Tempest Mine Trail #256, undesignating portions of the Princess Trail #251 and Tempest Mine Trail #256, and conversion of part of National Forest System Road 4555 to the Sunrise Butte Trail #255 would occur in these areas; however, the use of sustainable trail practices under forested canopy and along a well-armored stream is expected to control overland flow and sediment mobilization. These practices would control the potential for relic trail structure to concentrate overland flow, for granodioritic soils to erode during large, rare runoff events, and for debris torrents, similar to those of 1998, to start in the altered headwaters of Granite Boulder Creek. Composite watershed hazard would be slightly reduced.

Cumulative Effects

Cumulative effects to soils; water quality; air quality; plant and animal communities; habitat for threatened, endangered, and sensitive species; recreation; non-native invasive plants; and cultural resources in inventoried roadless areas are disclosed throughout chapter 3 and specialist reports, and are not reiterated here.

Under alternatives 2 and 3, upland restoration activities would increase the numbers of stumps, and the open nature of the forest stand would likely be the most apparent visual change resulting from implementation. In the long term (about 50 plus years), alternatives 2 and 3 would restore areas with dry meadows, scabland flats, western white pine stands, and whitebark pine stands.

The effects of the proposed prescribed fire would combine with effects from past wildfires within the inventoried roadless area to create a mosaic of fuel loads. This would create conditions that would allow for future wildfire to burn instead of being suppressed. Cumulatively, this would benefit the natural character of the inventoried roadless area. Combined effects of the proposed prescribed fire with effects of past fires within the inventoried roadless area would also create conditions that would allow future natural fire to occur. These effects would appear natural and visually blend with surrounding areas that have burned, creating a mosaic of vegetation types and sizes.

The reasonably foreseeable future activities authorized by the Aquatic Restoration Decision would be visually evident in the first year(s) following treatment; however, these would soon blend in with the landscape and contribute towards the improved function of the treated watersheds.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Malheur Forest Plan

The outcomes of all project activities within the Dixie Butte and Greenhorn Mountain inventoried roadless areas are consistent with the intent of the land allocation decisions made in the Malheur Forest Plan.

2001 Roadless Area Conservation Rule

The 2001 Roadless Rule states that the cutting, sale, or removal of generally small diameter timber is allowed if it is needed to maintain or improve one or more of the roadless area characteristics as defined in §294.11. "To improve threatened, endangered, proposed, or sensitive species habitat" 36 Code of Federal Regulations 294.13(b)(1)(i), or "to maintain or restore the characteristics of ecosystem structure, such as to reduce the risk of uncharacteristic wildfire effects, within the range of variability that would be expected to occur under natural disturbance regimes of the current climatic period" 36 Code of Federal Regulations 294.13(b)(1)(ii).

Generally Small Diameter – The Roadless Area Conservation Rule did not specifically define what constitutes "generally small diameter timber . . . (b)ecause of the great variation in stand characteristics between vegetation types in different areas . . ." The Rule further states that project planning:

> [W]ill consider how the cutting or removal of various size classes of trees would affect the potential for future development of the stand, and the characteristics and interrelationships of plant and animal communities associated with the site and overall landscape. Site productivity, due to factors such as moisture and elevation gradients, site aspect, and soil types, will be considered, as well as how such cutting or removal of various size classes of standing or down timber would mimic the role and legacies of natural disturbance regimes in providing habitat patches, connectivity, and structural diversity critical to maintaining biological diversity. In all cases, the cutting, sale, or removal of small diameter timber will be consistent with maintaining or improving one or more of the roadless area characteristics (see Final Rule, Federal Register, Volume 66, No.9, 3257).

The extent and amount of timber cutting varies with each alternative; no timber would be sold or removed under either alternative 2 or 3. Non-commercial thinning for the dry meadow and scabland flat bunchgrass, whitebark pine, and western white pine restoration within the Dixie Butte and Greenhorn Mountain inventoried roadless areas would consist of generally small diameter trees felled with chainsaws. All trees felled would either be left on site for resource protection (such as for erosion mitigation measures), jackpot burned, or piled and burned. Most trees felled would be young juniper and conifers less than about 9 inches diameter at breast height. These trees are generally small diameter because trees in these stands range from young to old growth trees that are 30 inches diameter at breast height and larger; except for in the whitebark pine stands, which are located at high elevations where trees do not get that large. However, to protect whitebark pine and western white pine trees, occasional larger conifers (that do not exhibit old tree characteristics[36]) directly adjacent to these trees may be felled. In those instances, larger trees would be directionally felled and left on site to provide large wood habitat for American pine marten and other small mammals.

Maintaining or Improving Roadless Area Characteristics – Tree (timber) cutting would maintain or improve the following two roadless area characteristics (§294.11):

[36] Using Johnston et al. (2018) and Van Pelt (2008).

- Diversity of plant and animal communities.
    - Western white pine and whitebark pine in the inventoried roadless areas are currently in decline due to white pine blister rust, mountain pine beetles, and encroachment by subalpine fir and grand fir (due to fire suppression). Whitebark pine and western white pine restoration activities would improve the health and vigor of these trees, maintaining and improving their presence on the landscape (see Ragged Ruby Rare Plants and Silviculture reports).
    - Dry meadows and scabland flats in the Dixie Butte Inventoried Roadless Area have been encroached upon by juniper, ponderosa pine, Douglas-fir, and non-native invasive plants, which are shading out and competing with the native bunchgrass and shrub communities that provide important wildlife habitat utilized by many species. Dry meadow and scabland flat bunchgrass restoration activities would restore or increase native bunchgrasses, mountain mahogany, and other forage and browse species that are important for a variety of wildlife species (including elk and deer) (see Ragged Ruby Rare Plants and Wildlife reports).
- Habitat for proposed species, sensitive species, and/or for those dependent on large, undisturbed areas of land.
    - Whitebark pine restoration would improve habitat for this species, which is a candidate for federal listing. Non-commercial thinning would increase the health and vigor of these trees (see Ragged Ruby Rare Plants and Silviculture reports).

It is important to re-iterate that none of the material cut within the Dixie Butte and Greenhorn Mountain inventoried roadless areas would be sold or removed; it would be either cut and left in place, scattered, or pile burned to reduce fuel loading, used for woody debris placement in nearby streams, or placed on highly erodible soils to reduce the potential for erosion.

Improving Proposed Species Habitat – Whitebark pine restoration would improve habitat for this species, which is a candidate for federal listing. Non-commercial thinning would increase the health and vigor of these trees (see Ragged Ruby Rare Plants and Silviculture reports).

Maintaining or Restoring the Characteristics of Ecosystem Composition and Structure – As stated above, western white pine restoration activities would improve the health and vigor of these trees, maintaining and improving their presence on the landscape (see Ragged Ruby Rare Plants and Silviculture reports). Dry meadow and scabland flat bunchgrass restoration activities would restore or increase native bunchgrasses, mountain mahogany, and other forage and browse species (see Ragged Ruby Rare Plants and Wildlife reports).

Cutting and Sale of Timber is Infrequent – Harvest last occurred in the Dixie Butte Inventoried Roadless Area about 26 years ago (between 1985 and 1992) and last occurred in the Greenhorn Mountain Inventoried Roadless Area about 22 years ago (between 1986 and 1996). There are no foreseeable projects that would cut or remove timber in the Dixie Butte or Greenhorn Mountain inventoried roadless areas; this action would be infrequent on this landscape.

Potential Wilderness Areas

Affected Environment

The June 2018 Draft Record of Decision for the Malheur, Umatilla, and Wallowa-Whitman National Forests Revised Land Management Plans and Draft Malheur National Forest Land Management Plan (USDA Forest Service 2018a and 2018b) identified two preliminary administratively recommended wilderness areas on the Malheur National Forest. Neither of these areas are within or directly adjacent to the Ragged Ruby planning area. The closest designated preliminary administratively recommended wilderness area is the North Fork John Day Wilderness Additions on the Umatilla National Forest, located approximately 2 miles to the north of the planning area. In addition, the Malheur National Forest's Strawberry Mountain Wilderness Area Additions and McClellan Mountain preliminary administratively recommended wilderness areas are located over 20 miles from the Ragged Ruby planning area.

Other Inventories of Potential Wilderness

Other inventories of potential wilderness may exist that were developed by organizations other than the Forest Service. The Forest Service uses the criteria in Forest Service Handbook 1909.12, section 71 to identify areas of potential wilderness.

Environmental Consequences

Methodology

Impacts to potential wilderness areas were assessed using the methodologies and analyses contained in the Ragged Ruby Fire, Fuels, and Air Quality Report.

The spatial boundaries for analyzing the indirect and cumulative effects to potential wilderness areas are the preliminary administratively recommended wilderness areas (management area 1B) identified in the June 2018 Draft Record of Decision for the Malheur, Umatilla, and Wallowa-Whitman National Forests Revised Land Management Plans and Draft Malheur National Forest Land Management Plan (USDA Forest Service 2018a and 2018b), which includes the North Fork John Day Wilderness Additions, McClellan Mountain, and Strawberry Mountain Wilderness Area Additions. The temporal boundaries for analyzing the indirect and cumulative effects are short term during project implementation (approximately 1 to 10 years), because that is when implementation of project activities could occur that would impact air quality.

Alternative 1 – No Action

Direct and Indirect Effects

Alternative 1 would have no direct or indirect effects on potential wilderness areas, because no activities would occur adjacent to or within any potential wilderness area.

Cumulative Effects

Because there would be no direct or indirect effects under alternative 1 due to taking no action, there would be no cumulative effects to potential wilderness areas.

Alternatives 2 and 3

Direct and Indirect Effects

Alternatives 2 and 3 would have no direct effects on potential wilderness areas because no project activities would occur within any potential wilderness areas.

There would be no indirect effects from upland, watershed, fisheries, and wildlife restoration, road activities, or recreation system changes because this work would occur at a great distance from potential wilderness areas. There may be indirect effects from the prescribed burning causing short-term views of smoke in the McClellan Mountain and Strawberry Mountain Wilderness Area Additions potential wilderness areas.

Cumulative Effects

There may be short-term cumulative effects from smoke in the McClellan Mountain and Strawberry Mountain Wilderness Area Additions potential wilderness areas if prescribed burning implemented on the Malheur, Umatilla, or Wallowa-Whitman national forests; nearby agency lands; or nearby private lands overlaps in time. However, as stated above, all burning activities on the Forest would comply law, regulation, and policy to minimize smoke impacts.

There would be no cumulative effects from the upland, watershed, fisheries, and wildlife restoration; road activities; and recreation system changes because there would be no direct or indirect effects.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

Potential wilderness areas in the Ragged Ruby planning area were identified in June 2018 Draft Record of Decision for the Malheur, Umatilla, and Wallowa-Whitman National Forests Revised Land Management Plans (USDA Forest Service 2018b), following Forest Service Handbook 1909.12 chapter 70. Alternatives 1, 2, and 3 would not adversely affect the eligibility of these lands to be designated as wilderness in the future.

Other Undeveloped Lands

Affected Environment

Methodology

Other undeveloped lands were identified by removing areas with evidence of past harvest, previously owned by the Oregon Lumber Company, within 300 feet of an existing road (distance that firewood is typically gathered and roadside danger trees are removed), with current lode and placer mining claims, and the Dixie Butte and Greenhorn Mountain inventoried roadless areas. Then individual polygons less than 1,000 acres in size were eliminated from further study because these smaller polygons cannot be separately preserved due to a physical terrain or a natural condition in part because of their small size and in part because they are each part of a larger overall continuous ecosystem condition distributed throughout the planning area.

Existing Condition

These acres of land have no history of harvest activity, do not contain forest roads, and are not designated as a wilderness area, inventoried roadless area, or preliminary administratively recommended wilderness areas. They are areas that have no obvious previous activity and are “leftover” areas from other analyses. For example (but not limited to): these areas may have been too steep, located in between roads and harvest areas, or too wet. These areas may have values associated with them such as scenery, cultural resources, and unfragmented habitat. These acres have no previous roads or harvest activities located in them. See the Ragged Ruby Special Areas Report for the inventory process used to identify other undeveloped lands.

There are 8 polygons ranging from 4 to 185 acres in size (totaling approximately 330 acres), that are adjacent to either the Dixie Butte or Greenhorn Mountain inventoried roadless areas that are identified as other undeveloped lands.

Other undeveloped lands include soils, water, and fish and wildlife habitat that have not been directly impacted by past harvest, mining, and road building, or the impacts are not readily evident. Indirect impacts have and continue to occur due to fragmentation of vegetation. The current condition of soil; water; air quality; plant and animal communities; habitat for threatened, endangered, and sensitive species; noxious weeds; recreation; and cultural resources within the planning area, including other undeveloped lands, are described in chapter 3.

Environmental Consequences

Methodology

Impacts to other undeveloped lands were assessed using the methodologies in Silviculture; Soils; Watershed; Fire, Fuels, and Air Quality; Rare Plants; Wildlife; Aquatics; Recreation; Visuals; and Heritage reports. Geographic information system layers were also used to compare other undeveloped lands to proposed activities (for example, upland restoration activities; watershed, fisheries, and wildlife habitat restoration; prescribed burning; road activities; and recreation system changes).

The spatial boundaries for analyzing the direct, indirect, and cumulative effects to other undeveloped lands are the lands identified as other undeveloped lands by the Forest's analysis (see Special Areas Report Appendix A). The temporal boundaries for analyzing the direct, indirect, and cumulative effects to other undeveloped lands are the 330 acres identified as other undeveloped lands in the Ragged Ruby planning area.

Alternative 1 – No Action

Direct and Indirect Effects

Under alternative 1, there would be no direct or indirect effects to undeveloped lands because no activities would occur in these areas. The existing condition would remain unchanged, except by natural processes and ongoing management activities. Biological and ecosystem functions would continue. The landscape would likely continue developing complex fuel loads. A wildfire may burn more extensively and kill more trees within upland forest stands which would result in larger acreages of blackened landscapes compared to prescribed fires. All polygons of other undeveloped lands would continue to be managed according to their Malheur Forest Plan management area allocation and not as an inventoried roadless area, an area with wilderness characteristics, or a designated wilderness area.

Cumulative Effects

Because there would be no direct or indirect effects under alternative 1 due to taking no action, there would be no cumulative effects to other undeveloped lands.

Alternatives 2 and 3

Direct and Indirect Effects

Under alternatives 2 and 3, all acres of other undeveloped lands would continue to be managed according to their Malheur Forest Plan management area allocation and not as an inventoried roadless area, area with wilderness characteristics, or designated wilderness area. Table 101 lists the activities proposed in other undeveloped lands under alternatives 2 and 3. Table 102 displays a summary showing the changes in acres for other undeveloped lands under each alternative. Acres changed from undeveloped to developed acres include upland restoration activities;

although prescribed fire acres are included in Table 101 as part of the proposed activities, the percentages in Table 102 do not include prescribed burning because the impacts of this activity would be similar to a wildfire.

Table 101. Proposed activities within other undeveloped lands

Project activity	Alternative 1	Alternative 2	Alternative 3
Dry pine restoration (commercial and non-commercial thinning)	--	21 acres	--
Mixed conifer restoration (commercial and non-commercial thinning)	--	19 acres	--
Mixed conifer thinning (non-commercial thinning)	--	58 acres	61 acres
Whitebark pine restoration	--	3 acres	3 acres
Western white pine restoration	--	28 acres	28 acres
Prescribed burning and unplanned ignitions	--	325 acres	322 acres

Table 102. Changes in other undeveloped lands in the Ragged Ruby planning area

Measure	Alternative 1	Alternative 2	Alternative 3
Other undeveloped land acres after implementation	330 acres	201 acres	238 acres
Acres changed by upland restoration activities	0 acres	129 acres	92 acres
Percentage of planning area remaining as other undeveloped lands after implementation	1%	0.6%	0.7%
Developed acres after implementation	26,670 acres	26,799 acres	26,891 acres

Intrinsic Physical and Biological Resources (Soil, Water, Wildlife, Recreation, Fisheries, etc.)

For other undeveloped lands within the Ragged Ruby planning area where activities proposed under alternatives 2 and 3 would occur, the impacts to soil, water quality, air quality, and forage; plant and animal communities; habitat for threatened, endangered, and sensitive species; recreation; non-native invasive plants; and cultural resources are the same as described in other resource sections in chapter 3 and other resource reports and are not reiterated here.

Intrinsic Social Values (Apparent Naturalness, Solitude, and Remoteness)

The following effects to other undeveloped lands are common to alternatives 2 and 3. Upland restoration activities would increase the number of stumps and the open nature of forested stands would likely be the most apparent visual change resulting from implementation. All treated units would remain forested after project activities; however, skid trails and stumps would be evident under alternatives 2 and 3. Stand structure would change, therefore diversity of plant and animal communities may shift from current patterns but ecological diversity would remain (chapter 3, Forest Vegetation section). Prescribed burning would change composition and structure of vegetation (chapter 3, Fire and Fuels section) and for a few years burned areas would display a blackened color. Affected areas would appear managed and developed.

The sights, sounds, and changes in vegetation from project activities in other undeveloped lands would decrease the natural integrity and sense of naturalness within treated areas. Impacts to natural integrity and sense of naturalness would likely be evident until stumps and vegetation canopies are no longer substantially recognizable (about 75 to 100 years). The sounds of timber harvest and road building machinery from active units would reduce a sense of naturalness and solitude during project operations but would not persist in the long term. Other impacts, such as tree marking paint and logging slash would be visible in the short term (about 5 to 10 years). Impacts such as closed roads, skid trails, and tree stumps would be evident much longer.

The sounds, smells, and possible sighting of mechanical activities and fuel treatment activities occurring in areas adjacent to the other undeveloped lands would reduce the sense of solitude and remoteness in the short term, during project activities. Other sights and sounds of ongoing and previously approved activities in areas adjacent to the boundary of the other undeveloped areas would continue to have short-term effects on opportunities for solitude and remoteness. In the long term, there would be no change to the current availability of solitude or primitive recreation.

In the long term, the project would result in the development of open conditions characterized by larger-diameter trees, though more stumps would be present. Treatments would provide an overall mix of size classes of trees for visual as well as biological diversity (see Ragged Ruby Silviculture; Fire, Fuels, and Air Quality; and Visuals reports).

Opportunities for a feeling of solitude, the spirit of adventure and awareness, serenity, and self-reliance are limited by the size and shape of the polygon. Distance and topographic screening are also factors. The optimum shape and location to retain solitude and a sense of isolation from noise and sights of other humans and their activities would be at the center of a circle. Areas greater than or equal to 5,000 acres or about 8 square miles may have sufficient size to offer a sense of solitude, yet this may vary by individual. Long narrow shapes provide less distance from noise at their midpoint. Nearby, non-conforming sights and sounds of project activities can be heard and often seen from within the polygons of other undeveloped areas because they are all less than 1 square mile in size and none is a perfect circle in shape. The existing condition of all remaining acres with evidence of past harvest and forest roads of land within and affected by the Ragged Ruby Project presents a landscape that has been managed and is generally developed in nature. Past management actions and current conditions within these areas reflect the multiple-use intent and decisions made in the Malheur Forest Plan, as amended, and reflect consistency with forest plan management area allocations.

Other undeveloped lands with no proposed activities would still be classified as other undeveloped lands and would retain their intrinsic social values as described in the affected environment. They would remain free of developments such as forest roads or timber harvest stumps. These undeveloped lands would remain as small scattered areas detached from each other by terrain, roads, and harvest activities.

There would be slightly less impacts from alternative 3, as compared to alternative 2, because only non-commercial thinning is proposed under that alternative in these areas and fewer acres would be impacted.

Cumulative Effects

Cumulative effects to soils; water quality; air quality; plant and animal communities; habitat for threatened, endangered, and sensitive species; recreation; non-native invasive plants; and cultural resources as disclosed in chapter 3 and specialist reports and are not reiterated here. As displayed in Table 102, alternatives 2 and 3 would cumulatively decrease the acres of other undeveloped lands in the Ragged Ruby planning from 1 percent to 0.6 percent (alternative 2) or 0.7 percent (alternative 3).

Apparent naturalness, solitude, and remoteness would be cumulatively impacted by grazing, dispersed camping, and motorized vehicle use on open system roads and trails under alternatives

2 and 3. Effects associated with recreational use, including non-native invasive plant spread, hunting, fishing, erosion, litter, and evidence of fire rings, are expected to remain cumulatively minor. Ongoing removal of hazard trees along forest roads and trails changes the vegetation but does not change the overall sense of naturalness or sense of solitude along an existing developed transportation corridor. Overall, cumulative effects from these activities on apparent naturalness, solitude, and remoteness is very small (not measurable/indistinguishable) in proportion to the changes anticipated from the direct and indirect effects of the alternatives disclosed above.

The reasonably foreseeable future activities authorized by the Aquatic Restoration Decision would be visually evident in the first years following treatment; however, these would soon blend in with the landscape and contribute towards the improved function of the treated watersheds.

Compliance with Forest Plan and Other Relevant Laws, Regulations, and Policies

There is no special management direction for other undeveloped lands. Environmental effects to resources in other undeveloped lands would be consistent with applicable laws, regulations, and Forest Plan management area standards and guidelines (see chapter 3 for findings of consistency for each resource).

Evaluation of Proposed Forest Plan Amendments

As discussed in chapter 1, the Forest Service has identified a need to change the Malheur Forest Plan to better reflect current conditions and scientific understanding regarding necessary restoration of the Ragged Ruby planning area. Based on the direction provided in 36 Code of Federal Regulations 219, the responsible official must determine the appropriate scope and scale of forest plan amendments and apply those provisions of 36 Code of Federal Regulations 219.8 through 219.11 that directly apply to the proposed amendment.[37] In the following section, the provisions of 36 Code of Federal Regulations 219.8 through 219.11 that directly apply to the proposed amendments are briefly identified and discussed.

Provisions of 36 Code of Federal Regulations 219.8 through 219.11 that are not directly applicable to the proposed amendments can be found in Appendix F – 36 Code of Federal Regulations 219.8 to 11 Applicability to Amendments to the 1990 Malheur Forest Plan, as Amended, along with the rationale for why those provisions are not directly applicable to the proposed amendments.

Management Area 13 (Old Growth) Area Changes

Based on the need for change, site-specific conditions in the Ragged Ruby planning area, and relevant Malheur National Forest-specific information and data, the following substantive requirements of 36 Code of Federal Regulations 219.8 through 219.11 apply to the proposed amendment to designate replacement old growth areas within the Ragged Ruby planning area. See Appendix F – 36 Code of Federal Regulations 219.8 to 11 Applicability to Amendments to the 1990 Malheur Forest Plan, as Amended for a rationale for why other provisions of 36 Code of Federal Regulations 219.8 through 219.11 do not apply.

The Malheur Forest Plan provides direction to inventory and validate all old growth areas during project planning, and correct previously dedicated old growth unit designations that are not meeting management requirements (USDA Forest Service 1990a, page IV-105, standard #4).

[37] 36 Code of Federal Regulations §219.13 (2012).

This allows dedicated and replacement old growth to be designated to provide old forest structure for wildlife species dependent on that habitat across the landscape of the Malheur National Forest through time (36 Code of Federal Regulations §219.8(a)(1)(ii)). Validation of these management areas provides the flexibility to move and designate dedicated old growth in areas where old growth forest structure and composition currently exist, and replacement old growth in areas where it would potentially exist in the future. This promotes old forest structure and composition through time, and allows planning to be responsive to changes in stand structure and composition in a dynamic landscape driven by stand succession, drought, wildfire, insect and disease activity, or other ecological processes (36 Code of Federal Regulations §219.8(a)(1)(iv) and §219.10(a)(8)). Changes to management area 13 for the Ragged Ruby Project include:

- Adding approximately 256 acres to existing dedicated old growth (dedicated old growth units 3122, 3128, 3252, and 3332).
- Designating approximately 581 acres as replacement old growth (replacement old growth units 3245, 3252, and 3332).

The goals of management area 13 are to "Provide "suitable" habitat for old growth dependent wildlife species, ecosystem diversity, and preservation of aesthetic qualities" (USDA Forest Service 1990a, page IV-105) (36 Code of Federal Regulations §219.9(a)(1) and §219.9(a)(2)). Dedicated old growth is designed to provide habitat for pileated woodpecker, pine marten, and three-toed woodpecker, which are Malheur Forest Plan Management Indicator Species (USDA Forest Service 1990a, pages IV-32 and IV-105) (36 Code of Federal Regulations §219.9(a)(2)(i)). Replacement old growth is designed to provide replacement habitat for these species in the future. Although management area 13 is specifically designed to provide habitat for these three species, old forest structure and composition provides habitat for many other wildlife species as well. These species are commonly enjoyed and used by the public for trapping (pine marten) and observing (pileated woodpecker and three-toed woodpecker), as well as many other activities (36 Code of Federal Regulations §219.10(a)(5)). Wildlife connectivity corridors are also proposed under the Ragged Ruby Project to serve as connectivity between dedicated old growth, replacement old growth, and other late and old structure stands. These corridors allow for the dispersal and movement of wildlife species that use and are dependent on old forest structure.

Changes to management area 13 boundaries would have direct impacts to aesthetic values, fish and wildlife species, and habitat and habitat connectivity (36 Code of Federal Regulations § 219.10(a)(1)). Specifically:

- Aesthetic values related to management area 13 are provided through stands with large trees and old forest characteristics (see chapter 3, Visual Resources section).
- Management area 13 provides nesting, roosting, and foraging habitat for pileated woodpeckers and three-toed woodpeckers, and denning, foraging, and dispersal habitat for pine marten (see chapter 3, Wildlife – Management Indicator Species section).
- Management area 13 provides habitat for pileated woodpeckers, pine marten, three-toed woodpeckers, and other old growth dependent species, and contributes to the habitat connectivity of management area 13, late and old structure stands, and the wildlife connectivity corridors that connect them (see chapter 3, Wildlife – Management Indicator Species section).

Direct and Indirect Effects

See chapter 3, Wildlife – Management Indicator Species, Forest Vegetation, and Visual Resources sections for the direct and indirect effects of the proposed old growth forest plan amendments.

Alternative 1 (No Action)

Under alternative 1, there would be no changes to the management area 13 network. The management area 13 system in the Ragged Ruby planning area would continue to not meet Malheur Forest Plan standards, contributing less than alternatives 2 and 3 to the broader ecosystem integrity and diversity (both within the planning area and in the surrounding landscape), provided through management area 13, late and old structure, and the wildlife connectivity corridors that connect them.

Four dedicated old growth units would not be expanded to meet forest plan standards and three dedicated old growth units would not have their associated replacement old growth unit designated. The current amount of management area 13 that is providing aesthetic values in the form of maintaining stands of large trees viewable by the public would be maintained. This alternative would not be responsive to system drivers (for example, ecological processes).

Alternatives 2 and 3

Alternatives 2 and 3 would alter the stand boundaries of dedicated old growth units in order to expand the current management area 13 network to include replacement old growth units to meet Malheur Forest Plan standards (Table 2). Ultimately, there would be an increase of approximately 837 acres in management area 13.

Changes to the management area 13 system in the Ragged Ruby planning area would contribute to the broader ecosystem integrity and diversity both within the planning area and in the surrounding landscape, provided through management area 13, late and old structure, and the wildlife connectivity corridors that connect them (consistent with 36 Code of Federal Regulations §219.8(a)(1)(ii), §219.9(a)(1), §219.9(a)(2), §219.9(a)(2)(i), and §219.10(a)(1)). Management area 13 additions would provide old growth habitat and designate replacement old growth in areas that are on the path to becoming old growth habitat in the future. Reviewing the management area 13 system, and making these adjustments at the project planning level allows for management area 13 to be adjusted in response to system drivers (for example, ecological processes, disturbances, natural succession, wildland fire, invasive species, and climate change) (consistent with 36 Code of Federal Regulations §219.8(a)(1)(iv) and §219.10(a)(8)).

Changing management area 13 boundaries under alternatives 2 and 3 would maintain habitat for old growth dependent species (including pine marten, pileated woodpecker, and northern goshawk), which are commonly enjoyed by the public for trapping and observing (consistent with 36 Code of Federal Regulations §219.10(a)(1) and §219.10(a)(5)). In addition, management area 13 would provide aesthetic values in the form of maintaining stands of large trees viewable by the public (consistent with 36 Code of Federal Regulations §219.10(a)(1)).

Cumulative Effects

Cumulative effects of this proposed forest plan amendment are addressed at the Forest-scale. The 1990 Malheur Forest Plan estimated 47,690 acres of dedicated old growth in management area 13 outside of wilderness, research natural areas, semi-primitive areas, and wild and scenic rivers (USDA Forest Service 1990c, ROD-24). Since 1990, there have been 35 amendments that have affected the location and acreage of old growth areas (see Table 103). Most non-fire related old growth replacements were minor relocations or adjustments to old growth area boundaries to better meet Malheur Forest Plan requirements for old growth habitat. With these amendments, there are currently approximately 75,413 acres of the management area 13 designation outside of wilderness, research natural areas, semi-primitive areas, and wild and scenic rivers. Additional old-growth habitat exists on the Malheur National Forest in other management allocations that are distributed across the Forest.

Table 103. Malheur Forest Plan amendments affecting management area 13 (old growth) since 1990

Number of projects with old growth amendments	Year	Project	Amendment
1	1990	Snowshoe Timber Sale	Location of replacement old growth units can now be greater than 0.25 miles away from its associated dedicated old growth unit.
2	1992	Huck Timber Sale	Located a replacement old growth unit farther than 0.25 miles away from dedicated old growth unit 106.
3	1992	Forks Timber Sale	Designated a replacement old growth unit in the planning area further than the standard 0.25 miles from the original dedicated old growth unit.
4	1993	Hog Flat Timber Sale	Designated a replacement old growth unit (HRO 036) in the Hog Flat planning area more than 0.25 miles from the original dedicated old growth unit (HMB 036).
5	1993	Tin Can Timber Sale	Relocated dedicated old growth unit 27 to Brophy Creek drainage and reallocated management area 13 lands to management area 1 lands in the planning area.
6	1993	Fawn Timber Sale	Located a replacement old growth unit beyond 0.25 miles radius from the original dedicated old growth unit.
7	1993	Shirtail	Relocated 2 dedicated old growth units.
8	1995	Awake	Moved a dedicated old growth unit within the Awake Timber Sale Area to a location that better met management requirements.
9	1996	Powder	Allowed salvage harvest entry into a dedicated old growth unit.
10	2000	Dry Fork	Adjusted the boundaries of dedicated and replacement old growth in the analysis area.
11	2000	Triangle Lex	Relocated two dedicated old growth units outside of lands legislated to be exchanged in the Triangle Land Exchange.
12	2001	Olmstead	Adjusted dedicated old growth boundaries.
13	2001	Parasol	Relocated dedicated and replacement old growth within the planning area.
14	2004	Silvies Canyon	Adjusted boundaries of dedicated and replacement old growth in the planning area.
15	2004	Flagtail Fire	Relocated dedicated and replacement old growth in the planning area.
16	2004	Monument Rock	Relocated dedicated and replacement old growth in the planning area.
17	2004	Easy	Relocated dedicated and replacement old growth in the planning area.
18	2005	Merit	Adjusted boundaries of dedicated and replacement old growth in the planning area.

Number of projects with old growth amendments	Year	Project	Amendment
19	2007	Canyon Creek Wildland Urban Interface	Exchanged dedicated old growth unit 236 and replacement old growth unit 236.
20	2008	Thorn Fire Salvage Recovery	Relocated dedicated and replacement old growth in the planning area.
21	2008	Crawford	Adjusted dedicated old growth boundaries and located replacement old growth.
22	2008	Balance	Adjusted dedicated old growth and increased the size of replacement old growth.
23	2008	Dads Creek Wildland Urban Interface	
24	2010	Damon Wildland Urban Interface	Commercial thinning in old growth and changed pileated woodpecker habitat management objectives to white-headed woodpecker management objectives in the Swick dedicated old growth.
25	2012	Marshall Devine	Designated dedicated and replacement old growth.
26	2013	Blue Mountain Snow Park	Increased management area 13 by 147 acres.
27	2013	Galena	Designated dedicated and replacement old growth.
28	2013	Upper Pine Healthy Forest Restoration Act	Designated dedicated and replacement old growth.
29	2015	Elk 16	Increased management area 13 by 259 acres.
30	2015	Wolf	Increased management area 13 by 1,715 acres.
31	2015	Big Mosquito	Increased management area 13 by 433 acres.
32	2017	Magone	Increased management area 13 by 1,215 acres.
33	2017	Dove	Increased management area 13 by 1,000 acres.
34	2017	Summit	Increased management area 13 by 327 acres.
35	2018	Flat	Increased management area 13 by 789 acres.

This proposed forest plan amendment would change management area 13 boundaries for existing areas and delineate boundaries for new areas within the planning area to bring total acres up to Malheur Forest Plan standards for alternatives 2 and 3. The management area 13 network would increase by approximately 837 acres, resulting in approximately 76,250 acres of mapped management area 13 on the Forest outside of wilderness, research natural areas, semi-primitive areas, and wild and scenic rivers (see Table 104). See Appendix B – Maps, Maps 10 and 11 for the proposed management area 13 locations.

Table 104. Summary of existing management area 13 (old growth) and proposed changes within the planning area

Habitat type	Dedicated old growth areas	Dedicated old growth acres	Replacement old growth areas	Replacement old growth acres
Existing habitat	6	1,412	3	615
Proposed new areas	0	0	3	581
Proposed changes to existing areas	4	256	0	0

Habitat type	Dedicated old growth areas	Dedicated old growth acres	Replacement old growth areas	Replacement old growth acres
Habitat after proposed changes	*6*	*1,668*	*6*	*1,196*

Reasonably foreseeable projects which could include forest plan amendments to management area 13 include the Camp Lick, Rattlesnake, Cliff Knox, and Austin projects. These projects, combined with the Ragged Ruby Project, could increase the number of forest plan amendments to management area 13, and increase the acres of mapped management area 13 to 77,761 acres (an increase of 2,348 acres) outside of wilderness, research natural areas, semi-primitive areas, and wild and scenic rivers. This would result in approximately 4.6 percent of the 1,700,000-acre Malheur National Forest allocated to the management area 13 designation.

Table 105. Proposed and reasonably foreseeable Malheur Forest Plan amendments affected management area 13 (old growth)

Number of projects with old growth amendments	Year	Project	Amendment	Total acres of MA13 with proposed amendment
36	Expected in 2019	Camp Lick	Increased management area 13 by 1,511 acres.	76,924 acres
37	Expected in 2019	Ragged Ruby	Management area 13 would increase by approximately 837 acres.	77,761 acres
38	Expected in 2019	Rattlesnake	This project could include updates to management area 13, however at this early stage in the planning process this has not yet been determined and thus there is no estimate of acres available.	--
39	Expected in 2019	Cliff Knox	This project could include updates to management area 13, however at this early stage in the planning process this has not yet been determined and thus there is no estimate of acres available.	--
40	Expected in 2020	Austin	This project could include updates to management area 13, however at this early stage in the planning process this has not yet been determined and thus there is no estimate of acres available.	--

MA13 = management area 13, or old growth network.

These management area changes are small in scale and there would be no changes to the standards and guidelines for any management area due to this amendment.

Management area 13 changes would not alter the multiple use goals and objectives for long-term land and resource management because the changes in management areas would not alter the long-term relationship between goods and services projected by the Malheur Forest Plan, nor would it forgo the opportunity to achieve an output in later years. Combined, management area changes are small in scale and there would be no changes to the standards and guidelines for any management area due to these amendments. The Malheur Forest Plan anticipated that changes in management area 13 would occur. Management area 13 standards 4 through 8 direct that dedicated old growth units that are not meeting management requirements be corrected; and that replacement old growth areas be provided to counter possible damage or deterioration of dedicated old growth in the future.

The cumulative addition of management area 13 across the Forest with past amendments, the proposed amendment, and foreseeable projects would improve the distribution, availability, and survivability of the management area 13 network across the Malheur National Forest. This ensures that adequate old growth habitat is currently available and suitable for species that utilize or are obligates of late-seral habitat, and also assures that habitat is designated for management towards old growth conditions so that old growth conditions persist in the long-term. Further, the expansion of the management area 13 network combined with connectivity corridors would allow dispersal and landscape permeability of old growth-dependent species across the Malheur National Forest. The amendment, combined with similar past and foreseeable amendments would ultimately expand the forest network of old growth habitat to support or improve old growth management indicator species populations and provide more opportunities for those species to disperse across the landscape as specified in the Malheur Forest Plan.

The proposed amendment meets the long-term goals of the Malheur Forest Plan to provide “suitable” habitat for old growth dependent wildlife species, ecosystem diversity, and preservation of aesthetic qualities.

Uniqueness of the Proposed Forest Plan Amendments for Old Growth

Management area 13 changes are proposed to locate the old growth management area designation on the unique sites in the Ragged Ruby planning area that are on the path to developing into old growth habitat. These sites provide habitat for wildlife species dependent on mature/overmature forest conditions (USDA Forest Service 1990a, page IV-105). This follows Malheur Forest Plan direction to inventory, validate, and correct dedicated old growth unit designations at the project planning level.

Removal of Trees Greater Than or Equal to 21 Inches Diameter at Breast Height and Harvest within and Reduce Late and Old Structure Stands

Based on the need for change, site-specific conditions in the Ragged Ruby planning area, and relevant Malheur National Forest-specific information and data, the following substantive requirements of 36 Code of Federal Regulations 219.8 through 219.11 apply to the proposed amendments to remove trees greater than or equal to 21 inches diameter at breast height and harvest within late and old structure stands in the Ragged Ruby planning area. See Appendix F – 36 Code of Federal Regulations 219.8 to 11 Applicability to Amendments to the 1990 Malheur Forest Plan, as Amended for a rationale for why other provisions of 36 Code of Federal Regulations 219.8 through 219.11 do not apply.

As discussed in chapter 1, there is a need to change the Malheur Forest Plan, as amended, to better reflect current conditions and scientific understanding regarding necessary restoration of the Ragged Ruby planning area. These amendments are being addressed jointly because they are both associated with the Eastside Screens, standard 6(d), scenario A (interim wildlife standard) where one or both of the late and old structural stages falls below historical range of variability in a particular biophysical environment.

Within the Ragged Ruby planning area there has been an increasing trend of younger shade-tolerant grand fir and Douglas-fir trees growing in the understory. The combination of timber harvest and fire suppression has gradually converted these dry forests from primarily long-lived, early-seral species (ponderosa pine and western larch) to a higher proportion of late-seral species (grand fir and Douglas-fir). Grand fir was historically not a major component within these dry forest types, but was present on the landscape, primarily on northern slopes and topographic depressions with higher availability of moisture. Some of these younger late-seral species are now greater than or equal to 21 inches diameter at breast height. The ingrowth of younger grand fir and Douglas-fir trees has increased the risk of tree mortality to old ponderosa pine and western larch due to competition induced stress, insect attacks, and uncharacteristic wildfire.

Stand densities and multi-layered canopies have also increased across the planning area. Stand structures in the planning area currently do not reflect the desired condition based on historical references. Heavy stocking, drought stress, and slow growth, accompanied by stagnated stand conditions are contributing to insect activity. Currently the Ragged Ruby planning area is outside the natural range of variation. Within the planning area, 46 percent of the Hot Dry plant association group is old forest multi-strata, while modeling indicates that there is no old forest single stratum within the Hot Dry plant association group. Conditions are similar within the Warm Dry plant association group as well. Within the planning area, 23 percent of the Warm Dry plant association group is old forest multi-strata, while only 3 percent is old forest single stratum. This is a reversal of the historical range of variability. Powell (1998) shows forest structural stage historical range of variability to be 5 to 15 percent for old forest multi-strata and 20 to 70 percent for old forest single stratum for the Hot Dry plant association group, and 5 to 20 percent for old forest multi-strata and 15 to 55 percent for old forest single stratum for the Warm Dry plant association group (these percentages are to be used with a mid-scale analysis area of 15,000 to 35,000 acres).

The proposed forest plan amendments are needed to address the need for change and the site-specific conditions in the planning area described above. Specifically the dry pine and mixed conifer restoration commercial thinning and non-commercial thinning with biomass removal would restore historically present tree species composition and restore the drier forest landscapes to a more historically fire resistant condition, and reduce stand densities and stress due to competition (§219.8(a)(1)(v) and §219.8(a)(1)(vi)). The ecosystem structure and function within the landscape would be restored by moving the tree species composition toward the ecologically desired mix of fire-resistant species (§219.8(a)(1)(ii)). Studies completed within the Ragged Ruby planning area show that the dry forest landscapes were historically dominated by ponderosa pine (Johnston et al. 2018). Historically, frequent low-severity and mixed severity fire regimes maintained ponderosa pine as the dominant species (Munger 1912) (§219.8(a)(1)(iv) and §219.10(a)(8)).

Within the planning area there are foreseeable risks to ecological sustainability because of the current imbalance of tree species composition and stand structures (§219.10(a)(7)). Proposed treatments would begin to restore the landscape condition (integrity) (§219.9(a)(1)), including stand structures and densities, species composition, and function (ability to withstand insects, diseases, and fire) while also restoring habitats for historically present plant communities and wildlife habitat (§219.8(a)(1)(iii) and §219.10(a)(1)). Treatments would develop an ecological balance and diversity of structural stages and tree species composition across the landscape that better reflect the historical range of variability for the Hot Dry and Warm Dry biophysical environments (§219.9(a)(2)).

Maintaining or enhancing ecologically appropriate old forest conditions provides ecosystem types and habitat for forest plan management indicator species for old growth (§219.9(a)(2)(i)).

Management indicator species are commonly enjoyed and used by the public for trapping (pine marten) and observing (pileated woodpecker and three-toed woodpecker) (§219.10(a)(5)). See chapter 3, Wildlife – Management Indicator Species, Forest Vegetation, Fire and Fuels, and Visual Resources sections for more information.

Direct and Indirect Effects of Removal of Trees Greater Than or Equal to 21 Inches Diameter Breast Height and Harvest within and Reduce Late and Old Structure Stands

See chapter 3, Wildlife – Management Indicator Species, Forest Vegetation, Fire and Fuels, and Visual Resources sections for direct and indirect effects of the proposed forest plan amendments.

Alternative 1 (No Action)

By definition, direct and indirect effects (40 Code of Federal Regulations 1508.8) result from the proposed action, and thus are not germane to alternative 1. Forest vegetation and other conditions that would result from taking no action are summarized below.

Under alternative 1, there would be no removal of trees greater than or equal to 21 inches diameter at breast height. There would be no removal of any trees within the planning area, other than activities that fall under previous decisions described in Appendix E – Past, Ongoing, and Reasonably Foreseeable Actions.

Without action, there would be no harvest within late and old structure stands. Currently, 2 percent of the forested stands within the planning area fall within the old forest single stratum category and 35 percent fall within the old forest multi-strata category. Within the Hot Dry plant association group there is no old forest single stratum and 46 percent of forested stands fall within old forest multi-strata. Within the Warm Dry plant association group, 3 percent of forested stands fall within old forest single stratum and 23 percent fall within old forest multi-strata. Forest Vegetation Simulator Data Analyzer was used to model all alternatives into the future. Under alternative 1, modeling shows the Hot Dry plant association group old forest single stratum at 7 percent and old forest multi-strata at 87 percent. Modeling also shows the Warm Dry plant association group old forest single stratum at 8 percent and old forest multi-strata at 53 percent in 2059. This is not in alignment with the historical range of variability for old forest stand structures within the Hot Dry and Warm Dry plant association groups, which are 20 to 70 percent for old forest single stratum and 5 to 15 percent for old forest multi-strata for the Hot Dry plant association group, and 15 to 55 percent for old forest single stratum and 5 to 20 percent for old forest multi-strata for the Warm Dry plant association group (Powell 1998). Currently, and in the future (with no action), old forest single stratum would be below the historical range of variability and old forest multi-strata would be above the historical range of variability for both plant association groups.

Forested stands would continue on their current trajectory with a majority of trees focusing their energy on growing taller, and trying to outcompete each other for sunlight. In overstocked stands, when trees focus their energy on attaining sunlight for photosynthesis, they are less likely to produce cones for future tree recruitment and wildlife forage. The trees also have increased stress, which leads to increased susceptibility to insects and diseases. Species that need sunlight usually die, and shrubs and herbs may become dormant. Establishment of new trees is precluded by a lack of sunlight or of moisture (Powell 1998).

Large overstory ponderosa pine would continue to weaken due to moisture stress resulting from competition in overstocked stands. Western larch would continue to lose vigor due to dense stand conditions that reduce crown width and crown height. Both of these tree species and size classes are important to a wide variety of wildlife species. Susceptibility to insect and disease disturbances in excess of the historical range of variability would continue to increase. Large snags would likely increase due to tree mortality from the above causes, benefiting snag-dependent species in areas where roads do not provide access for firewood cutting.

Fire effects would result in higher stand loss as seen in the Canyon Creek Complex Fire (2015) which burned in similar fuels profiles. The majority of the planning area is currently prone to high tree mortality through cambium kill and crown fire. Disturbances would be of a higher severity, increased mortality of larger trees, and over a larger area than under historical conditions (see chapter 3, Fire and Fuels section). Specifically, patch sizes of high severity would be larger. Recent fires in eastern Oregon, including on the Malheur National Forest in 2013, 2014, and 2015 indicate that in similar conditions as those in the planning area, tree mortality through cambium kill and crown scorch could burn through a majority of the planning area. Historically, these stands burned with low large tree mortality, as surface fires with average flame lengths less than 4 feet and occasional single tree torching. Severe fire affecting a large portion of the planning area would negatively impact a majority of species.

Alternatives 2 and 3

Under alternatives 2 and 3, young (less than 150 years old), relatively large (greater than or equal to 21 inches diameter at breast height) grand fir and Douglas-fir trees in the Warm Dry and Hot Dry plant association group stands would be removed on either approximately 3,350 acres (alternative 2) or 3,020 acres (alternative 3). Alternatives 2 and 3 would restore the ecosystem structure and function would be restored by shifting tree species composition toward the ecologically desired mix of fire-resistant, early seral tree species (ponderosa pine and western larch) (consistent with §219.8(a)(1)(ii), §219.8(a)(1)(iii), §219.8(a)(1)(vi), §219.9(a)(2), and §219.10(a)(1)). Encroaching grand fir and Douglas-fir trees greater than or equal to 21 inches diameter at breast height (but less than 150 years old) would be removed, reducing the risk of future insect outbreaks and uncharacteristic wildfire, while also restoring habitats for historically present plant communities and wildlife habitat (consistent with §219.8(a)(1)(iv), §219.9(a)(2)(i), §219.10(a)(5)), and §219.10(a)(8)).

Alternative 2 would include approximately 70 acres of commercial thinning within old forest multi-strata stands in the Hot Dry plant association group to move these stands to old forest single stratum. Modeling indicates that directly after treatment old forest single stratum would be 4 percent (below the historical range of variability of 20 to 70 percent) and old forest multi-strata would be 41 percent (above the historical range of variability of 5 to 15 percent). In 2059, old forest single stratum would be 25 percent and old forest multi-strata would be 69 percent. Although treatments in the Hot Dry plant association group for alternative 2 do not immediately reach the historical range of variability goals, they move old forest single stratum toward the historical range of variability and set late and old structure stands up to be within or above the historical range of variability in the future. Alternative 2 also includes approximately 1,250 acres of upland restoration treatments (approximately 1,080 of those acres are commercial thinning and 170 acres are non-commercial thinning where biomass could be removed) within late and old structure stands in the Warm Dry plant association group. Modeling indicates that directly after treatment old forest single stratum would be 5 percent (below the historical range of variability of 15 to 55 percent) and old forest multi-strata would be 21 percent (above the historical range of variability of 5 to 20 percent). In 2059, old forest single stratum would be 15 percent and old forest multi-strata would be 44 percent. Treatments for alternative 2 in the Warm Dry plant association group also move towards the historical range of variability goals directly after treatment and set late and old structure stands up to be within or above the historical range of variability in the future (consistent with §219.9(a)(2)).

Alternative 3 would include approximately 50 acres of commercial thinning within old forest multi-strata stands in the Hot Dry plant association group to move these stands to old forest single stratum. Modeling indicates that directly after treatment old forest single stratum would be 4 percent (below the historical range of variability of 20 to 70 percent) and old forest multi-strata would be 41 percent (above the historical range of variability of 5 to 15 percent). In 2059, old forest single stratum would be 25 percent and old forest multi-strata would be 69 percent. Although treatments in the Hot Dry plant association group for alternative 3 do not immediately reach the historical range of variability goals, they move old forest single stratum toward the historical range of variability and set late and old structure stands up to be within or above the historical range of variability in the future. Alternative 3 also includes approximately 970 acres of upland restoration treatments (approximately 800 of those acres are commercial thinning and 170 acres are non-commercial thinning where biomass could be removed) within late and old structure stands in the Warm Dry plant association group. Modeling indicates that directly after treatment old forest single stratum would be 5 percent (below the historical range of variability of 15 to 55 percent) and old forest multi-strata would be 21 percent (above the historical range of variability of 5 to 20 percent). In 2059, old forest single stratum would be 16 percent and old forest multi-strata would be 44 percent. Treatments for alternative 3 in the Warm Dry plant association group also move towards the historical range of variability goals directly after treatment and set late and old structure stands up to be within or above the historical range of variability in the future (consistent with §219.9(a)(2)).

Under alternative 2, 63 percent of the forested stands would be within or below their management zone directly after treatment, compared to 47 percent under alternative 1 (no action). Under alternative 3, 61 percent would be within or below the management zone directly after treatment. With the actions proposed under each action alternative, approximately 36 percent for alternative 2 and 35 percent for alternative 3, of the forested stands would be at healthy stocking levels in 2059 (compared to 21 percent for alternative 1). Theses stands would be more resilient to natural disturbances such as insects, disease, and wildfire (consistent with §219.9(a)(1), §219.8(a)(1)(iii), and §219.10(a)(1)).

Larger high severity wildfires are a threat to the sustainability of forest resources and ecosystems in the Ragged Ruby planning area, which has departed from its historical fire regime characterized by frequent fires (0 to 35 years) of low (surfaces fires most common) to mixed severity (consistent with §219.8(a)(1)(iv)) and §219.10(a)(7)). Currently, 90 percent of the Ragged Ruby planning area falls within fire regime condition class class 3, which is characterized by a high departure from the natural (historical) regime of vegetation characteristics; fuel composition; fire frequency, severity, and pattern; and other associated disturbances.

Past management, including fire exclusion, has allowed the ingrowth of younger grand fir and Douglas-fir trees which have increased the risk of tree mortality to old ponderosa pine and western larch due to competition induced stress insect and disease attacks, and uncharacteristic wildfire. Grand fir was historically not a major component within these dry forest types, however was present on the landscape. Munger (1912) describes 9 tracts of “yellow pine” also known as ponderosa pine he studied. Two of the tracts are in Grant County, Oregon and relatively near the Ragged Ruby planning area. Descriptions of the two tracts, Crawford Creek and Austin & Whitney are “typical of thousands of acres at this altitude on the south and west slopes of the

Blue Mountains" and "characteristically, fairly pure yellow pine slopes adjacent to Whitney and Austin, Grant County, Oregon." In the Crawford Creek tract, Munger noted before timber cutting, 44.96 trees per acre yellow pine and 11.98 trees per acre of other species, with 81.2 percent of the trees over 12 inches diameter at breast height being yellow pine. The Austin & Whitney tract had 38 trees per acre yellow pine and 18.47 trees per acre of other species, with 81.6 percent of the trees over 12 inches diameter at breast height being yellow pine (Munger 1917) (consistent with §219.8(a)(1)(vi)).

Alternatives 2 and 3 would directly allow for terrestrial ecosystems to adapt to change by reducing ladder fuels, reducing tree density, increasing water availability, and shifting species composition toward higher percentages of fire resistant trees (consistent with §219.10(a)(8)). Implementation of alternatives 2 and 3 would lead to an increased percentage in both ponderosa pine and western larch. Without the removal of grand fir and Douglas-fir trees greater than or equal to 21 inches diameter at breast height, the percentage of ponderosa pine and western larch would be lower.

The amendments are proposed to transition the Ragged Ruby planning area to a more historically fire resilient landscape characterized by frequent, low severity fires, such as those found in ponderosa pine stands (consistent with §219.8(a)(1)(v)). The transition from frequent, low severity fires to less frequent, higher severity fires started in the 1800s (Heyerdahl and Agee 1996). Studies completed in the area within or near the Ragged Ruby planning area show dry forest landscapes were historically dominated by ponderosa pine. Munger (1912) states, "most of the stands for which this yield study was made consistent, to the extent of at least 85 percent, of yellow pine, the remainder being mostly western larch, Douglas-fir, white fir, and grand fir."

There is a need for landscape scale restoration on the Blue Mountain Ranger District and specifically the Ragged Ruby planning area. There are several recent and planned projects adjacent to the Ragged Ruby Project that include restoration treatments: Balance, Summit and Reed Fire Restoration, Galena, Big Mosquito, and Camp Lick projects. Connectivity corridors for wildlife movement have been identified to connect all five projects. These corridors connect management area 13 and late and old structure stands. Some of the late and old structure stands already meet desired conditions. There are approximately 12,500 acres identified as late and old structure within the Ragged Ruby planning area, approximately 37 percent of the planning area. Less than 1 percent of these acres are below their management zones in terms of stand density index and approximately 65 percent are above their management zones (approximately 35 percent of the stands are within their management zones). Under alternative 2, approximately 8,610 acres are not proposed for treatment (except prescribed burning), 1,150 acres are proposed for dry pine restoration, 2,030 acres are proposed for mixed conifer restoration, 190 acres are proposed for dry meadow and scabland flat bunchgrass restoration, 190 acres are proposed for whitebark pine restoration, and 330 acres are proposed for western white pine restoration. Out of those 3,890 acres of proposed treatments within late and old structure listed, the forest plan amendment to remove grand fir or Douglas-fir trees greater than or equal to 21 inches diameter at breast height, but less than 150 years old, would be limited to approximately 1,320 acres within the Warm Dry and Hot Dry plant association groups. Under alternative 3, approximately 9,260 acres are not proposed for treatment (except prescribed burning), 920 acres are proposed for dry pine restoration, 1,610 acres are proposed for mixed conifer restoration, 190 acres are proposed for dry meadow and scabland flat bunchgrass restoration, 190 acres are proposed for whitebark pine restoration, and 330 acres are proposed for western white pine restoration. Out of those 3,240 acres of proposed treatments within late and old structure listed, the forest plan amendment to remove grand fir and Douglas-fir trees greater than or equal to 21 inches diameter at breast height, but less than 150 years old, would be limited to approximately 1,020 acres within the Warm Dry and Hot Dry plant association groups. Proposed dry meadow and scabland flat bunchgrass, whitebark pine, and western white pine restoration treatments would not include the forest plan amendment. Direct effects of these restoration treatments would reclassify a majority of late and old structure stands as within their management zones and help make the landscape more resilient across project boundaries (consistent with §219.8(a)(1)(vi)).

Cumulative Effects of Removal of Trees Greater Than or Equal to 21 Inches Diameter Breast Height

The cumulative effects discussed below are associated with alternatives 2 and 3. Alternative 1 (no action) does not propose removing trees greater than or equal to 21 inches diameter at breast height, therefore there would be no cumulative effects associated with that alternative. The effects from past, present, and foreseeable projects must overlap temporally and spatially with this project to contribute to a cumulative effect. Cumulative effects for this proposed forest plan amendment are addressed at the ranger district and Forest scales as described below.

In the 23 years the Regional Forester's Eastside Forest Plan Amendment 2 has been in place, the Malheur National Forest has authorized 12 forest plan amendments to standard 6(d) scenario A(2)(a) to allow removal of trees greater than or equal to 21 inches diameter at breast height (Table 106). Amendments to remove live trees greater than or equal to 21 inches diameter at breast height have been authorized on approximately 36,336 acres (2.1 percent) of the Malheur National Forest. Amendments have been distributed across the Malheur National Forest to accomplish a variety of specific purposes including reducing the spread of insects and diseases, aspen restoration, fire salvage, rock pit expansion, restoring historical tree species composition and improving the survivability of older trees. Recent projects have been proposed to shift species composition, protect old ponderosa pine and western larch, and restore unique habitats (for example, aspen).

The effects of removing trees greater than or equal to 21 inches diameter at breast height in several past projects such as the 1996 Parish Timber Sale, 1997 Clear Creek project, and 1997 Badger Timber Sale have likely recovered with the growth and development of additional large trees over the last 20 years.

Table 106. Summary of projects with forest plan amendments to Regional Forester's Eastside Forest Plan Amendment 2, standard 6(d) scenario A(2)(a) (amendments to remove trees greater than or equal to 21 inches diameter at breast height)

Number of projects with amendments to remove trees ≥21 inches diameter at breast height	Year	District, subbasin (hydrologic unit code 8)	Project	Amendment rationale	Scale of amendment
1	1996	Blue Mountain, Silvies	Parish Timber Sale	Remove a portion of the large component trees in stands with insect infestation and mistletoe infection to promote future healthier, vigorous, big-tree forest stands.	An estimated 235 acres of the 32,933 acre environmental analysis unit.

Number of projects with amendments to remove trees ≥21 inches diameter at breast height	Year	District, subbasin (hydrologic unit code 8)	Project	Amendment rationale	Scale of amendment
2	1997	Prairie City, Middle Fork John Day	Clear Creek – 91B Analysis Area	Reduce intertree competition to promote growth of future large trees and improve the health and vigor of existing large trees. Reduce existing levels of dwarf mistletoe and future spread of dwarf mistletoe to susceptible healthy trees. Improve economic viability of proposed treatments.	Approximately 2,119 acres in the 12,052 Clear Creek subwatershed.
3	1997	Emigrant Creek, Silvies	Badger Timber Sale	To decrease shading of aspen stands by encroaching conifers.	Approximately 92 acres of aspen restoration.
4	2006	Blue Mountain, Silvies	Starr Rock Pit	To allow expansion of the existing 6.2-acre Starr Rock Pit by 2.7 acres to provide a long-term, economical, and readily accessible source of aggregate material that meets quality standards for transportation projects.	6-10 trees ≥21 inches diameter at breast height within an approximately 3-acre area in the Starr subwatershed (approximately 18,300 acres of which are located on the Malheur National Forest).
5	2008	Blue Mountain, Upper John Day	Thorn Fire Salvage	To define both live and trees in order to meet the purpose and need of recovering the economic value of the available dead and dying trees.	To be applied on 2,529 acres of commercial salvage. The analysis area included 7,783 acres of the Shaketable fire that burned in 2006.
6	2012	Blue Mountain, Silvies	Soda Bear	To improve the retention and survivability of older trees and transition the landscape to a more historically present fire-resistant species.	Approximately 8,400 acres of the 20,774 acre planning area.
7	2015	Emigrant Creek, Upper Malheur	Wolf	To maintain and enhance the conditions of aspen stands through reducing conifer shading within aspen stands.	Approximately 35 acres of the 39,465 acre planning area.

Number of projects with amendments to remove trees ≥21 inches diameter at breast height	**Year**	**District, subbasin (hydrologic unit code 8)**	**Project**	**Amendment rationale**	**Scale of amendment**
8	2015	Prairie City, Upper Malheur	Elk 16	Removal of young (less than 150 years old), relatively large (≥21 inches diameter at breast height) grand fir and Douglas-fir trees where it will favor healthy ponderosa pine, western larch, and aspen in the Warm Dry plant association group. Several sources of information show that grand fir ≥21 inches diameter at breast height have grown in since the suppression of fire in the planning area. Although these grand fir are large, they are not old and are threatening the survival of fire-resistant long-lived early-seral ponderosa pine and western larch, some of which are true old-growth trees. Maintaining a consistent and sustainable long-lived early-seral presence on the landscape will improve forest heterogeneity and restore resiliency.	Removal of Douglas-fir and grand fir trees ≥21 inches diameter at breast height and less than 150 years on 8,486 acres of the approximately 43,000 acre planning area. No trees ≥21 inches diameter at breast height were removed within late and old structure.
9	2015	Blue Mountain, Middle Fork John Day	Big Mosquito	To meet the need to transition the dry forest landscape in the planning area to more historically present tree species compositions and stand structures (structural states) by allowing removal of relatively large (≥21 inches diameter at breast height) grand fir where it would favor healthy ponderosa pine, western larch, and western white pine.	Amendment will be applied to a total of approximately 5,625 acres within the 36,000 acre Big Mosquito planning area.
10	2016	Blue Mountain, Silvies	Starr Aspen	Reduce conifers that are currently overtopping and shading aspen, and those that have the potential to in the future, by creating conditions that will allow for successful aspen regeneration and development and an increase in stand size. Western larch will have a 21 inches diameter at breast height cut limit. Additionally, all grand fir, ponderosa pine, and Douglas-fir over 30 inches diameter at breast height will be retained, as modified by objection resolution.	357 acres in the 17,500 acre Starr subwatershed.

Number of projects with amendments to remove trees ≥21 inches diameter at breast height	Year	District, subbasin (hydrologic unit code 8)	Project	Amendment rationale	Scale of amendment
11	2017	Prairie City, Upper Malheur	Summit	To remove young (less than 150 years old), relatively large (≥21 inches diameter at breast height) grand fir and Douglas-fir trees competing with older ponderosa pine, western larch, or aspen trees, causing competition stress and increasing the risk the older trees may die as a result of insects, drought, or wildfire.	Approximately 8,308 acres in the Warm Dry plant association group and 73 acres in aspen stands.
12	2018	Emigrant Creek, Silvies	Flat	To cut and remove conifer trees ≥21 inches diameter at breast height but less than 30 inches diameter at breast height to result in better growing conditions for aspen and promote their existence across the landscape.	Approximately 147 acres of aspen stands.

This proposed forest plan amendment would allow removal of young (less than 150 years old), relatively large (greater than or equal to 21 inches diameter at breast height) grand fir and Douglas-fir trees in the dry pine and mixed conifer restoration units where commercial thinning is proposed (approximately 3,350 acres within the Warm Dry plant association group and 100 acres within the Hot Dry plant association group for alternative 2 and 2,920 acres within the Warm Dry plant association group and 100 acres within the Hot Dry plant association group for alternative 3).

Reasonably foreseeable projects which could include forest plan amendments to remove trees greater than or equal to 21 inches diameter at breast height include the Cliff Knox and Austin projects.

At the scale of the Middle Fork John Day River subbasin there have been two previous amendments (Clear Creek – 91B and Big Mosquito projects), one of which, the Clear Creek – 91B Project, was authorized in 1997, which has likely recovered with the growth and development of additional large trees over the last 20 years. Therefore, the effects of the Clear Creek – 91B Project likely do not overlap temporally. The Ragged Ruby Project (alternative 2) would increase the acres impacted in the Middle Fork John Day River subbasin from approximately 5,625 to 8,975 acres; resulting in approximately 3.3 percent of the 271,000-acre Middle Fork John Day River subbasin within the boundary of the Malheur National Forest having been impacted.[38] Alternative 3 would increase the acres impacted in the Middle Fork John Day River subbasin from approximately 5,625 to 8,645 acres, resulting in approximately 3.2 percent of the subbasin having been impacted.

At the scale of the Blue Mountain Ranger District there have been six previous amendments, one of which, the Parish Timber Sale, was authorized in 1996, which has likely recovered with the growth and development of additional large trees over the last 23 years. Therefore, the effects of the Parish Timber Sale likely do not overlap temporally. The Ragged Ruby Project (alternative 2) would increase the acres impacted on the Blue Mountain Ranger District from approximately

[38] The Middle Fork John Day River subbasin is approximately 507,800 acres in size.

16,914 to 20,264 acres; resulting in approximately 2.9 percent of the 707,000-acre Blue Mountain Ranger District having been impacted. Alternative 3 would increase the acres impacted on the Blue Mountain Ranger District from approximately 16,914 to 19,934 acres; resulting in approximately 2.8 percent of the Blue Mountain Ranger District having been impacted.

At the scale of the Malheur National Forest there have been 12 previous amendments, three of which were authorized in 1996 and 1997 (Parish Timber Sale, Clear Creek – 91B, and Badger Timber Sale), and which have likely recovered with the growth and development of additional large trees over the last 21 years. Therefore, the effects of these projects likely do not overlap temporally. The Ragged Ruby Project (alternative 2) would increase the acres impacted on the Malheur National Forest from approximately 36,152 to 39,502 acres; resulting in approximately 2.3 percent of the 1,700,000-acre Malheur National Forest having been impacted. Alternative 3 would increase the acres impacted on the Malheur National Forest from approximately 36,152 to 39,172 acres; resulting in approximately 2.3 percent of the Malheur National Forest having been impacted.

All other past or ongoing projects with amendments to remove trees greater than or equal to 21 inches diameter at breast height on the Malheur National Forest are located in different geographical areas than the Ragged Ruby Project.

Table 107. Foreseeable projects with forest plan amendments to Regional Forester's Eastside Forest Plan Amendment 2, standard 6(d) scenario A(2)(a) (amendments to remove trees greater than or equal to 21 inches diameter at breast height)

Number of projects with amendments to remove trees ≥21 inches diameter at breast height	Year	District, subbasin (hydrologic unit code 8)	Project	Amendment rationale	Scale of amendment
13	Expected in 2019	Blue Mountain, Middle Fork John Day	Camp Lick	To remove young (less than 150 years old), relatively large (≥21 inches diameter at breast height) grand fir and Douglas-fir trees competing with older ponderosa pine and western larch, causing competition stress and increasing the risk that the older trees may die as a result if insects, drought, and wildfire.	Approximately 4,700 acres in the grand fir and Douglas-fir plant association stands in the Warm Dry plant association group.
14	Expected in 2019	Blue Mountain, Middle Fork John Day	Ragge d Ruby	To meet the need to transition the dry forest landscape (Hot Dry and Warm Dry plant association groups) in the planning area to more historically present tree species compositions and stand structures (structural states) by allowing removal of young (less than 150 years old), relatively large (≥21 inches diameter at breast height) grand fir and Douglas-fir trees to favor healthy ponderosa pine, western larch, and western white pine.	Approximately 3,250 acres in the Warm Dry plant association group and 100 acres in the Hot Dry plant association group for alternative 2. Approximately 2,920 acres in the Warm Dry plant association group and 100 acres in the Hot Dry plant association group for alternative 3.

Number of projects with amendments to remove trees ≥21 inches diameter at breast height	Year	District, subbasin (hydrologic unit code 8)	Project	Amendment rationale	Scale of amendment
15	Expected in 2019	Prairie City, Upper Malheur	Cliff Knox	This project could include updates to Regional Forester's Eastside Forest Plan Amendment 2, standard 6(d) scenario A(2)(a) (amendments to remove trees ≥21 inches diameter at breast height), however at this early stage in the planning process this has not yet been determined and thus there is no estimate of acres available.	--
16	Expected in 2020	Blue Mountain, Middle Fork John Day	Austin	This project could include updates to Regional Forester's Eastside Forest Plan Amendment 2, standard 6(d) scenario A(2)(a) (amendments to remove trees ≥21 inches diameter at breast height), however at this early stage in the planning process this has not yet been determined and thus there is no estimate of acres available.	--

Cumulatively, the acres on which a person may see trees greater than or equal to 21 inches diameter at breast height would be increased with this amendment. Over time, the quality of trees greater than or equal to 21 inches diameter at breast height would be enhanced and be more representative of historical conditions. One of the goals of removing relatively young (less than 150 year old) trees greater than or equal to 21 inches diameter at breast height is to restore conditions to what they were like before fire suppression took place. Fire suppression has increased the number of shade-tolerant, late seral trees of all sizes across the Blue Mountain Ranger District. In many cases these trees are a direct fire hazard, specifically endangering early seral ponderosa pine and western larch trees that are typically more resistant to wildfire because of their thick bark and because they traditionally had grown in more open stand conditions where there was a large presence of light, flashy, grassy fuel that kept fires at a low intensity.

Many of the large, early seral ponderosa pine and western larch trees across the Blue Mountain Ranger District are stressed due to competition from other trees. Tree stress attracts insects and threatens the longevity of the trees. If Warm Dry and Hot Dry stands were more open, and more old forest single stratum was promoted across the landscape, there would be the potential for an increased amount of ponderosa pine and western larch trees greater than or equal to 21 inches diameter at breast height over time.

The effects of current projects along with the implementation of alternatives 2 and 3 would additively restore more acres and provide the opportunity for more ponderosa pine and western larch trees greater than or equal to 21 inches diameter at breast height across the landscape.

Cumulative effects of the proposed forest plan amendment would not alter the long-term relationship between goods and services projected by the Malheur Forest Plan, as amended, nor would it forgo the opportunity to achieve an output in later years. At the Malheur National Forest and Blue Mountain Ranger District scales the cumulative effects from removing trees greater than or equal to 21 inches diameter at breast height are expected to be limited or not occur.

Cumulative Effects of Harvest within and Reduce Late and Old Structure Stands

The cumulative effects discussed below are associated with alternatives 2 and 3. Alternative 1 (no action) does not propose an amendment for harvest within late and old structure stands, therefore there would be no cumulative effects associated with that alternative.

The effects from past, present, and foreseeable projects must overlap temporally and spatially with this project to contribute to a cumulative effect. Cumulative effects for this proposed forest plan amendment are addressed at the District and Forest scales as described below.

In the 23 years Regional Forester's Forest Plan Amendment 2 has been in place, there have been two amendments to standard 6(d) scenario A: to allow a short-term loss of late and old structure. The 2010 Damon Wildland Urban Interface Project allowed conversion of 253 acres of old forest multi-strata structure in the Warm Dry plant association group to old forest single stratum. This reduced the percentage of old forest multi-strata structure to 4 percent, below the lower end of the historical range of variability (5 percent). The Damon Project converted old forest multi-strata structure to old forest single stratum structure, so technically there was not a loss of late and old structure on the Malheur National Forest as a result. The 2015 Big Mosquito Project reduced old forest multi-strata in the Warm Dry plant association group by approximately 600 acres, reducing the percentage of old forest multi-strata to 18 percent directly after treatment, which is within the historical range of variability. Combined, the Damon and Big Mosquito project amendments impacted 853 acres of late and old structure; resulting in approximately 0.05 percent of the 1.7 million acre Malheur National Forest having been impacted over time.

Table 108. Summary of projects with forest plan amendments to Regional Forester's Eastside Forest Plan Amendment 2, standard 6(d), scenario A (amendments to allow a loss of late and old structure)

Number of projects with amendments to allow loss of late and old structure	Year	District, subbasin (hydrologic unit code 8)	Project	Amendment rationale	Scale of amendment
1	2010	Blue Mountain, Silvies	Damon Project	To allow conversion of 253 acres of old forest multi-strata structure in Warm Dry plant association group to old forest single stratum. This reduced the percentage of old forest multi-strata structure to 4 percent, below the lower end of the historical range of variability of 5 percent. The amendment authorized conversion of old forest multi-strata to old forest single stratum in the Warm Dry plant association group to reduce fuels within the wildland urban interface in stands that were a fire risk to private lands, were overstocked and likely unsustainable given their stand structure, species compositions, and location in dryer forest types. The Damon Wildland Urban Interface project converted old forest multi-strata structure to old forest single stratum structure, so technically there was not a loss of late and old structure on the Malheur National Forest as a result.	253 acres of the Damon planning area.
2	2015	Blue Mountain, Middle Fork John Day	Big Mosquito Project	To allow removal of grand fir trees ≥21 inches diameter at breast height that currently exist within Warm Dry late and old structure stands, to reduce the acres of old forest multi-strata.	600 acres of the approximately 36,000-acre Big Mosquito planning area.

Alternative 2 proposes to allow approximately 50 acres of commercial thinning within old forest multi-strata stands in the Hot Dry plant association group (which is currently above the historical range of variability), to move these stands to old forest single stratum (which is currently below the historical range of variability). It would also amend the Eastside Screens to allow approximately 1,160 acres of upland restoration treatments (approximately 1,010 of those acres are commercial thinning and 150 acres are non-commercial thinning) within late and old structure stands in the Warm Dry plant association group. Almost all of the approximately 1,160 acres proposed for upland restoration treatments in the Warm Dry plant association group are within the old forest multi-strata structure class (which is above the historical range of variability) (only 5 acres are within the old forest single stratum structure class). Of these acres approximately 120 acres would be removed from late and old structure, approximately 440 acres would transition from old forest multi-strata to old forest single stratum, and approximately 590 acres would remain old forest multi-strata. With mechanical treatment old forest single stratum would move closer to the historical range of variability, from 3 to 5 percent of the Warm Dry plant association group (the historical range of variability is 15 to 55 percent), while old forest multi-strata would remain above the historical range of variability at 21 percent (the historical range of variability is 5 to 20 percent). Modeling also indicates that through continual growth of trees, despite some stands being removed from late and old structure, there is still no net loss of late and old structure after treatment. This amendment includes removal of both trees less than 21 inches diameter at breast height and young (less than 150 years old), relatively large (greater than or equal to 21 inches diameter at breast height) grand fir and Douglas-fir trees.

Alternative 3 proposes to allow approximately 50 acres of commercial thinning within old forest multi-strata stands in the Hot Dry plant association group (which is currently above the historical range of variability), to move these stands to old forest single stratum (which is currently below the historical range of variability). It would also amend the Eastside Screens to allow approximately 970 acres of upland restoration treatments (approximately 820 of those acres are commercial thinning and 150 acres are non-commercial thinning) within late and old structure stands in the Warm Dry plant association group. All of the approximately 970 acres proposed for upland restoration treatments in the Warm Dry plant association group are within the old forest multi-strata structure class (which is above the historical range of variability). Of these acres approximately 120 acres would be removed from late and old structure, approximately 350 acres would transition from old forest multi-strata to old forest single stratum, and approximately 510 acres would remain old forest multi-strata. With mechanical treatment, old forest single stratum would move closer to the historical range of variability, from 3 to 5 percent of the Warm Dry plant association group (the historical range of variability is 15 to 55 percent), while old forest multi-strata would remain above the historical range of variability at 21 percent (the historical range of variability is 5 to 20 percent). Modeling also indicates that through continual growth of trees, despite some stands being removed from late and old structure, there is still no net loss of late and old structure after treatment. This amendment includes removal of both trees less than 21 inches diameter at breast height and young (less than 150 years old), relatively large (greater than or equal to 21 inches diameter at breast height) grand fir and Douglas-fir trees.

Reasonably foreseeable projects that could include an amendment to Eastside Screens, standard 6(d), scenario A to allow harvest within or a reduction of late and old structure include the Camp Lick, Cliff Knox, and Austin projects. These projects, combined with the Ragged Ruby Project, could increase the acres impacted by harvest within or a reduction of late and old structure from approximately 853 to 2,443 acres under alternative 2 and to 2,253 acres under alternative 3, resulting in approximately 0.1 percent of the 1,700,000-acre Malheur National Forest being impacted over time. This is a small additive effect that would not alter the long-term relationship between goods and services projected by the Malheur Forest Plan.

The Big Mosquito, Camp Lick, and Austin projects are located adjacent to or nearby the Ragged Ruby planning area in the Middle Fork John Day River subbasin, and have the potential for effects to overlap spatially and temporally. Removal of grand fir trees greater than or equal to 21 inches diameter at breast height (and less than 150 years old) is authorized in Warm Dry late and old structure stands on 600 acres of the Big Mosquito Project. Removal of grand fir and Douglas-fir trees greater than or equal to 21 inches diameter at breast height (and less than 150 years old) is proposed within Warm Dry late and old structure stands on 380 acres of the Camp Lick Project. Removal of grand fir and Douglas-fir trees greater than or equal to 21 inches diameter at breast height (and less than 150 years old) is proposed within 1,210 acres for alternative 2 and within 1,020 acres for alternative 3 for the Ragged Ruby Project. The potential total effect within late and old structure of all three projects added together would be 2,190 acres for alternative 2 and 2,000 acre for alternative 3, out of the 271,000-acre Middle Fork John Day River subbasin, or 0.8 percent for alternative 2 and 0.7 percent for alternative 3. The Austin Project is in the early stages of development at this time, but could include a similar forest plan amendment within late and old structure. Implementation of the Big Mosquito Project began after the project was signed in late 2015. The Camp Lick and Ragged Ruby projects are anticipated to be signed in 2019, and the Austin Project is anticipated to be signed in 2020. Restoration activities within these projects could take approximately 5 to 10 years to complete, which could distribute the potential affected area of the Middle Fork John Day River subbasin over approximately 14 years. Additionally, the Camp Lick project would actually increase acres of late and old structure.

The Damon and Cliff Knox projects are located in a different geographical area of the Forest than the Ragged Ruby Project, in the Silvies and Upper Malheur subbasins, respectively. Because the effects from these past and foreseeable projects do not overlap spatially with the Ragged Ruby Project, there would not be a cumulative effect.

Table 109. Foreseeable projects with forest plan amendments to Regional Forester's Eastside Forest Plan Amendment 2, standard 6(d), scenario A (amendments to allow a loss of or harvest within late and old structure stands)

Number of projects with amendments to allow loss of late and old structure	Year	District, subbasin (hydrologic unit code 8)	Project	Amendment rationale	Scale of amendment
3	2018	Blue Mountain, Middle Fork John Day	Camp Lick	To allow silvicultural treatments within old forest single stratum stands in the Warm Dry plant association group (which is currently below the historical range of variability).	380 acres of the 40,000-acre planning area
4	Expected in 2018	Blue Mountain, Middle Fork John Day	Ragged Ruby	To allow treatment and removal of grand fir and Douglas-fir trees ≥21 inches diameter at breast height that currently exist within Warm Dry and Hot Dry late and old structure stands. Treatments in alternatives 2 and 3 would transition the Hot Dry plant association group old forest multi-strata to old forest single stratum. Treatments in alternatives 2 and 3 would decrease late and old structure in the Warm Dry plant association group by 120 acres. The remaining late and old structure treated within the Warm Dry plant association group would either transition to old forest single stratum or remain old forest multi-strata. Trees would be removed to protect and enhance old growth ponderosa pine and western larch.	Alternative 2 would impact approximately 1,210 acres and alternative 3 would impact approximately 1,020 acres of the approximately 34,000-acre Ragged Ruby planning area.
5	Expected in 2019	Prairie City, Upper Malheur	Cliff Knox	This project could include updates to Regional Forester's Eastside Forest Plan Amendment 2, standard 6(d), scenario A (amendments to allow harvest within late and old structure), however at this early stage in the planning process this has not yet been determined and thus there is no estimate of acres available.	--

Number of projects with amendments to allow loss of late and old structure	Year	District, subbasin (hydrologic unit code 8)	Project	Amendment rationale	Scale of amendment
6	Expected in 2019	Blue Mountain, Middle Fork John Day	Austin	This project could include updates to Regional Forester's Eastside Forest Plan Amendment 2, standard 6(d), scenario A (amendments to allow a loss of and/or harvest within late and old structure), however at this early stage in the planning process this has not yet been determined and thus there is no estimate of acres available.	--

The amendment meets the intent of 36 Code of Federal Regulations Part 219.8 through 11.

Uniqueness of the Proposed Forest Plan Amendment

Understanding historical conditions and how those conditions fostered resilient forests is key to making management decisions that increase the likelihood of increasing forest resiliency. Research was conducted in the Ragged Ruby planning area to determine reference conditions in the area and develop tools to determine which trees to retain or remove to approximate those reference conditions (Johnston et al. 2018). For this research dendroecological reconstructions and General Land Office records were used to quantify historical forest structure and composition in 1880 and compare that to forest structure and composition in 2016. The research found that in the Ragged Ruby planning area the overall tree density increased by 273 to 316 percent between 1880 and 2016 and overall basal area increased by 60 to 176 percent, depending on the productivity of the site. This research also found that historically the planning area was dominated by shade intolerant trees, (ponderosa pine, western larch, and western white pine) and the abundance of shade tolerant trees has increased dramatically to the point where mixed conifer stands are now dominated by them.

One intent of the Regional Forester's Forest Plan Amendment 2 is to protect old trees from being harvested where there is a deficiency of old forest. However, Johnston et al. (2018) found the same or greater number of trees greater than or equal to 21 inches diameter at breast height in 2016 as compared to 1880, and that there are currently many more grand fir and Douglas-fir trees of this size class than existed historically. Restoring historical conditions in the Ragged Ruby planning area includes removing shade tolerant trees that have established within the past century, of which some are greater than or equal to 21 inches diameter at breast height.

Johnston et al. (2018) developed tools for determining the approximate age of the most common shade tolerant trees (grand fir and Douglas-fir) within the Ragged Ruby planning area to inform decisions about which trees to harvest and which trees to protect to move stands closer to historical conditions. Decision trees were created based on environmental variables and morphological characteristics that have been incorporated into thinning prescriptions. Table 110 provides the characteristics that will be used to determine when grand fir and Douglas-fir greater than or equal to 21 inches diameter at breast height would be removed for Hot Dry and Warm Dry units. Grand fir in units greater than 5,600 feet elevation would only be removed up to 18 inches diameter at breast height. In units lower than 5,600 feet elevation, grand fir greater than or equal to 21 inches diameter at breast height would only be removed if they have live foliage less than 4 feet from the ground. Douglas-fir in units greater than 5,600 feet elevation would have a

21 inch diameter at breast height limit, but would not allow the removal of trees with old tree characteristics. In units below 5,600 feet elevation, Douglas-fir would have a 26 inch diameter at breast height limit. Douglas-fir greater than or equal to 21 inches diameter at breast height and less than 26 inches diameter at breast height would only be removed if they have live or dead branches less than 6 feet from the ground.

Table 110. Diameter limits and morphological characteristics for the removal of large, young grand fir and Douglas-fir in Warm Dry and Hot Dry plant association group units

Proposed treatment	Units	Grand fir greater than or equal to 21 inches diameter at breast height	Douglas-fir greater than or equal to 21 inches diameter at breast height
Dry pine restoration (40 basal area)	64, 66, 68, 70, and 72	Height to live foliage less than 4 feet from ground.	26 inch diameter at breast height limit. Dead branches less than 6 feet from the ground.
Dry pine restoration (50 basal area)	44, 46, 48, 52, 54, 58, 60, 74, 76, 80, 82, 84, 144, 150, 156, 172, 178, 188, 202, 204, 274, 276, 286, 296, 304, 306, 388, 396, 400, 412, and 434	Height to live foliage less than 4 feet from ground.	26 inch diameter at breast height limit. Dead branches less than 6 feet from the ground.
Dry pine restoration (60 basal area)	30, 32, 34, 35, 36, 38, 40, 42, 90, 92, 104, 110, 154, 158, 160, 162, 212, 332, 336, 340, 370, 372, 374, 456, 460, and 468	Height to live foliage less than 4 feet from ground.	26 inch diameter at breast height limit. Dead branches less than 6 feet from the ground.
Mixed conifer restoration (below 5,600 feet elevation)	4, 6, 16, 18, 20, 24, 108, 126, 164, 200, 216, 248, 362, 420, 422, and 452	Height to live foliage less than 4 feet from ground.	26 inch diameter at breast height limit. Dead branches less than 6 feet from the ground.
Mixed conifer restoration (above 5,600 feet elevation)	220, 238, 242, 258, and 260	18 inch diameter at breast height limit.	21 inch diameter at breast height limit.

Not Maintaining Connectivity Between all Late and Old Structure and Old Growth Stands

Direct and Indirect Effects of Not Maintaining Connectivity Between all Late and Old Structure and Old Growth Stands

Based on the need for change, site-specific conditions in the Ragged Ruby planning area, and relevant Malheur National Forest-specific information and data, the following substantive requirements of 36 Code of Federal Regulations 219.8 through 219.11 apply to the proposed amendment to not maintain connectivity between all late and old structure and old growth stands in the Ragged Ruby planning area. See Appendix F – 36 Code of Federal Regulations 219.8 to 11 Applicability to Amendments to the 1990 Malheur Forest Plan, as Amended for a rationale for why other provisions of 36 Code of Federal Regulations 219.8 through 219.11 do not apply.

As discussed in chapter 1, there is a need to change the Malheur Forest Plan, as amended, to better reflect current conditions and scientific understanding regarding necessary restoration of the Ragged Ruby planning area. Due to fire suppression over the last century, the fire regime in the Middle Fork John Day River drainage has changed. Historically, fire was the dominant disturbance on the landscape with frequent ground fires varying in size from small to large. These fires favored fire resistant tree species (ponderosa pine, western larch, and to a lesser extent Douglas-fir) and development of more open, park-like stands with little vertical structure. Shade-tolerant species (grand fir and Douglas-fir) were generally susceptible to these fires due to their thinner bark and persistent, low hanging crown characteristics. In the Ragged Ruby planning area, because all sites (Cool Moist, Cold Dry, Warm Dry, and Hot Dry) experienced similar fire disturbance regimes, this tended to equalize stand biomass and species composition across the landscape (Johnston 2017).

Stand densities and multi-layered canopies have increased across the planning area. Stand structures in the planning area currently do not reflect the desired condition based on historical references. Heavy stocking, drought stress, and slow growth, accompanied by stagnated stand conditions are contributing to insect activity. Currently the Ragged Ruby planning area is outside the natural range of variation.

The proposed forest plan amendment is needed to address the need for change and the site-specific conditions in the planning area described above. Specifically the upland restoration treatments would move the planning area towards the historical range of variability for stand structure and tree species composition, restore the planning area to a more historically fire resistant condition, and reduce stand densities and stress due to competition (§219.8(a)(1)(v) and §219.8(a)(1)(vi)). The ecosystem structure and function within the landscape would be restored by moving the tree species composition toward the ecologically desired mix of fire-resistant species (§219.8(a)(1)(ii)). Recent studies on the Malheur National Forest have found that fire return intervals within mixed conifer forest types were only slightly longer than fire return intervals for Warm Dry ponderosa pine sites (fire return intervals between 1680 and 1900 ranged from 10.6 to 18.4 years within ponderosa pine sites and from 11.8 to 21.2 years within mixed conifer sites) (Johnston et al. 2017). Fire severity in these forest types was predominately low severity, although some mixed severity and relatively small (1 to 100-acre) stand replacement patches did occur across the landscape through time. These fires favored fire resistant tree species and also kept the ground vegetation dominated by fire-adapted grasses such as pine grass and elk sedge (§219.8(a)(1)(iv) and §219.10(a)(8)).

Within the planning area there are foreseeable risks to ecological sustainability because of the current imbalance of tree species composition and stand structures (§219.10(a)(7)). Proposed treatments would begin to restore the landscape condition (integrity) (§219.9(a)(1)), including stand structures and densities, species composition, and function (ability to withstand insects, disease, and fire) while also restoring habitats for historically present plant communities and wildlife habitat (§219.8(a)(1)(iii) and §219.10(a)(1)). Treatments would develop an ecological balance and diversity of structural stages and tree species composition across the landscape that better reflect the historical range of variability for the Ragged Ruby planning area (§219.9(a)(2)).

This proposed forest plan amendment would allow for upland restoration activities to reduce stand density, increase tree spatial heterogeneity, protect old trees, and shift species composition to a higher proportion of early seral species (§219.9(a)(2)(i)). Management indicator species are commonly enjoyed and used by the public for trapping (pine marten) and observing (pileated woodpecker and three-toed woodpecker) (§219.10(a)(5)). See chapter 3, Wildlife – Management Indicator Species, Forest Vegetation, Fire and Fuels, and Visual Resources sections for more information.

Alternative 1 (No Action)

By definition, direct and indirect effects (40 Code of Federal Regulations 1508.8) result from the proposed action, and thus are not germane to alternative 1. Forest vegetation and other conditions that would result from taking no action are summarized below.

Under alternative 1, there would be no connectivity corridors designated between late and old structure and old growth stands.

Without action, there would be no connectivity corridors designated and also no additional treatments authorized in the Ragged Ruby planning area. Forested stands would continue on their current trajectory with a majority of trees focusing their energy on growing taller, and trying to outcompete each other for sunlight. In overstocked stands, when trees focus their energy on attaining sunlight for photosynthesis, they are less likely to produce cones for future tree recruitment and wildlife forage. The trees also have increased stress, which leads to increased susceptibility to insects and diseases. Species that need sunlight usually die, and shrubs and herbs may become dormant. Establishment of new trees is precluded by a lack of sunlight or of moisture (Powell 1998).

Large overstory ponderosa pine would continue to weaken due to moisture stress resulting from competition in overstocked stands. Western larch would continue to lose vigor due to dense stand conditions that reduce crown width and crown height. Both of these tree species and size classes are important to a wide variety of wildlife. Susceptibility to insect and disease disturbances in excess of the historical range of variability would continue to increase. Large snags would likely increase due to tree mortality from the above causes, benefiting snag-dependent species in areas where roads do not provide access for firewood cutting.

Fire effects would result in higher stand loss as seen in the Canyon Creek Complex Fire (2015) which burned in similar fuels profiles. The majority of the planning area is currently prone to high tree mortality through cambium kill and crown fire. Disturbances would be of a higher severity, increased mortality of larger trees, and over a larger area than under historical conditions (see chapter 3, Fire and Fuels section). Specifically, patch sizes of high severity would be larger. Recent fires in eastern Oregon, including on the Malheur National Forest in 2013, 2014, and 2015 indicate that in similar conditions as those in the planning area, tree mortality through cambium kill and crown scorch could burn through a majority of the planning area. Historically, these stands burned with low large tree mortality, as surface fires with average flame lengths less than 4 feet and occasional single tree torching. Severe fire affecting a large portion of the planning area would negatively impact a majority of species.

Alternatives 2 and 3

Under alternatives 2 and 3, the current level of connectivity between all late and old structure and old growth stands would not be maintained. However, wildlife corridors would be provided between all management area 13 stands, some late and old structure stands, and to wildlife connectivity corridors in adjacent watersheds; however, not all late and old structure stands would be connected. Approximately 2,200 acres (alternative 2) or 3,260 acres (alternative 3) would be designated as part of the Ragged Ruby Project. Alternatives 2 and 3 would restore the ecosystem structure and function would be restored by allowing treatments that would shift tree species composition toward the ecologically desired mix of fire-resistant, early seral tree species (ponderosa pine and western larch) (consistent with §219.8(a)(1)(ii), §219.8(a)(1)(iii), §219.8(a)(1)(vi), §219.9(a)(2), and §219.10(a)(1)). Encroaching grand fir and Douglas-fir would be removed, reducing the risk of future insect outbreaks and uncharacteristic wildfire, while also restoring habitats for historically present plant communities and wildlife habitat (consistent with §219.8(a)(1)(iv), §219.9(a)(2)(i), §219.10(a)(5)), and §219.10(a)(8)). Treatments under alternatives 2 and 3 would move stands towards the historical range of variability goals directly after treatment and set late and old structure stands up to be within or above the historical range of variability in the future (consistent with §219.9(a)(2)). Stands would be more resilient to natural disturbances such as insects, disease, and wildfire (consistent with §219.9(a)(1), §219.8(a)(1)(iii), and §219.10(a)(1)).

Larger high severity wildfires are a threat to the sustainability of forest resources and ecosystems in the Ragged Ruby planning area, which has departed from its historical fire regime characterized by frequent fires (0 to 35 years) of low (surfaces fires most common) to mixed severity (consistent with §219.8(a)(1)(iv)) and §219.10(a)(7)). Currently, 90 percent of the Ragged Ruby planning area falls within fire regime condition class class 3, which is characterized by a high departure from the natural (historical) regime of vegetation characteristics; fuel composition; fire frequency, severity, and pattern; and other associated disturbances.

Past management, including fire exclusion, has allowed the ingrowth of younger grand fir and Douglas-fir trees which have increased the risk of tree mortality to old ponderosa pine and western larch due to competition induced stress insect and disease attacks, and uncharacteristic wildfire. Grand fir was historically not a major component within these dry forest types, however was present on the landscape. Munger (1912) describes 9 tracts of “yellow pine” also known as ponderosa pine he studied. Two of the tracts are in Grant County, Oregon and relatively near the Ragged Ruby planning area. Descriptions of the two tracts, Crawford Creek and Austin & Whitney are “typical of thousands of acres at this altitude on the south and west slopes of the Blue Mountains” and “characteristically, fairly pure yellow pine slopes adjacent to Whitney and Austin, Grant County, Oregon.” In the Crawford Creek tract, Munger noted before timber cutting, 44.96 trees per acre yellow pine and 11.98 trees per acre of other species, with 81.2 percent of the trees over 12 inches diameter at breast height being yellow pine. The Austin & Whitney tract had 38 trees per acre yellow pine and 18.47 trees per acre of other species, with 81.6 percent of the trees over 12 inches diameter at breast height being yellow pine (Munger 1917) (consistent with §219.8(a)(1)(vi)).

Alternatives 2 and 3 would directly allow for terrestrial ecosystems to adapt to change by reducing ladder fuels, reducing tree density, increasing water availability, and shifting species composition toward higher percentages of fire resistant trees (consistent with §219.10(a)(8)). Implementation of alternatives 2 and 3 would lead to an increased percentage in both ponderosa pine and western larch. Without the removal of grand fir and Douglas-fir trees greater than or equal to 21 inches diameter at breast height, the percentage of ponderosa pine and western larch would be lower.

This amendment is proposed to transition the Ragged Ruby planning area to a more historically fire resilient landscape characterized by frequent, low severity fires, such as those found in ponderosa pine stands (consistent with §219.8(a)(1)(v)). The transition from frequent, low severity fires to less frequent, higher severity fires started in the 1800s (Heyerdahl and Agee 1996). Studies completed in the area within or near the Ragged Ruby planning area show dry forest landscapes were historically dominated by ponderosa pine. Munger (1912) states, “most of the stands for which this yield study was made consistent, to the extent of at least 85 percent, of yellow pine, the remainder being mostly western larch, Douglas-fir, white fir, and grand fir.”

There is a need for landscape scale restoration on the Blue Mountain Ranger District and specifically the Ragged Ruby planning area. There are several recent and planned projects adjacent to the Ragged Ruby Project that include restoration treatments: Balance, Summit and Reed Fire Restoration, Galena, Big Mosquito, and Camp Lick projects. Connectivity corridors for wildlife movement have been identified to connect all five projects. These corridors connect management area 13 and late and old structure stands. Some of the late and old structure stands already meet desired conditions. There are approximately 12,500 acres identified as late and old structure within the Ragged Ruby planning area, approximately 37 percent of the planning area. Less than 1 percent of these acres are below their management zones in terms of stand density index and approximately 65 percent are above their management zones (approximately 35 percent of the stands are within their management zones). Under alternative 2, approximately 8,610 acres are not proposed for treatment (except prescribed burning), 1,150 acres are proposed for dry pine restoration, 2,030 acres are proposed for mixed conifer restoration, 190 acres are proposed for dry meadow and scabland flat bunchgrass restoration, 190 acres are proposed for whitebark pine restoration, and 330 acres are proposed for western white pine restoration. Under alternative 3, approximately 9,260 acres are not proposed for treatment (except prescribed burning), 920 acres are proposed for dry pine restoration, 1,610 acres are proposed for mixed conifer restoration, 190 acres are proposed for dry meadow and scabland flat bunchgrass restoration, 190 acres are proposed for whitebark pine restoration, and 330 acres are proposed for western white pine restoration. Direct effects of these restoration treatments would reclassify a majority of late and old structure stands as within their management zones and help make the landscape more resilient across project boundaries (consistent with §219.8(a)(1)(vi)).

Cumulative Effects of Not Maintaining Connectivity between all Late and Old Structure and Old Growth Stands

The cumulative effects discussed below are associated with alternatives 2 and 3. Alternative 1 (no action) does not propose an amendment to not maintain connectivity between all late and old structure and old growth stands, therefore there would be no cumulative effects associated with that alternative.

The effects from past, present, and foreseeable projects must overlap temporally and spatially with this project to contribute to a cumulative effect. Cumulative effects for this proposed forest plan amendment are addressed at the District and Forest scales as described below.

In the 23 years Regional Forester's Forest Plan Amendment 2 has been in place, there have been two amendments to standard 6(d)(3)(a), to not provide connectivity as described. The 2000 Dry Fork Project allowed 84 acres to move out of connectivity in order to treat Armillaria root rot. The Soda Bear Project did not connect every management area 13 and late and old structure stand in two or more ways to avoid placing connectivity corridors in areas that are not sustainable as connectivity.

Table 111. Summary of projects with forest plan amendments to Regional Forester's Eastside Forest Plan Amendment 2, standard 6(d)(3)(a) (amendments to not provide connectivity as described in the Eastside Screens)

Number of projects with amendments to allow loss of late and old structure	Year	District, subbasin (HUC8)	Project	Amendment rationale	Scale of amendment
1	2000	Prairie City, Middle Fork John Day	Dry Fork	Allowed a stand to move out of connectivity. The 84 acres stand was heavily infested with Armillaria root rot. The level of thinning require to treat the root rot pocket did not meet the connectivity requirements because of the reduction of canopy closure. The stand was not maintained within the top one-third of site potential.	84 acres
2	2012	Blue Mountain, Silvies	Soda Bear	Amendment was authorized to avoid placing connectivity corridors in areas that are not sustainable in a dense stand condition such as south aspects and dry plant associations. All aspects of standard 6 were met with the exception that a contiguous network pattern at least two or more ways between all late and old structure stands and "old growth/MR" habitats were not maintain in a few areas.	20,800-acre planning area

This proposed forest plan amendment would not maintain or enhance the current level of connectivity between all late and old structure and old growth (management area 13) stands. Wildlife corridors would be provided between all management area 13 stands, some late and old structure stands, and to wildlife connectivity corridors in adjacent watersheds; however, not all late and old structure stands would be connected.

Reasonably foreseeable projects that could include an amendment to Eastside Screens, standard 6(d)(3)(a) to not maintain or enhance the current level of connectivity between all late and old structure and old growth (management area 13) stands include the Cliff Knox Project. This project, combined with the Ragged Ruby Project, could increase the area impacted by not maintaining or enhancing the current level of connectivity. However, this is a small additive effect that would not alter the long-term relationship between goods and services projected by the Malheur Forest Plan.

The Soda Bear and Cliff Knox projects are located in different geographical areas of the Forest than the Ragged Ruby Project, in the Silvies and Upper Malheur subbasins, respectively. Because the effects from these past and foreseeable projects do not overlap spatially with the Ragged Ruby Project, there would not be a cumulative effect.

The Dry Fork Project is also located in the Middle Fork John Day River subbasin, and has the potential for effects to overlap spatially and temporally. The 2000 Dry Fork Project allowed 84 acres to move out of connectivity to treat a root rot pocket; these 84 acres would likely not have currently met criteria to be considered as connectivity with or without treatment due to the Armillaria root rot infestation (many trees would have died and fallen over in the past 18 years even without treatment). Thus, there would be a small decrease in connectivity corridors in the Middle Fork John Day River Subbasin. However, see the Direct and Indirect Effects of Not

Maintaining Connectivity Between all Late and Old Structure and Old Growth Stands, Alternatives 2 and 3 section above for a description of how both the Ragged Ruby Project would have cumulatively beneficial effects to conditions in the planning area.

Table 112. Foreseeable projects with forest plan amendments to Regional Forester's Eastside Forest Plan Amendment 2, standard 6(d)(3)(a) (amendments to not provide connectivity as described in the Eastside Screens)

Number of projects with amendments to allow loss of late and old structure	Year	District, subbasin (hydrologic unit code 8)	Project	Amendment rationale	Scale of amendment
4	Expected in 2018	Blue Mountain, Middle Fork John Day	Ragged Ruby	This proposed forest plan amendment would not maintain or enhance the current level of connectivity between all late and old structure and old growth (management area 13) stands.	--
5	Expected in 2019	Prairie City, Upper Malheur	Cliff Knox	This project could include updates to Regional Forester's Eastside Forest Plan Amendment 2, standard 6(d)(3)(a) to not maintain or enhance the current level of connectivity between all late and old structure and old growth (management area 13) stands. However, at this early stage in the planning process this has not yet been determined and thus there is no estimate of acres available.	--

The amendment meets the intent of 36 Code of Federal Regulations Part 219.8 through 11.

Uniqueness of the Proposed Forest Plan Amendment

The Ragged Ruby planning area is unique because a large portion of the area north of the Middle Fork John Day River outside of the Greenhorn Mountain Inventoried Roadless Area was burned over by the Reed Fire of 1994 and the Summit Fire of 1996. Dedicated old growth, replacement old growth, and late and old structure stands that remain in this portion of the planning area were burned through during these fires and are connected as best as possible with stands that meet connectivity standards.

Criteria for connectivity corridors specified in the Malheur Forest Plan, as amended, were designed to connect spatially isolated stands of late and old structure. The portion of the planning area south of the Middle Fork John Day River does not fit these conditions because approximately one third of this area is late and old structure that is well connected. This is demonstrated in Appendix B – Maps, Map 26, which illustrates the late and old structure (old forest single strata and old forest multi stratum) within the planning area.

The Ragged Ruby planning area is also unique because there are four planning areas that almost completely surround the Ragged Ruby planning area boundary that have already designated wildlife corridors. These projects designated connectivity corridors up to the Ragged Ruby planning area boundary in locations that are likely to connect with late and old structure stands in anticipation that these connectivity corridors would be connected through during the planning process for the Ragged Ruby Project. Wildlife corridors in the Ragged Ruby Project connected the corridors from previous projects to dedicated old growth, replacement old growth, and late and old structure stands in the planning area, creating a large matrix of connectivity corridors across the Middle Fork John Day River watershed.

Short-term Uses and Long-term Productivity

The National Environmental Policy Act requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 Code of Federal Regulations 1502.16). As declared by the Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (National Environmental Policy Act section 101).

Short-term uses are those that generally occur annually. Long-term productivity refers to the ability of the land to produce a continuous supply of a resource. The Ragged Ruby Project would result in short-term impacts, but maintain the long-term productivity of the area through the use of specific Malheur Forest Plan standards and guidelines, features built into the project's design, and project design criteria. A description of impacts expected by alternative can be found by resource area in the above discussions. The project would result in a long-term yield of forest stands by reducing competition and improving growth of individual trees. The project would also result in an economic return from wood products produced and jobs created.

Unavoidable Adverse Effects

No unavoidable adverse effects over and above those addressed in the Malheur Forest Plan Final Environmental Impact Statement (chapter 4, pages IV-89) have been identified.

Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time, such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line rights-of-way or road.

The action alternatives are not expected to create any impacts that would cause irreversible damage to soil productivity. The development and use of temporary roads and logging facilities is considered an irretrievable loss of soil productivity until their functions have been served and disturbed sites are returned back to a productive capacity.

Other Required Disclosures

National Environmental Policy Act at 40 Code of Federal Regulations 1502.25(a) directs "to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with …other environmental review laws and executive orders."

Prime Farm Lands, Range Lands, and Forest Lands

All alternatives are in accordance with the Secretary of Agriculture Memorandum 1827 for prime farm land, range land, and forest land. "Prime" forest land is a term used only for non-Federal land, which would not be affected by proposed alternatives in this project. The Ragged

Ruby planning area also does not contain any prime farm land or range land. Regardless of the alternative selected, National Forest System lands would be managed with sensitivity to adjacent private and public lands.

Potential or Unusual Expenditures of Energy

Energy (fuel) would be required to perform management activities implemented under the action alternatives, including but not limited to: harvesting and transportation of timber products, conducting fuels treatments such as excavator piling, implementing prescribed burning activities, road reconstruction activities, and road decommissioning and storage. The proposed project would not involve construction or maintenance of any new facilities. Because there is no unusual expenditure of energy and the energy requirements are minor, the project activities do not lend themselves to particular energy conservation measures. Activities for the project involve a short-term and non-significant expenditure of energy.

Conflicts with Plans, Policies, or Other Jurisdictions

There are no known conflicts with plans or policies of other jurisdictions associated with the alternatives. Specifically, this project is consistent with the Grant County Comprehensive Land Use Plan, and other applicable county statutes.

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Chapter 4 – Preparers and Contributors

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes and other organization and individuals during the development of this environmental impact statement:

Interdisciplinary Team Members

Table 113. Current interdisciplinary team members

Resource	Name	Educational degree	Years' experience
Botanical Resources and Invasive Species	Amanda Hardman	Master of Science, Botany	18 years as a professional botanist
Economics	Brandon Crisler	N/A	6 years forestry technician (timber), 1 year timber sale appraisals
Fisheries	Dan Armichardy	Master of Science, Biology (Emphasis on Fish Migration); Bachelor of Science, Fish and Wildlife Management	13 years
Geographic information systems	Robin Harris	N/A	7 years of field and 25 years of geographic information systems experience
Heritage	Katee Withee	Master of Arts, Anthropology, Bachelor of Arts, Anthropology	2 years as an archaeologist, 7 years as an archeological technician
Interdisciplinary Team Leader, National Environmental Policy Act, Special Areas	Sasha Fertig	Master of Community and Regional Planning; Bachelor of Science, Fisheries and Wildlife Science	9 years as a planner and 3 years as a fisheries, hydrology, or forestry technician
Logging Systems	Scott Officer	Bachelor of Science, Agricultural and Natural Resource Economics/Management	7 years forestry technician (timber), 1 year silviculture technician, 1 year range technician
Range	Nick Stiner	Bachelors of Science: Rangeland Ecology and Management	12 years
Recreation and Visuals	Teresa Dixon	Bachelor of Arts, Anthropology/Archaeology	11 years as an archaeologist, 4 years as supervisor/program manager of cultural (heritage), recreation and lands, 3 years as supervisor/program manager of recreation, lands and minerals

Resource	Name	Educational degree	Years' experience
Silviculture	Amanda Lindsay	USDA Forest Service Certified Silviculturist; Master of Science, Forest Science / Silviculture; Bachelor of Science, Forest Management	10 years as a silviculture forester and 7 years as a forestry technician
Soils	Robert "Hersh" McNeil	Doctor of Philosophy, Forestry; Bachelor and Master of Science, Botany	27 years
Transportation	Dan DuShey	N/A	4 years as a primary firefighter/engine operator, 23 years as a timber sale and contract preparation as a forestry technician, 2.5 years as a transportation planner as a civil engineer technician
Watershed	Mary Lou Welby	Master of Science, Forestry; Bachelor of Arts, Biological Science (Botany)	26 years
Wildlife	Dustin Hollowell	Master of Science, Wildlife Management	8 years
Writer Editor	Laurie Montgomery	Bachelor of Arts, English	6 years writing and editing experience

Table 114. Past interdisciplinary team members

Resource	Name	Educational degree	Years' experience
Fire, Fuels, and Air Quality	Kenneth Boucher Jr.	Biological Science Certificate, University Nevada Las Vegas, 2007	25 years
Fisheries	Allen Taylor	Bachelor of Science, Fisheries Science	20 years
Range	Isaac Whitman	Bachelor of Science, Rangeland Sciences	3 years as a Rangeland Management Specialist and 7 seasons as a Range Technician
Recreation and Visuals	Shannon Winegar	Bachelor of Science	32 years

Consultation and Coordination

The Forest Service is consulting with the following individuals, Federal, State, and local agencies, and tribes during the development of this environmental impact statement

Federal, State, and Local Agencies

- Oregon State Historic Preservation Office
- U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service
- U.S. Department of the Interior, Fish and Wildlife Service
- U.S. Environmental Protection Agency

Tribes

- Burns Paiute Tribe
- Confederated Tribes of the Umatilla Indian Reservation
- Confederated Tribes of Warm Springs

Distribution of the Draft Environmental Impact Statement

The draft environmental impact statement was distributed to individuals or organizations who specifically requested a hard copy of the document:

- Karen Coulter (Blue Mountains Biodiversity Project)
- Billie Jo and Terry George
- Bob and Judy Kerr
- Frances Preston

Hard copies of the draft environmental impact statement have been sent to the following Federal agencies, federally recognized tribes, and State and local governments:

- Burns Paiute Tribe
- Confederated Tribes of the Umatilla Indian Reservation
- Confederated Tribes of Warm Springs
- Grant County Court
- U.S. Department of Agriculture, National Agricultural Library
- U.S. Department of the Interior, Office of Environmental Policy and Compliance
- U.S. Environmental Protection Agency, Region 10

An executive summary of the project has been sent to the following agencies:

- Advisory Council on Historic Preservation
- Northwest Power Planning Council
- U.S. Army Corps of Engineers, Northwestern Division
- U.S. Coast Guard, Office of Environmental Management
- U.S. Department of Agriculture, Animal and Plant Health Inspection Service
- U.S. Department of Agriculture, Natural Resources Conservation Service
- U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Northwest Region and Office of Policy and Strategic Planning
- U.S. Department of Energy, Director of National Environmental Policy Act Policy and Compliance
- U.S. Department of Transportation, Federal Aviation Administration, Northwest Mountain Region
- U.S. Department of Transportation, Federal Highway Administration, Oregon Division
- U.S. Navy, Chief of Naval Operations, Energy and Environmental Readiness

Additionally, over 200 additional individuals or organizations were notified of the availability of the draft environmental impacts statement on the Malheur National Forest’s webpage and at the Malheur National Forest Supervisor’s Office / Blue Mountain Ranger District Office through letter and/or email.

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Glossary

age class – A group of trees that started growing (regenerated) within the same time frame, usually 20 years. A single age class would have trees that are within 20 years of the same age, such as 1 to 20 years or 21 to 40 years.

allotment (grazing) – Area designated for use by a prescribed number of livestock for a prescribed time.

anadromous fish – Fish that hatch in fresh water, migrate to the ocean, mature there, and return to fresh water to reproduce, for example, salmon and steelhead.

aquatic ecosystem – Waters that serve as habitat for interrelated and interacting communities and populations of plants and animals. The stream channel, lake or estuary bed, water, biotic communities and the habitat features that occur therein.

aspect – The direction a surface faces. A hillside facing east has an eastern aspect.

basal area – The area of the cross-section of a tree trunk near its base, usually 4.5 feet above the ground. Basal area is a way to measure how much of a site is occupied by trees. The term basal area is often used to describe the collective basal area of trees per acre.

biophysical environments – Plant association group - Vegetation classification using similar moisture and temperature environments resulting in similar fire regimes.

buffer – A land area designated to block or absorb impacts to the area beyond the buffer. For example, a streamside buffer is often retained to reduce impacts of a harvest unit.

canopy – In a forest, the branches of the uppermost layer of foliage. It can also be used to describe lower layers in a multistoried forest.

canopy cover – The proportion of the forest floor covered by the vertical projection of the tree crowns.

canopy base height – The lowest height above the ground at which there is a sufficient amount of canopy fuel to propagate fire vertically into the canopy.

canopy closure – The amount of ground surface shaded by tree canopies as seen from above. Used to describe how open or dense a stand of trees is, often expressed in 10 percent increments.

canopy fuels – the part of the canopy that can burn in the flaming front of a crown fire. The foliage and some branch wood, which is less than 0.25 inches (0.6 centimeters) in size, are usually considered available canopy fuel. Larger fuel pieces in the canopy do not burn quickly enough to contribute to crown fire spread and are not considered canopy fuels.

channel morphology – The dimension (width and depth), shape and pattern (sinuous, meandering, or straight) of a stream channel.

closed canopy – Greater than or equal to 60 percent canopy cover within the moist and cold upland forest potential vegetation groups; greater than or equal to 40 percent canopy cover within the dry upland forest potential vegetation group.

connectivity – The arrangement of habitats that allow organisms and ecological processes to move across the landscape; patches of similar habitats are either close together or linked by connectivity corridors of appropriate vegetation. Connectivity is the opposite of fragmentation.

corridor – A tract of land forming a passageway. Can refer to areas of wildlife movement, boundaries along rivers, or the present or future location of a transportation or utility right-of-way within its boundaries.

cover – (1) Any feature that conceals wildlife or fish, sometimes referred to as “hiding cover.” Cover may be dead or live vegetation, boulders, or undercut stream banks. Animals use cover for protection from predators, or to ameliorate conditions of weather, or in which to reproduce; (2) the area of ground covered by plants of one or more species.

crown – The part of a tree containing live foliage; treetops.

crown fire – A forest fire that advances through the crown fuel layer normally in direct conjunction with a surface fire.

density (stand) – The number of trees growing in a given area, usually expressed in terms of trees per acre.

departure – The difference between an existing condition and the desired condition

desired future condition – A portrayal of the land or resource conditions that are expected to result if goals and objectives are fully achieved.

diameter at breast height – Tree diameter measured at 4.5 feet from the ground.

disjunct – Populations that are separated geographically from the main distribution of a species. Many plants with disjunct populations are biologically unique because they are not found again for dozens to over one hundred miles. Disjunct populations are thus rare in this portion of their distribution.

disturbance – Events that alter the structure, composition, or function of terrestrial or aquatic habitats. Natural disturbances include, among others, drought, floods, wind, fires, wildlife grazing, and insects and diseases. Human–caused disturbances include, among others, actions such as timber harvest, livestock grazing, roads, and the introduction of exotic species.

diversity – The distribution and abundance of different plant and animal communities and species within the area covered by a land and resource management plan.

duff – Organic matter in various stages of decomposition on the floor of the forest.

early seral species – Early seral refers to plants that are present soon after a disturbance or at the beginning of a new successional process

ecosystem – A complete interacting system of living organisms and the land and water that make up their environment; the home places of all living things, including humans.

ecosystem function (processes) – The flow and cycling of energy, materials, and organisms in an ecosystem. Examples of ecosystem processes include the carbon and hydrologic cycles, terrestrial and aquatic food webs, and plant succession, among others.

ephemeral – A channel in which streamflow occurs inconsistently, infrequently, or seasonally and, except during periods of streamflow, does not intersect the local groundwater table (for example, streams that flow only as the direct result of rainfall or snowmelt).

floodplain – The lowland and relatively flat areas joining inland and coastal waters including debris cones and flood-prone areas of off-shore islands, including at a minimum, that area subject to a one percent (100-year recurrence) or greater chance of flooding in any given year (Executive Order 11988, Section 6c); or the area of relatively flat land adjacent to streams that is inundated during times of high flow; or an area formed by the deposition of stream-transported sediment.

floodplain function – Collectively, the normal physical and biological processes that are responsible for the formation and maintenance of river floodplains and the biotic communities that inhabit them.

flow regime – The range of magnitude, duration, timing and frequency of streamflows characteristic of a given stream.

forb – Broad-leafed, herbaceous, nongrass-like plant species other than true grasses, sedges, and non-woody plants; fleshy leafed plants; having little or no woody material.

forage – Vegetation (both woody and non-woody) eaten by animals, especially big game and livestock.

forest health – The condition in which forest ecosystems sustain their complexity, diversity, resiliency, and productivity while providing for human needs and values. It is a useful way to communicate about the current condition of the forest, especially with regard to resiliency, a part of forest health that describes the ability of the ecosystem to respond to disturbances. Forest health and resiliency can be described, in part, by species composition, density, and structure.

fragmentation – The breakup of a large land area (such as a forest) into smaller patches that are isolated from the original area. Fragmentation can occur naturally (as by stand-replacing wildfire) or from human activities (such as road building).

habitat – The place where a plant or animal finds what it needs to survive, either year-round or seasonally.

intermittent stream – A stream that flows only at certain times of the year when it receives water from streams or some surface source, such as melting snow.

mortality – The loss of a population due to all lethal causes, often referring to the rate of death of a species in a given population or community.

mosaic – A pattern of vegetation in which two or more kinds of plant communities are interspersed in patches, such as a meadow between stands of old growth.

perennial stream – A stream that flows throughout the year from its source to mouth.

prescription – Measurable criteria that define conditions under which a prescribed fire may be ignited, guide selection of appropriate management responses, and indicate other required actions. Prescription criteria may include safety, economic, public health, and environmental, geographic, administrative, social, or legal considerations.

redd –Spawning nest made by salmon or steelhead in the gravel bed of a river.

resident fish – Fish that spend their entire life in freshwater: examples include bull trout and westslope cutthroat trout.

resiliency – The capacity of a plant community or ecosystem to maintain or regain normal function and development following disturbance.

riparian area – The interface between aquatic and terrestrial ecosystems that is identified by the presence of vegetation that requires or tolerates free or unbound water or conditions that are more moist than normal.

seral – Refers to the sequence of transitional plant communities during succession. Early seral refers to plants that are present soon after a disturbance or at the beginning of a new successional process (such as seedling or sapling growth stages in a forest); mid-seral in a forest would refer to pole or medium saw timber growth stages; late or old seral refers to plants present during a later stage of plant community succession (such as mature or old forest stages).

silviculture – The practice of manipulating the establishment, composition, structure, growth, and rate of succession of forests to accomplish specific objectives.

stand – A group of trees in a specific area that are sufficiently alike in composition, age, arrangement, and condition to be distinguishable from the forest in adjoining areas.

stand density – Refers to the number of trees growing in a given area, usually expressed in trees per acre.

stand structure –The mix and distribution of tree sizes, layers, and ages in a forest. Some stands are all one size (single-story), some are two-story, and some are a mix of trees of different ages and sizes (multistory).

subwatershed – A drainage area of approximately 20,000 acres, equivalent to a 6th-field hydrologic unit code. Hierarchically, subwatersheds (6th-field hydrologic unit code) are contained within a watershed (5th-field hydrologic unit code), which in turn is contained within a subbasin (4th-field hydrologic unit code).

successional stage – The development of forest communities over time. With a lack of disturbance, forest development generally consists of early, mid, and late successional communities that tend toward a stable climax state.

sustainability – (1) Meeting the needs of the present without compromising the abilities of future generations to meet their needs; emphasizing and maintaining the underlying ecological processes that ensure long-term productivity of goods, services, and values without impairing productivity of the land. (2) In commodity production, refers to the yield of a natural resource that can be produced continually at a given intensity of management.

tiering – In an environmental impact statement, refers to incorporating by reference the analyses in an EIS of a broader scope. For example, a Forest Service project-level environmental impact statement could tier to the analysis in a forest plan environmental impact statement; a forest plan environmental impact statement could tier to a regional guide environmental impact statement.

understory – The trees and woody shrubs growing beneath the overstory.

watershed – The entire region drained by a waterway (or into a lake or reservoir). More specifically, a watershed is an area of land above a given point on a stream that contributes water to the stream flow at that point.

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