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Forest
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Environmental Assessment

Westside Collaborative Vegetation Management Project

Darby Ranger District, Bitterroot National Forest
Ravalli County, Montana

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Chapter 1: Purpose and Need

The Forest Service prepared this environmental assessment in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. The Forest Service discloses the potential direct, indirect, and cumulative environmental effects of implementing the proposed action and alternatives to it in this environmental assessment.

Project Development

The Westside Collaborative Vegetation Management Project (Westside Project) area is approximately 5,700 acres and administered by the Darby Ranger District, Bitterroot National Forest in Ravalli County (legal location: T.5N. R.21W., sections 16, 21, 27, 28, 32-33; T.4N. R.22W. sections 1, 12; and T.4N., R.21W. Sections 4-8, 17, 18 PMM). Drainages within the Westside project area include Roaring Lion Creek, Judd Creek, Gold Creek, Camas Creek, Coyote Coulee, Hayes Creek, and Lost Horse Creek, all of which drain toward the Bitterroot River (Fig. 1-1). The project area also includes about 930 acres of the Selway-Bitterroot Inventoried Roadless Area (IRA) and 91 acres of private land. This project does not analyze any activities on private lands.

Bitterroot Restoration Committee

The Bitterroot Restoration Committee (BRC) is a local collaborative group whose members represent conservation, community, agency, business, and industry interests. The BRC is interested in:

- restoring low-to-mid-elevation ponderosa pine and Douglas fir forests to a more open and resilient condition
- reducing the potential for wildfire, originating on National Forest System land, to threaten adjacent private properties
- creating opportunities for managing natural fire

The BRC works on projects that support the application of restoration principles (www.montanarestoration.org/restoration-principles). The BRC encouraged the Bitterroot National Forest to look at thinning the forests between Roaring Lion Creek and Camas Creek that are potentially prone to severe wildfire and supports fuel reduction and forest restoration. The northern half of this area is in the Selway-Bitterroot Inventoried Roadless Area (IRA).

In the past few years, BRC members met with individual landowners and hosted an informal neighborhood gathering in November 2014, followed by another meeting in April 2015. The reasons for thinning as well as the challenges presented by steep topography, difficult access, and roadless area designation were discussed at these gatherings.

The Forest Service was developing a proposal to treat the area north of Lost Horse Canyon at the time the BRC was exploring treatments between Camas and Roaring Lion creeks. The Forest Service agreed to consider the BRC proposal, and added it to the larger project north of Lost Horse Creek. The project was renamed Westside Collaborative Vegetation Management Project. The Forest Service proposal would continue treatments in the Wildland Urban Interface (WUI) along the Bitterroot front and improve forest resilience to insects, disease, and fire, as recommended in the Bitterroot Community Wildfire Protection Plan (RC&D 2006).

Healthy Forest Restoration Act

Every five years, Congress passes legislation that sets national agriculture, nutrition, conservation, and forestry policy. In 2014, Congress approved the Agriculture Act of 2014, commonly referred to as the "2014 Farm Bill." Section (§) 8204 of the 2014 Farm Bill amended Title VI of the Healthy Forest Restoration Act of 2003 ((HFRA) 16 U.S.C. 6591)) by adding §602, and §603 to provide treatment in areas of declining forest health. The projects are carried out in accordance with HFRA Title I §102(b), (c), (d), and sections 104, 105, and 106. Section 603 allows the use of categorical exclusions for projects that meet specific criteria. The HFRA encourages collaboration, emphasizes community protection, focuses the environmental analysis process, and provides a "pre-decisional" objection process.

Under HFRA Title VI, §602 (b)(1), the Secretary of the U.S. Department of Agriculture, which oversees the U.S. Forest Service, was required to designate areas requested by state Governors as part of an insect and disease treatment program. An area may be designated as part of an insect and disease treatment program if it meets as least one of the following criteria:

- Experiencing forest health decline based on annual forest health surveys
- At risk of experiencing substantially increased tree mortality over the next 15 years based on the most recent National Insect and Disease Map published by the Forest Service
- In an area in which hazard trees pose imminent risk to public infrastructure, health, or safety

On May 20, 2014, Secretary Vilsack announced the designation of approximately 45.6 million acres of National Forest System lands in 35 states to address insect and disease threats that weaken forests and increase the risk of forest fire. The Governor of Montana requested designation of nearly 5 million acres in Montana, and asked that project development in these designated landscapes be given priority. Approximately 3,731 acres of the proposed Westside project area were included in the Governor's priority landscape designation (Fig. 1-2) as part of a national insect and disease treatment program.

The Selway-Bitterroot IRA in the project area was not designated as part of the initial insect and disease treatment program. In addition, a mapping error did not include lands in the project area that had been added to the National Forest system. The Bitterroot National Forest Supervisor submitted a request to the Secretary, which is supported by the State Forester, for these areas to be designated as part of the insect and disease treatment program. The request to designate the additional 1,876 acres is pending; however, the areas are within the WUI (Fig. 1-3) and activities are proposed as part of the Westside project to reduce hazardous fuels. If the areas are not designated under HFRA Title VI, they can be treated using HFRA Title I.

Therefore, the Westside Project is eligible for analysis under Titles I and VI of the HFRA. Title I authorizes hazardous fuel reduction projects located in the WUI. Title VI, Section 602 (d), authorizes projects where areas have been designated as part of a national insect and disease treatment program (USDA 2015, R1-15-11). All proposed treatment units in the Westside project area are in the WUI (Fig. 1-3) and some of these units are in areas designated as part of the national insect and disease treatment program due to stands that are increasingly susceptible to mountain pine beetle infestation and Douglas-fir dwarf mistletoe infection. Stand susceptibility to mountain pine beetle infestation is based on 2015 Forest Health Aerial survey maps and Forest Health Protection field evaluations (PF-SILV-001).

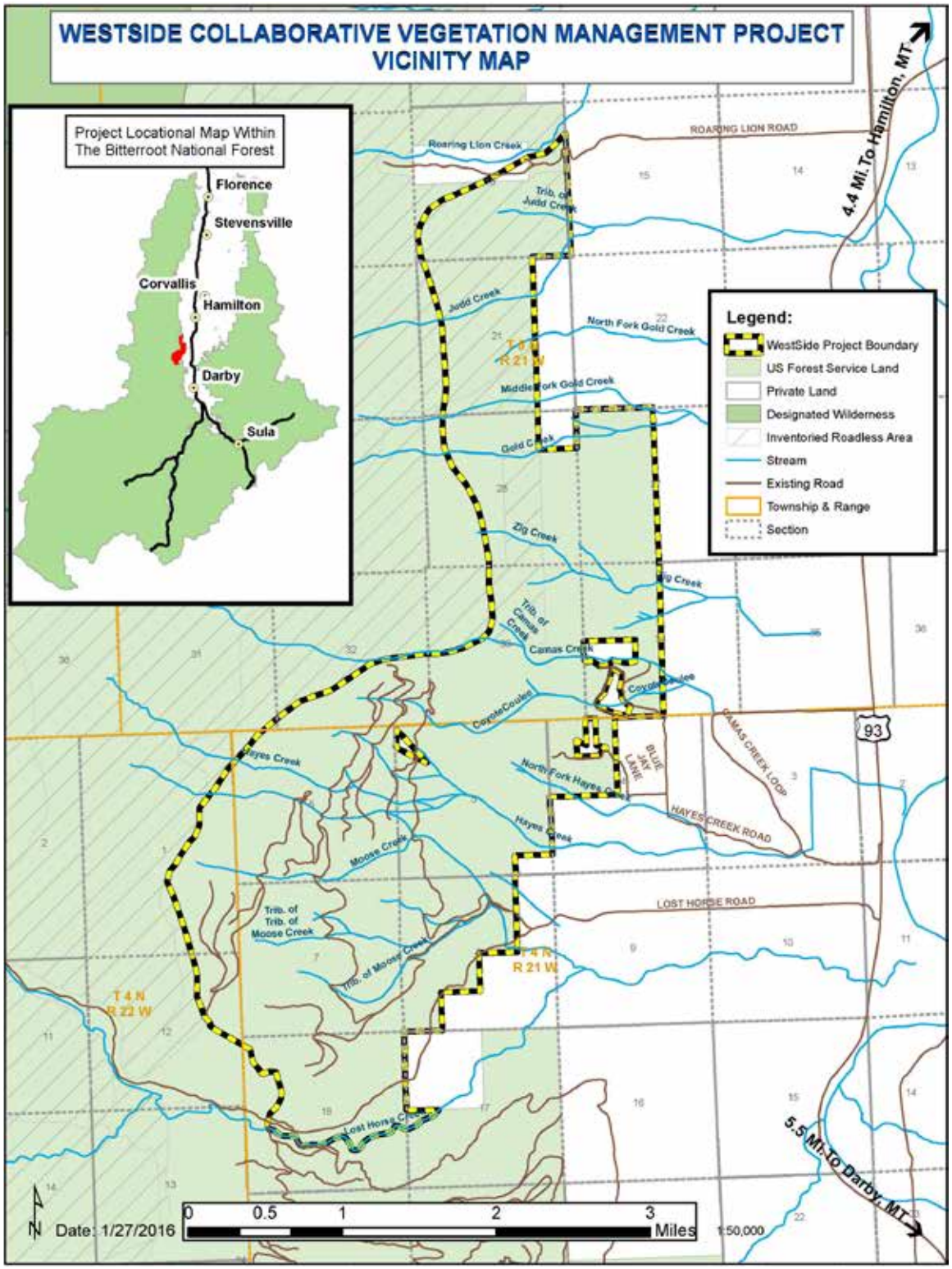

Figure 1-1: Vicinity Map of the Westside Collaborative Vegetation Management Project between Lost Horse and Roaring Lion Creeks, south of Hamilton, Montana and North of Darby, Montana.

A project designated under HFRA Title I or VI does not change or exempt the Forest Service from complying with any other existing law, regulation, or policy that applies, such as the National Environmental Policy Act. Under HFRA Title I §104, which applies to both Titles I and VI §602, the project can be analyzed using an EA or EIS. Projects in the WUI (within 1.5 miles of the boundary of an at-risk community) are not required to study, develop, and describe any alternative other than the proposed agency action if the proposed agency action implements the recommendations of the Bitterroot Community Wildfire Protection Plan (CWPP) regarding general location and basic methods of treatment (HFRA §104(d)(2) (3)). The National Forest boundary is the boundary of the at-risk community because of the density of homes with basic infrastructure and services within or adjacent to it (101(1)(ii)). All activities proposed for the Westside project are within 1.5 miles of the boundary of an at-risk community (Fig. 1-3), as identified in the Bitterroot CWPP, and implement the recommendations of this CWPP (PF-FIRE/FUELS-21).

Purpose and Need for Action

The Interdisciplinary Team (ID Team) considered the BRC concerns, the priority to reduce fuels in the CWPP, and the Montana Governor's priority for treating insect and disease potential, as well as the differences between existing and desired conditions in the Westside project area (Ch. 3 pgs. 21–26, 51, 146-149, and affected environment sections in wildlife analysis) and determined there is need to:

- Improve forest resilience to natural disturbances such as fire, insects, and disease
- Reduce stand density to provide more separation between tree crowns and reduce the potential that fire would spread through the canopy in low- and mid-elevation mixed ponderosa pine and Douglas-fir forests
- Restore, maintain, and enhance wildlife and native plant habitat and diversity in riparian areas, aspen clones, and meadows
- Manage timber to contribute to the sustainable supply of timber products from the Bitterroot National Forest, and provide forest products, jobs, and income
- Provide sustainable infrastructure (road access and bridge) for long-term management of the National Forest

Proposed Action

Management Areas in the Westside Project area are (Fig. 1-4):

- MA 2: Manage big game winter range (476 ac.)
- MA3a: Manage timber and maintain a partial retention visual quality objective (3,870 ac.)
- MA 3b: Manage riparian habitat
- MA 3c: Manage timber and maintain a retention visual quality objective (608 ac.)
- MA 5: Manage semi-primitive recreation areas and Inventoried Roadless Areas (543 ac.)

Commercial timber harvest is allowed in each of these management areas but only under specific circumstances in MA 3b and 5. In MA 3b, the removal of commercial-sized trees has to benefit the riparian values. In the IRA, "the cutting, sale, or removal of generally small diameter timber is needed …to maintain or restore the characteristics of ecosystem composition and 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

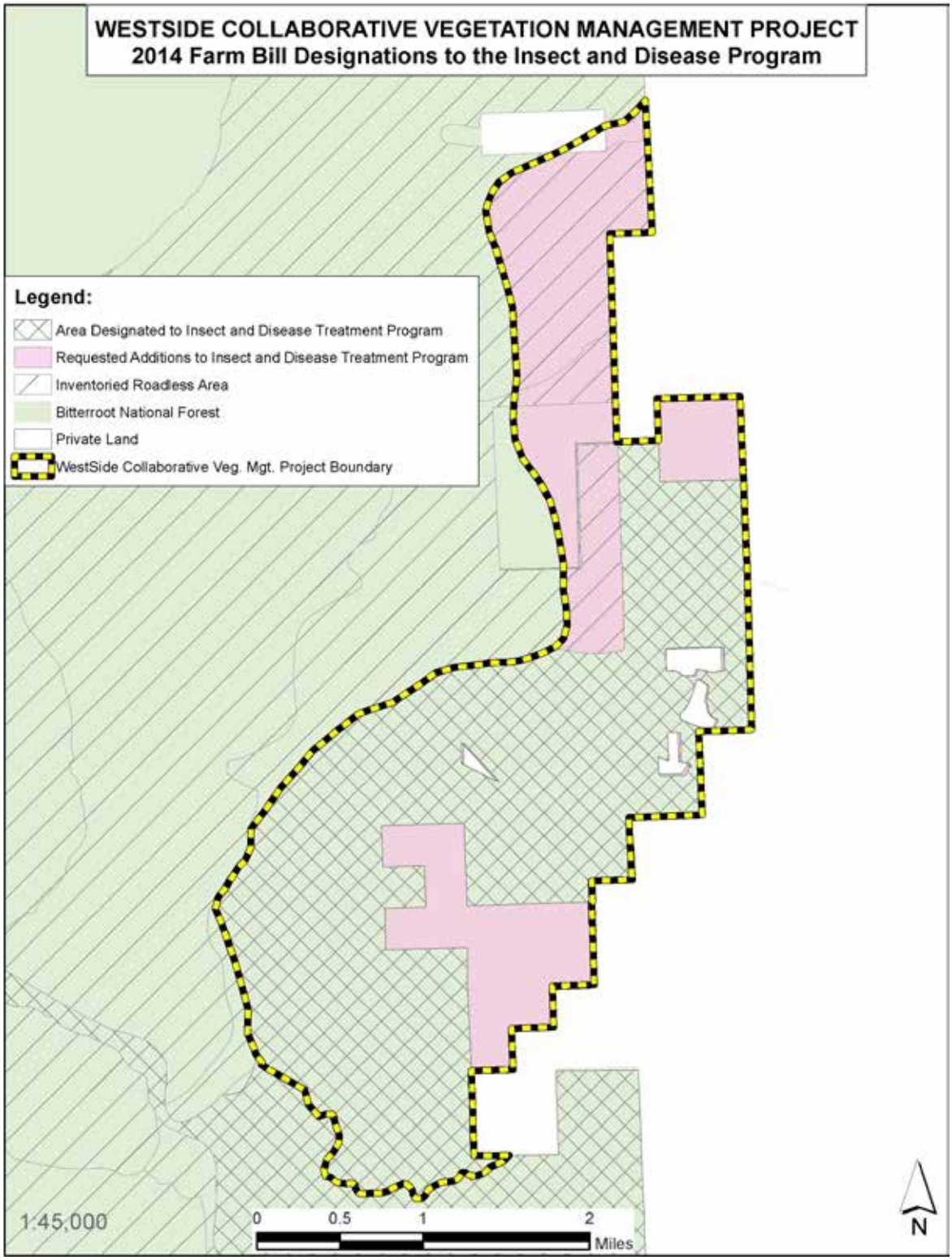

Figure 1- 2: Westside Project Area Designation as High Priority for Treatment under HFRA § 602 by the Governor of Montana and U.S. Secretary of Agriculture.

climatic period…and will maintain or improve one or more of the roadless area characteristics." A proposal to remove timber from an IRA must be approved by the Regional Forester. On June 5, 2015, the Bitterroot Forest Supervisor, Julie King, briefed the Regional Forester on the proposal to commercially harvest timber in Unit 1 of the Westside project area and non-commercially thin Units 11-16, 19, and 20. The purpose of the proposed harvest and thinning is to reduce fire behavior should a fire in the IRA burn toward the community at the Forest boundary and provide an anchor point for fire suppression. These treatments are not designed to stop a fire from burning onto adjacent private lands but would lower the potential fire behavior and provide more fire management options. Private land owners adjacent to National Forest, especially adjacent to the inventoried roadless area, need to continue fuel reduction treatments to reduce fire risk on their property (Cohen, Jack D. 2000) and complement fuel reduction treatments on adjoining lands.

The proposed action was developed in response to the needs listed above. Elements of the proposed action include:

- commercial timber harvest and non-commercial thinning, including 22 acres of commercial harvest and 139 acres of non-commercial thinning in a portion of the Selway-Bitterroot IRA. Treatments in the IRA are generally adjacent to the National Forest-private land boundary
- natural or artificial regeneration
- prescribed burning
- permanent road construction, reconstruction, and maintenance
- temporary road construction
- bridge construction
- road decommissioning
- restoring historic meadows in the Selway-Bitterroot IRA

The proposed project activities would improve growing conditions for long-lived ponderosa pine and Douglas-fir trees that are more resistant to insects and disease on these sites. They will also improve wildlife habitat conditions and contribute to the economy of local communities and counties. The areas proposed for treatment integrate multiple objectives to maximize the effectiveness of treatments and meet the project goals and objectives.

How the Project meets the Restoration Principles

There are 13 restoration principles defined by the Montana Forest Restoration Committee, the umbrella committee for the BRC. The Westside Project fulfills these principles to varying degrees.

Restore functioning ecosystems by enhancing ecological processes

Commercial timber harvest will reduce standing fuels, create more diverse forest structure, improve aspen growth and development, and reduce dwarf mistletoe inoculum and the potential for bark beetle outbreaks. The treatments would enhance the long-term development of old growth forests and snag habitat by retaining large trees in the commercial units and creating openings for ponderosa pine regeneration.

Apply adaptive management approach

Design features are incorporated into the project design to avoid negative environmental effects from proposed treatments. Treatments are monitored through application and conditions are defined that would trigger certain actions to achieve specific objectives (Table 2-4).

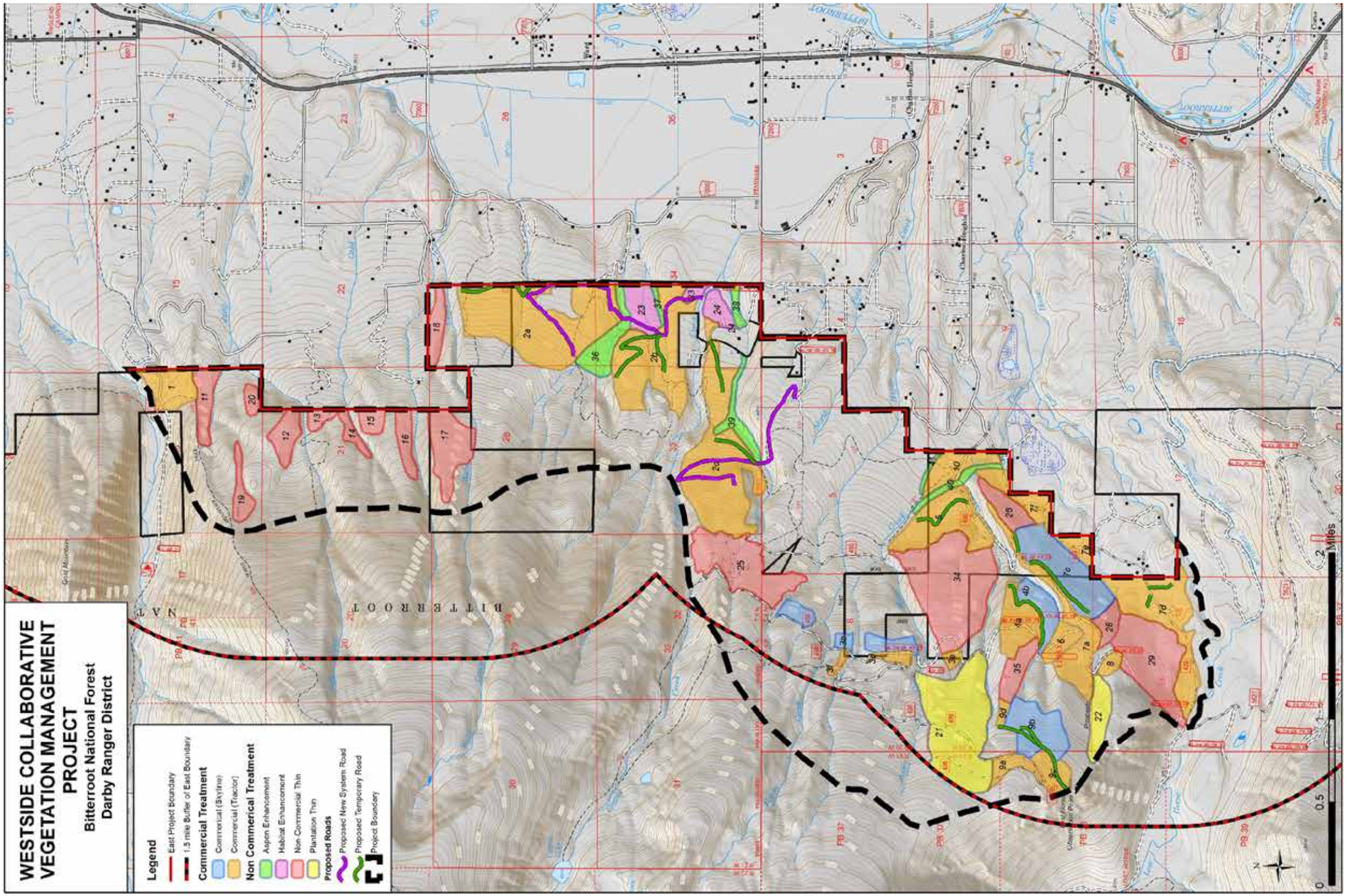

Figure 1- 3: Treatment Units Inside the Wildland Urban Interface Boundary of the Westside Project Area. The Wildland Urban Interface is 11/2 miles from an at-risk community. Since houses and infrastructure are directly adjacent to the National Forest boundary, the National Forest boundary was used to estimate the Wildland Urban Interface.

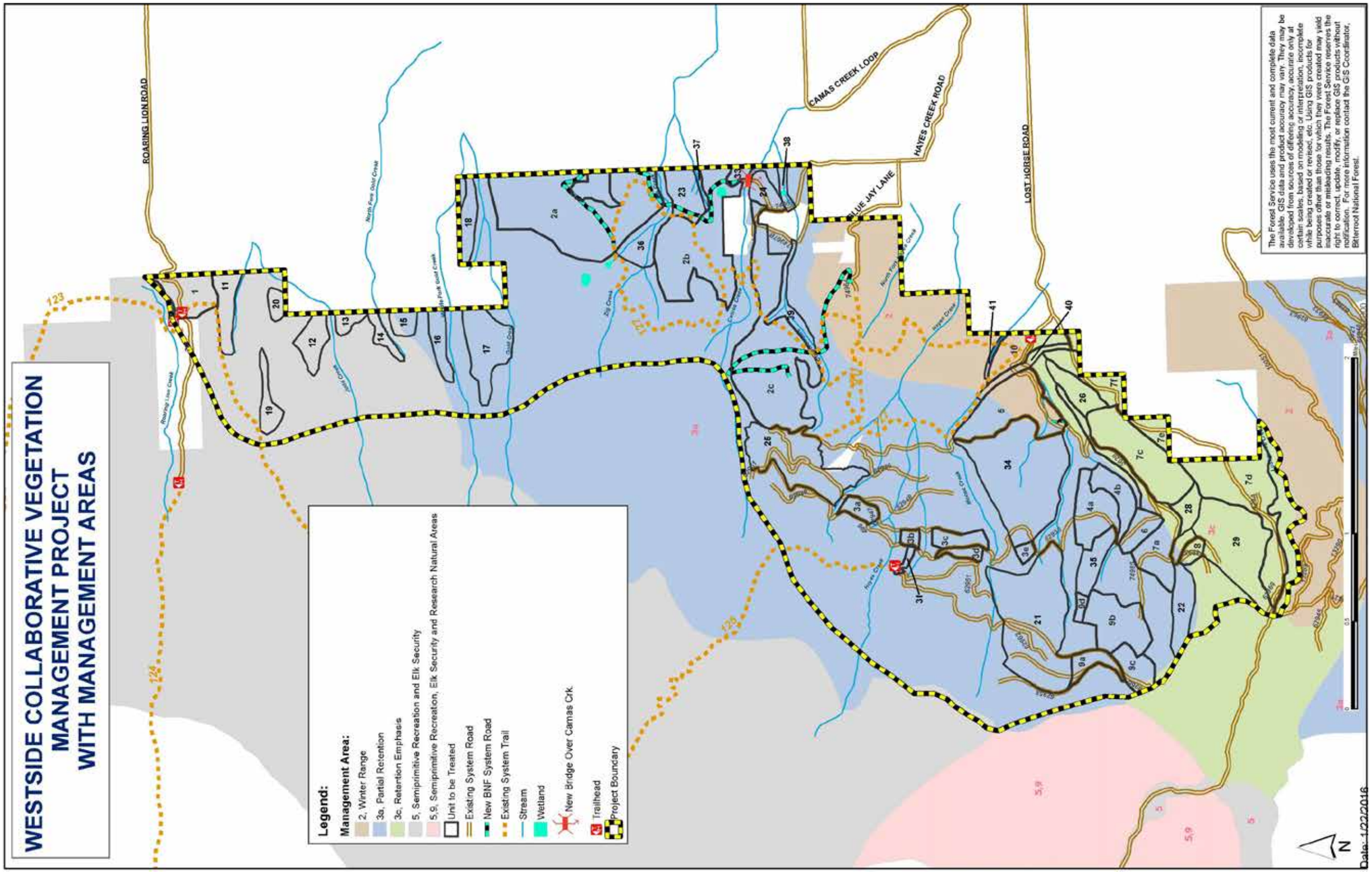

Figure 1- 4: Management Areas in the Westside Collaborative Vegetation Management Project Area and Proposed Treatment Units.

Use the appropriate scale of integrated analysis to prioritize and design restoration activities.

Ravalli County and surrounding National Forest was the initial scale of prioritizing landscapes for fuel reduction (PF-FIRE-010). Fuels have been treated in Trapper-Bunkhouse, Lower West Fork, Larry-Bass, Three Saddle, and Como Forest Health projects since 2006. The priority for analysis of these projects shifted to areas with the highest potential to support a bark beetle outbreak as mountain pine beetle became more active.

The Westside Collaborative Vegetation Management Project connects the area between Como Forest Health project and the 2012 Sawtooth Fire perimeter and is between the two main streams, Lost Horse Creek and Roaring Lion Creek. It is the appropriate scale because it treats an area large enough to influence fire behavior in the adjoining landscape without discounting or exaggerating the site-specific affects.

Monitor Restoration Outcomes.

The Westside project would be monitored through project implementation, post-treatment reviews, National Best Management Practices review, and Forest Plan monitoring items.

Reestablish fire as a natural process on the landscape.

This project will reduce forest density such that prescribed fire can be used to further reduce surface fuels while maintaining fire severity within historic ranges for the forest type. Should a wildfire occur following full treatment (timber harvest, thinning, and prescribed fire), fire severity should also be within historic ranges and provide for an array of management options.

Consider social constraints and seek public support for reintroducing fire on the landscape.

Many people do not understand or appreciate role of fire in the forest ecosystems. They are concerned about the dust, noise, and smoke resulting from the proposed project. These concerns are reduced to the extent possible through the timber sale contract and by following Clean Air Act policies. People living within or directly adjacent to the National Forest boundary will be the most affected by dust, smoke, and noise and will be notified about the onset of activities. Prescribed fire burning under specific conditions will cause less harm than wildfires burning in the hottest, driest season of the year.

Engage community and interested parties in the restoration process.

The community and interested parties were engaged in the restoration planning process through the CWPP, the work of the BRC, and a Forest Service-hosted open house. Bitterroot National Forest personnel met with individuals and adjacent landowners when requested, and sent 102 letters and 57 e-mails to adjacent landowners and interested individuals and organizations. We also sent letters to elected Federal, Tribal, State, and County officials.

Improve terrestrial and aquatic habitat and connectivity

The Westside project maintains the old growth habitat in the project area, which provides fisher and marten habitat connectivity between lower and higher elevations and between drainages. Some of the commercial treatments will promote the development of future old growth by restoring growing space and maintaining large diameter trees in the treatment units. The treatments will improve the growth rate of the remaining trees and expedite the transition of the forest to an old growth condition. The forest will also be more resilient to fire because of the increased space between trees and the higher level of the bottom of the crowns.

The project also removes colonizing trees from meadows, which restores and improves forage production next to forest cover.

The Westside project will improve aquatic habitat in the long run by promoting the development of aspen in the riparian areas. Aquatic habitat connectivity is affected by diversions for agricultural uses, which is outside of National Forest management jurisdiction. The proposed reroute of the 0.6 mile streamside section of FSR 5620 along Moose Creek will eliminate direct sedimentation in the stream.

Emphasize ecosystem goods & services and sustainable land management.

The Westside project will provide timber to local timber industries as well as opportunities for contracting restoration activities.

Integrate restoration with socioeconomic well-being.

In addition to the jobs provided with the project activities, the forest will be in a more resilient condition when the project is completed. There is always the potential for severe wildfire depending on weather conditions; the project will improve the potential that fires will be within the natural range of fire severity following treatments. Fire analysis suggests fires won't be as devastating to the forest at the landscape level and the forest would recover faster. There would be lower impacts on the scenery and recreation resources.

Enhance education and recreation activities to build support for restoration.

Through implementation of this project, people will become more aware of the value of managing forests to benefit multiple resources. The trail system in the project area provides an opportunity to show how management can incorporate recreation concerns to benefit both the forest condition and the recreation experience.

Protect and improve overall watershed health, including stream health, soil quality and function and riparian function.

Overall, only minor changes to watershed health would be likely because of the small portion of the watershed area treated. Streams in the project area are buffered from management activities unless the harvest of trees would improve the riparian condition. The design features incorporated into the project avoid the loss of riparian function. The project will increase the prevalence of aspen in the riparian areas where it exists without the use of heavy equipment in the stream management zone. A system road adjacent to a tributary to Moose Creek will be decommissioned and re-routed outside of the stream zone. This treatment will restore riparian function on this section of streams.

Soil standards will be maintained in all harvest units. Old trails and roads would be used to the extent possible as locations for specified and temporary roads. Roads are located away from streams and cross when necessary at locations that are stable and least likely to contribute sediment to the streams. Temporary roads would be recontoured and revegetated after use. Roads not needed for future management would be decommissioned and treated where natural recovery of old road prisms has not occurred. These treatments will expedite the restoration of soil function.

Establish and maintain a safe and ecologically sustainable road and trail system.

This project provides a safe and ecologically sustainable road system by locating proposed new road on existing old road beds as much as possible. Stream crossing locations are chosen in areas with stable banks and low gradients to prevent or reduce the potential for sediment

reaching the stream. Both temporary and new system roads are located away from streams to the extent possible and closed after use.

Existing roads identified through the project Transportation analysis as having resource impacts or those no longer needed for current or future management will be decommissioned and treated where necessary to return them to the productive land base.

Decision Framework

Given the purpose and need, the deciding official reviews the alternatives to make the following decisions:

- Whether the proposed action will proceed as proposed
- What design criteria and monitoring requirements apply to the project
- Whether the project requires a Forest Plan amendment.

Public Involvement and Collaboration

The collaborative process is one that is transparent, non-exclusive, and includes multiple persons representing diverse interests. Though a portion of the Westside Collaborative Vegetation Management project was initiated by the BRC, many persons have been included in the scoping process through many venues.

The northern portion of the Westside Project was initially proposed by the BRC. The Forest Service included it in their proposal to treat the southern portion of the project area and analyze the entire area in compliance with NEPA. On July 22, 2015, prior to the start of the NEPA process, the Bitterroot National Forest held an open house to provide the public the opportunity to view maps and displays, ask questions, and offer comments about the initial proposal for the Westside Collaborative Vegetation Management Project. Approximately 50 people attended and 25 submitted comments. After considering their comments and changing the proposed action based on them, the scoping package for the project was released for 30-day review and comment on August 27, 2015.

The Bitterroot National Forest mailed the scoping package to about 159 individuals and organizations, State and Federal agencies, the tribal chairman for the Confederated Salish and Kootenai Tribes of the Flathead Reservation, and elected Federal, State, and County representatives. In addition, the Bitterroot National Forest issued a news release and legal notice about the Westside Collaborative Vegetation Management project in the Ravalli Republic and several other newspapers picked up the story. During the comment period, representatives of the Bitterroot National Forest met with four adjacent landowners who requested the meetings and briefed the BRC, Ravalli County Commissioners, Selway-Pintler Wilderness Chapter and the Bitterroot Chapter of the Backcountry Horsemen, and the Ravalli County Off-road Users Association. The Forest also posted a Question and Answer document about the Westside Collaborative Vegetation Management project on the Bitterroot National Forest web-site.

The Bitterroot National Forest received 80 comment letters on the proposed action. The ID Team reviewed the comments for possible alternatives to the proposed action that would meet the purpose and need for the project. Though many suggestions were received, they did not support the development of a new alternative that would be carried through analysis. Some of the suggestions:

- were considered during the early development of the project

- inspired changes to the proposed action
- would not meet the purpose and need for the project
- were addressed with design features of the proposed action (Table 2-5).

Bitterroot National Forest representatives continued briefing the BRC, Ravalli County Commissioners, and individuals who requested additional information after the comment period closed.

Issues

The ID Team separated the comments received during the scoping processes into significant and insignificant issues. Significant issues are defined as those issues directly or indirectly caused by implementing the proposed action. These issues were used to formulate alternatives to the proposed action and guide the analysis of effects. Insignificant issues are identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. This delineation of issues is explained in Sec. 1501.7 of the Council on Environmental Quality (CEQ) NEPA regulations. These regulations state, "...identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)..."

Many commenters are supportive of the project's purpose and some concur with the project design. Others, however, think the road construction is unnecessary or the objectives can be met without commercial timber harvest. The following significant issues are analyzed in the Westside Collaborative Vegetation Management project through the range of alternatives that includes alternatives considered but not carried through the full analysis. These issues come from internal discussions and public comments received during the scoping-comment period.

Roads

Most of the comments received during pre-NEPA discussions and project scoping were centered on the construction, decommissioning, and use of roads.

Road Construction:

The Forest Service received comments against the construction of new roads because they would interfere with the recreation use and aesthetics of the Coyote Coulee trail system, spread invasive plants, damage wetlands, degrade elk habitat, disturb a goshawk nesting area, create dust, promote illegal OHV use, and disturb the privacy of the adjacent landowners. The ID Team considered an alternative in which no new roads, including temporary roads, were constructed and another alternative in which roads were not constructed to access units 2a, 2b, and 2c. The alternatives were not carried through analysis because 86 % and 48% of the commercial unit area would not be treated, respectively, and the purpose and need for the project would not be met on a landscape scale. Not treating the commercial timber component would not reduce stand densities sufficiently to affect mountain pine beetle infestation potential or reduce fuels enough to affect fire behavior.

Helicopter Logging would negate the need for a road or a bridge:

Many people believe that using helicopters to log Units 2a, 2b, and 2c would make the construction of the roads and bridge to these units unnecessary, reduce wildlife disturbance, and protect soils. The ID Team studied the use of helicopters to log these units through a feasibility analysis and determined (based on yarding distances from helicopter logging operations) that some road construction and the bridge placement would be needed and the logging operation

would require substantial subsidy of taxpayer funds (PF-Economics-001). This alternative was not carried through the analysis because of the feasibility analysis results. However, if the timber sale is implemented, the purchaser would have the option to use helicopters if they believe it will help them complete their contract obligations economically and the effects are within the limits described in Chapter 3.

Use Blue Jay Lane or Hayes Creek as haul routes:

The Forest Service received comments that Blue Jay Lane and Hayes Creek road were too narrow and had tight curves that made them unsuitable as haul roads. People also expressed concerns about the effects of heavy truck traffic on their irrigation pipes beneath the road and the safety of children riding bicycles or playing near the roads. Many people are concerned about the potential dust created by heavy trucks on native surface roads. The Ravalli County Commission expressed concerns they would not be able to maintain the roads during or rehabilitate the roads after the project. The County does not currently maintain Blue Jay Lane, though it is a County road.

Decommissioning Roads:

Some people did not want specific roads decommissioned or roads that were stable and grown in to be disturbed in the process of decommissioning. NFSR 62961 is a short road segment that leads to a dispersed campsite and parking area for Camas Trail access. NFSR 62958 is a popular snow machine route that has been used for 30 years. NFSR 62946, 62947, 62948, 62951, and 62962 have grown in, are stable, and shouldn't be disturbed. Some people expressed that decommissioned roads should remain walkable.

The ID Team modified the proposed action to retain NFSR 62961 on the road system. The entrance of NFSR 62958 would be recontoured to eliminate unauthorized motorized use and accommodate the authorized winter use. Additional work to decommission naturally recovering and stable roads is not planned (Table 2-3).

Recreation

Coyote Coulee Trail System

Many people are concerned about the effects this project may have on the aesthetics and condition of the Coyote Coulee trail system. They appreciate the single track character of the trails and that they are accessible year-round. They fear the trails will become wide forest roads that would invite OHV use and create dust, noise, and safety hazards to the non-motorized users.

Design features are included in Alternative2 to reduce potential effects on the trail and user experience. The effects of treatments are described in Chapter 3.

Economics

Road and Bridge Construction

Many people believe the timber values in the project area do not support the costs of road and bridge construction. They believe timber harvest and trail management are mutually exclusive and that timber harvest will threaten the recreation and tourism economy.

Bridge costs and the effects of timber harvest on recreation and the tourism economy are evaluated in Chapter 3.

Wildlife

Elk

People are concerned about the effects this project may have on elk, particularly the potential loss of hiding and thermal cover. They are concerned that building road into Units 2a, 2b, and 2c will increase hunter access and elk disturbance and move them onto private property in the fall.

Some commenters noted the intent of the land exchange was to create favorable elk calving habitat and healthy elk herds. They believe road construction would be incompatible with the original purpose of the land exchange.

The effects of timber harvest and the activities associated with it are analyzed in Chapter 3.

Management Indicator Species (MIS)

A few comments were concerned about assuring the viability of MIS populations. MIS on the Bitterroot National Forest are elk, pileated woodpecker, and American marten. The potential project effects on MIS are analyzed in the Chapter 3.

Old Growth

Since a large portion of the project area was converted to orchards in the early 1900s and there is not much old growth in the project area, a few commenters think the project should include a conservation strategy for old growth species. Others question whether old growth forest can be developed with continual timber harvest.

The development and status of old growth in the Westside project area is discussed in the Silviculture section of Chapter 3.

Birds

Some commenters noted hearing pileated woodpeckers, pygmy owls, and a gray owl in Units 5, 10, and 40, peregrine falcon activity near the Lost Horse quarry, and a goshawk nest cluster adjacent to the proposed road location to Unit 2c. They believe that commercial harvest, road building, and use of the road would negatively affect these birds.

The effects of project activities on goshawk and peregrine falcons are discussed in the Wildlife section of Chapter 3.

Regulatory Framework and consistency with Laws, Regulations, and Executive Orders

Organic Administration Act, June 4, 1897

The Organic Administration Act established the national forests to protect and improve the forests for the purpose of securing a permanent supply of timber for the people and insuring conditions favorable to continuous water flow. This act authorizes the Secretary of Agriculture to make provisions for the protection of national forests against destruction by fire.

National Forest Management Act (NFMA)

This act directs the Secretary of Agriculture to specify guidelines for land management plans to ensure protection of forest resources. Regulations (36 CFR 219.27) specify that, consistent with the relative resource values involved, management prescriptions in forest plans must minimize serious or long-lasting hazards from wildfire.

Invasive Plants

This act directs the Forest Service to provide for diversity of plant and animal communities and requires the development and implementation of a resource management plan for a National Forest. This Act applies to the Westside Project by including provisions to protect plant diversity in site-specific projects. The Westside project design features prescribe invasive plant control and monitoring actions to protect the ecological health and diversity of native plant and animal communities.

Soil

The National Forest Management Act requires the Forest Service to insure that timber will be harvested only where soil will not be irreversibly damaged (16 USC Section 1604 (g)(3)(E)(i)) and even-aged regeneration harvest be carried out in a manner consistent with the protection of soil (16 USC Section 1604 (g)(3)(F)(v)). The intent is that by maintaining productivity of the parts (i.e. the treatment units), the productivity of the land in the larger area will be maintained.

Proposed activities in Alternatives 2 will not result in irreversible damage to the soil resource. Proposed activities that will have the greatest effect on soil are ground-based yarding. Skid trails will be designated and historic skid trails will be used to the greatest extent feasible to limit new disturbances.

Limited data has been released from the Long-term Site Productivity Project (LTSP) (Powers et al. 2005; Powers et al. 2004). Data released from the first 10 years (Sierra Nevada and Southern Coastal Plain sites) suggests that site productivity has not been impaired despite substantive soil compaction and a massive removal of surface organic matter on the test plots (Powers et al 2004). The authors also suggest that there is no evidence that the 10-year productivity was universally impacted by soil compaction. Possible reasons for this result include that the increase in bulk density was not severe enough, bulk density changes are strongly tied to initial soil bulk density, or that increased bulk density in coarse soil increases the water holding capacity on droughty soils. The authors caution against using this information for other sites and climates. They note that data has been collected and analyzed for only 10 years and future data may change the above conclusions.

Powers (1990) defines the processes that lead to declines in soil productivity. He concludes that if the loss of biomass, organic matter, soil porosity, and topsoil is limited; soil productivity should be preserved. The Westside Project protects organic matter, soil porosity, and topsoil through the application of Montana BMPs, SWCPs, and mitigations. Localized and limited losses will occur on landings, skid trails, temporary roads, or where the soil is sterilized with fire. However, over the majority of a treatment unit and the landscape, the processes that lead to soil productivity will be preserved.

Silviculture

Timber management requirements (FSH 1921.12a) are met in the Westside project area (Chapter 3 pg. 55, 56). Group selection harvests create openings in the forest canopy without departing from a fully stocked stand. These openings provide microenvironments for regeneration of tree species from local seed sources. The openings will be blended and feathered to avoid straight edges and will not be of uniform size, shape, or arrangement. The openings will be smaller than the 40-acre limit; openings will range between 2 and 20 acres. Most of the treatments would be intermediate harvests though openings will be created in the group selection treatments. The openings are proposed where trees are infested with root rots, bark beetles, or declining stands of ponderosa pine, Douglas-fir, subalpine fir, or lodgepole pine.

These stands have all met culmination of mean annual increment (CMAI). Project analysis was completed by an ID Team of resource specialists and the project is consistent with the protection of soil, watershed, fish, wildlife, recreation, esthetic resources, and cultural and historic resources. Soil, slope, or other watershed conditions will not be irreversibly damaged (Chapter 3 pg. 93, 208). Streams, streambanks, and wetlands are protected from detrimental changes in water temperatures, water course blockages, and sediment deposits, and timber harvest will not adversely affect water conditions or fish habitat (Chapter 3 pg. 208, 219).

Stands proposed for harvest treatment in Westside were examined for suitability in accordance with 36 CFR 219.12(a) (2) (D) (ii). Units were found to be suitable for timber management based upon the following:

- Meet the definition of forestland as described in 36 CFR 219.16.
- Technological feasibility exists to ensure soil productivity and watershed protection. All sites considered for treatment would use established harvesting and site preparation methods. In combination with resource protection standards in the Forest Plan, design features based on applicable Best Management Practices and INFISH would be sufficient to protect soil and water resource values.
- None of the stands considered for harvest have been withdrawn from timber production as specified in 36 CFR 219.12(2) (A) (B).

Wildlife

The National Forest Management Act (NFMA) provides for balanced consideration of all resources. It requires the Forest Service to plan for a diversity of plant and animal communities. Under its regulations, the Forest Service is to manage for viable populations of native and desired non-native species, and to maintain and improve habitat of management indicator species.

Bitterroot National Forest Plan Compliance and Consistency

The Bitterroot National Forest Plan (1987) in compliance with NFMA, sets out basic management direction and guides all natural resource management activities. The Westside project supports Bitterroot National Forest Plan (Forest Plan) goals and objectives, described on pages II-2 – II-7, and applies Forest-wide standards described on pages II-17 through II-33. Goals and objectives directly applicable to vegetation include:

- Maintain forest stands so that pest-caused losses are reduced to acceptable levels.
- Design fire management programs that are consistent with other resource goals
- Design transportation systems and road management programs that are responsive to public concerns and protect resource goals.
- Maintain soil productivity, water quality, and water quantity.
- Provide an economically efficient sale program
- Provide sawtimber and other wood products to help sustain a viable local economy.
- Seek out opportunities for biologically appropriate and cost-efficient uneven-aged management.
- Control noxious weeds to protect resource values and minimize adverse effects on adjacent private land.
- Provide habitat to support viable populations of native and desirable non-native wildlife and fish.
- Maintain habitat for the possible recovery of threatened and endangered species.

- Maintain riparian flora, fauna, water quality, and recreation activities.
- Protect significant cultural sites.
- Maintain a high level of visual quality on landscapes seen from population centers and major travel routes, and adjacent to fishing streams.

The Westside project area contains management areas (MAs) 2, 3a, 3b, 3c, and 5. Management Areas (MAs) standards are listed in the Forest Plan between pages III-3 and III-80. Proposed activities are consistent with MA goals (Forest Plan pgs. III-9, III-15, III-22, III-30, III-37). Commercial timber harvest is proposed only in areas defined as suitable for timber management under the Forest Plan.

Prescribed fire is integrated into fire management planning through NFMA and NEPA analysis where fire use objectives are defined and disclosed. Fuels management is based upon ecosystem management principles, processes, and desired conditions and the effects are analyzed at various scales (USDA Forest Service 1987, Appendix M-2). Fuel treatments include broadcast burning, underburning, jackpot burning, and pile burning. The Forest Plan requires 'prompt control action' only in Management Area 1 (Forest Plan, pgs.III-7). The full range of wildland fire management responses, from suppression to management, is allowed in the other Management Areas (Forest Plan, pgs. III-13, 20, 28, 34, 39, M-1, M-2). All fires are managed under the 2009 Federal Wildland Fire Policy (USDI/USDA 1995) and can be managed for multiple objectives under the Guidance for Implementation of Federal Wildland Fire Management Policy (USDI/USDA 2009) unless human caused.

Old Growth

The Bitterroot Forest Plan objective for old growth habitat is to maintain sufficient old growth habitat to support viable populations of old growth dependent species. Largely as a result of widespread, intensive harvest in the late 1890s and early 1900s, old growth forest in the Westside project area does not meet Forest Plan standards. Since there is no way to create old growth forest without growing a forest for more than 100 years, we need to restore or maintain forest structure and composition appropriate to the forest development stages. This includes maintaining snag and coarse woody debris components within their historical ranges. None of the alternatives would reduce the amount of old growth forest remaining in the project area in the short term, because there are no stands identified as old growth forest in treatment units. Treatments are intended to protect mature stands from stand-replacing fires and epidemic beetle infestations, thus protecting their potential as old growth forest. The treatments will improve the species composition, reduce forest density, and increase growth rates. They will maintain tree species best suited to site conditions, reduce the severity of fire, and improve tree recruitment into the mature and over-mature size classes. These conditions will improve the development of old growth forests adapted to the specific site characteristics, improve the health of the forest, and keep insects, disease, and fire severity within the parameters of the specific Vegetation Response Units.

Road Management

Roads will be maintained to design standards after completion of the Westside project. Two newly constructed roads and one undetermined road will be added to the National Forest System Road (NFSR) inventory. NFSR 62965 and 62960 would be Operational Maintenance Level (ML) 1 roads and closed yearlong to motorized travel. NFSR 62966 would be ML 2, available yearlong for Forest Service administrative motorized travel. These roads would be closed to public motorized users.

The new roads added to the National Forest System Roads are necessary for the future management of the surrounding National Forest. These roads access lands classified as part of the Forest's suitable timber base and timber production is appropriate use of this area. Future entries are anticipated to continue timber and fuel treatments initiated in this project. Commercial timber management and fuels treatments would likely occur in 25-30 year intervals. These roads may also facilitate fire suppression in the next 20 years.

Roads will be closed to public use if adequate road maintenance funds are not available. Closing the newly constructed roads and NFSR 62960 minimizes maintenance needs between administrative uses and maintains elk habitat effectiveness.

All new road construction would be designed to facilitate revegetation of disturbed areas within three years after contract termination. All disturbed areas associated with road construction will be revegetated as part of the construction package. Roadbeds of newly constructed, ML 2 system roads will not be revegetated to allow for future administrative travel.

Snags

The Bitterroot Forest Plan (p. II-20) states "All snags that do not present an unacceptable safety hazard will be retained." (USDA Forest Service 1987a, II-20). The Forest Plan Five Year Review (USDA Forest Service 1994, p. 22, Appendix p. 70) clarifies that the purpose of the 1987 Forest Plan snag standard is to retain some vertical structure in the regenerated forest, in support of wildlife goals and objectives, while providing a safe working environment. In contrast to some regeneration management practices prior to 1987 where no vertical structure was maintained, the standard intended that when conducting clearcuts, seed tree, and shelterwood harvests, some snags would be retained as vertical structure and biodiversity. The Forest Plan Five Year Review (p. 22) states that "In order to meet the intent of the Forest Plan to retain some large vertical woody structure, about two trees per acre are needed…" In old growth habitat, the Forest Plan (p. II-20) has as criteria to consider "snags, generally 1.5 per acre greater than 6 inches dbh and 0.5 per acre greater than 20 inches" (USDA Forest Service 1987a).

It is clear that the Forest Plan Record of Decision (p. 6) considered and permits salvage of dead or dying trees (USDA Forest Service 1987b). Fuel treatment is discussed in several areas of the Forest Plan (pp. II-7, II-8, II, 28, III-7, III-13, III-20, III-28, III-34, III-38, and III-63 in USDA Forest Service 1987). The Forest Plan FEIS (Volume I, p. III-33, IV-22) specifically discussed the concern of stand replacing fires from high fuel loads caused by fire suppression or insect epidemics. Salvage is also discussed in multiple areas of the Forest Plan and Record of Decision (USDA Forest Service 1987a; USDA Forest Service 1987b), further supporting that the removal of snags, beyond what is necessary for safety, was not only intended but was programmed (FP p. II-20(6), II-20(2), II-22(2), III-8, III-14, III-21, III-29, and III-35). The Westside project is consistent with the Forest Plan because the snag retention guidelines described in Chapter 2 and 3 of this EA meet the intent of the Forest Plan to provide vertical structure and maintain species viability while allowing commercial harvest and fuel reduction activities.

Soils

Forest wide standards for soil resources in the Forest Plan are found in Chapter II, pages 17-33, and Chapter III under the individual management areas, page II-46. The Forest Plan does not have numeric Soil Quality Standards; however, the plan addresses soils in the following standards and guidelines.

- Page III-6(3) Provide soils technical support for management activities on sensitive soils.

  - How addressed: The Forest Soil Scientist participated on the ID Team and will participate in the implementation as needed.
- Page II-25(7) Plan and conduct land management activities so that reductions of soil productivity potentially caused by detrimental compaction, displacement, puddling, and severe burning are minimized.
- Page II-25(8) Plan and conduct land management activities so that soil loss, accelerated surface erosion, and mass wasting caused by these activities will not cause an unacceptable reduction in soil productivity and water quality.
- Page II-25(9) Design or modify all management practices as necessary to protect land productivity and maintain land stability.
  - How addressed: The Forest Soil Scientist field reviewed site conditions in all of the proposed units in the action alternative.
  - The Forest Soil Scientist used this data to plan, design, and prepare implementation mitigation and rehabilitation treatments to protect soil productivity. The ID Team reviewed and integrated the mitigations (Table 2-4) between the resource areas.
- Page II-25(6) Soil and Water Conservation Practices (SWCPs) will be a part of project design and implementation to ensure soil and water resource protection (FSH 2509.22).
  - How addressed: SWCPs are linked to the timber sale contract provisions to insure implementation. Timber Sale Administrators monitor the implementation of BMPs and SWCPs during harvest and post-harvest activities.
- Page III-6(4) identifies the level of organic matter and coarse woody material following harvest.
  - How addressed: Target levels for coarse woody debris (CWD) are found in Table 2-4. The suggested ranges provide adequate CWD for soil productivity and other resource benefits without creating conditions that would lead to unacceptable fire severity. The amended CWD requirements for this project encompass less than 0.1 percent of the Bitterroot NF (based on maximum treatment area of 1,320 acres in Alternative 2). Since the establishment of the Forest Plan in 1987, five other allowances have been made. These amendments in combination with this project cumulatively amount to approximately 1.5 percent of the forest. The modifications of the CWD requirements for this project will not have appreciable cumulative effects at the site or forest scale.

Compliance with Forest Plan

The Westside project complies with the Forest Plan by specifying design features that control the spread of invasive plants, protect soils, riparian areas, wetlands, wildlife, fish, and plant habitats, and reduce the effects on visual quality.

Both alternatives in the Westside Collaborative Vegetation Management project are consistent with hazardous fuel reduction, rehabilitation, and restoration policies. The project aligns with objectives and standards outlined in the Forest Plan and the Bitterroot Fire Management Plan for management areas (MA 2, 3A, 3C, and 5).

Both alternatives are consistent with Forest Plan direction, as amended.

Forest Plan Amendments

Site-specific Forest Plan amendments are needed to address visual quality objectives (VQOs), elk habitat effectiveness (EHE), and coarse woody debris. VQO of retention may not be met in Unit 7c because of the potential that skyline corridors would create vertical lines and the temporary road would create a horizontal line. Though these unnatural features would be obscured by the trees remaining in the unit, the screening may not be adequate especially during winter when snow increases the contrast.

The VQO of partial retention in Units 3a, 3b, 3c, 4b, and 9c may also not be met for similar reasons as Unit 7c.

EHE is currently not met in the Lower Lost Horse and Hayes Creek third order drainages. Road closures in Alternative 2 improve EHE in the Lower Lost Horse drainage but not enough to meet Forest Plan standards. A portion of one of the main arterial roads would need to be closed to achieve EHE, which would prevent access to one of several important recreation destinations (Appendix B). EHE would be maintained at 44% in the Lower Lost Horse drainage (six percent below the Forest Plan standard).

To meet EHE in Hayes Creek drainage, a portion of NFSR 496 would need to be closed. NFSR is the main road through the drainage and accesses Trail 125, Camas Creek. All roads off of NFSR 496 are closed and proposed for decommissioning. EHE would be maintained at 59% (one percent below the Forest Plan standard) in Hayes Creek drainage. Since EHE cannot be met in these two 3rd-order drainages, a Forest Plan amendment is needed.

Forest Plan standards for coarse woody debris (CWD) are contradictory within the Forest Plan and require fuel loads that are too high in some habitat types to meet the fuel condition and fire severity for the site. A Forest Plan amendment is needed to reduce the fuel loads from 10-15 tons/acre to 5-10 tons/acre in Fire Groups 2 and 4. The effects of the forest plan amendments are described in the Wildlife, Soils, and Scenery sections of Chapter 3 and disclosed in Appendix B of this EA.

Healthy Forest Restoration Act (HFRA 2003 as amended by 2014 Farm Bill)

The Westside Project is authorized under provisions of HFRA 2003 Titles I and VI §602. The project area meets the definition of 'declining forest health in §602(a) and a portion of the area was designated as a priority landscape by the Montana Governor (§602(b)(1)). The project area is experiencing declining forest health based on annual forest health surveys conducted by the Secretary (§602(c)(1)). The Westside project would increase forest resilience to insects and disease (§602(d)(1).

The Forest Supervisor submitted a request, supported by the State Forester, to designate the remainder of the project area (1,876 acres) as a priority treatment area. Treatment units in the IRA were approved. All of the treatment units are within the WUI and the proposed treatments reduce hazardous fuels. Though some areas are not designated under HFRA Title VI, they can be treated using HFRA Title I. This project meets the definitions for at-risk community (HFRA §101 (1) (A)(ii)), appropriate tools (HFRA §101(2)), and follows the environmental analysis process described in §104, as prescribed in §602(d)(2). The range of alternatives complies with §104(d)(2) and is consistent with the Bitterroot Community Wildfire Protection Plan (2006) (§104(d)(3)). The Westside project:

- does not treat old growth stands (§102(e)))

- focuses largely on small diameter trees, thinning, strategic fuel modification, and prescribed fire to modify fire behavior (§102(f)(A))
- maximizes the retention of large trees, as appropriate for the forest type, to the extent that the trees promote stands resilient to fire (§102(f)(B)) and insects and diseases (§602(e)).

The Westside project treats 2,327 acres of the 5,700-acre project area and is well within the size limitations of the HFRA §102(c). All treatment units are within the WUI (§102(a)(1). The Westside project is consistent with the Forest Plan as amended for elk habitat effectiveness, coarse woody debris, and visual quality (§102(b). None of the proposed treatments are:

- within a component of the National Wilderness Preservation System (§102(d)(1)
- on Federal land on which the removal of vegetation is prohibited or restricted by Act of Congress or Presidential proclamation (§102(d)(2)
- within a Wilderness Study Area (§102(d)(3).

National Environmental Policy Act (NEPA)

This act requires all land management agencies to prepare environmental documents when there is an action that may have impact on the environment. The documents are prepared by ID Team members and must include assessments using natural and social sciences; alternative actions; a proposed action; public involvement and collaboration; and public notice before, during, and after decisions.

Endangered Species Act of 1973 (as amended)

Section 7 of the Endangered Species Act (ESA) directs that actions authorized, funded, or carried out by federal agencies do not jeopardize the continued existence of any threatened or endangered (T&E) species, or result in the adverse modification of habitat designated as critical to these species. The Bitterroot National Forest consults with the US Fish and Wildlife Service (USFWS) as required concerning the effects of projects on T&E species. In accordance with the requirements of the ESA, the wildlife analysis for this project addresses the direct, indirect, and cumulative effects of the selected alternative on T&E wildlife species, species habitat, individuals, and populations, and ends with an effects determination for each species. Effects determinations are then summarized in a Biological Assessment (BA) summary in the project file (PF-WILD-055). USFWS has determined that Canada lynx and yellow-billed cuckoo may occur on the Bitterroot National Forest. However, neither species is expected to occur within the project area due to lack of mapped or suitable habitat. The effects determination for both species is thus No Effect. There is no requirement or need to consult with USFWS when the effects determination for listed species is No Effect.

On January 12, 2016, USFWS published a 90-day finding on a new petition to list the Northern Rocky Mountain Distinct Population Segment (DPS) of the fisher as an endangered or threatened species under the Endangered Species Act (ESA) (USDI Fish and Wildlife Service 2016). USFWS found that the petition presented substantial scientific information indicating that the Northern Rocky Mountains DPS of the fisher may warrant federal protection as a threatened or endangered species. With this notice, USFWS initiated a 12-month review of the status of the fisher to determine whether federal listing of this DPS of the fisher is warranted. If USFWS determines that federal listing of the fisher is warranted, the status of the DPS would be changed to Proposed for listing, and another review period would commence. Potential listing of the fisher as endangered or threatened would take a minimum of two years from the start of the

status review. In the interim, the Northern Rocky Mountain DPS of the fisher is not protected under the ESA, but continues to be classified as a Sensitive species by the Northern Region. Potential listing does not change the analysis of project effects to fisher or the effects determination for fisher.

USFWS initiated a previous 12-month status review of the Northern Rocky Mountain DPS of the fisher on April 15, 2010 (USFWS 2010a). After an evaluation of the best scientific and commercial information available regarding the conservation status and potential threats, a June 30, 2011 decision determined that the fisher in this region did not warrant listing under the Endangered Species Act at that time (USDI Fish and Wildlife Service 2011).

On May 24, 2016, the USFWS added wolverine as a Proposed species to their list of Threatened, Endangered and Candidate species that may occur on the Bitterroot National Forest. This change occurred after the date that the Westside EA was finalized, but before the Decision Notice was signed. The Forest hereby acknowledges this status change. A GIS analysis indicates there are 16.5 acres of predicted wolverine habitat in the higher elevations along the western edge of the project area but that none of this predicted habitat is within a treatment unit (PF-WILD-057). The project's wildlife biologist used the Region 1 Programmatic Biological Assessment for North American wolverine and determined the proposed action in the Westside project will not jeopardize the continued existence of the DPS of the North American wolverine (PF-WILD-058). This determination is reflected in the Determination of Effects for TES Wildlife Species (PF-WILD-055). Projects routinely conducted on National Forest are not considered to be a threat to the wolverine (PF-WILD-058). There is no need to consult with FWS for a No Jeopardy determination on Proposed species.

Federal Wildland Fire Management Policy, February 2009

The Federal Wildland Fire Management Policy provides consistent implementation of the 1995/2001 Federal Fire Policy, as directed by the Wildland Fire Leadership Council. The 2009 guidance reaffirmed that firefighter and public safety outweigh all wildland fire management priorities. Some terminology changed in the 2009 guidance; for example wildland fire describes any non-structure fire that occurs in the wildland. Wildland fires are categorized into two distinct types:

- Wildfires – Unplanned natural ignitions, human-caused ignitions, and planned ignitions that are declared wildfires.
- Prescribed fires – Planned ignitions

Bitterroot Community Wildfire Protection Plan

The Bitterroot Community Wildfire Protection Plan (CWPP) identifies and serves the communities of Ravalli County and areas in the County where residents live in the Wildland Urban Interface. It was signed in 2006 and updated in 2010. The primary emphasis areas are:

- Fire prevention and suppression
- Hazardous fuels treatment
- Restoration of fire-adapted ecosystems
- Community assistance

The National Fire Plan and the 10-year Cohesive Strategy were the impetus behind the development of the CWPP. All city or town, rural, and federal fire department Fire Chiefs in Ravalli County collaboratively developed and adopted the Community Wildfire Protection Plan.

The County Commissioners and Bitterroot National Forest Supervisor signed the document in 2006. The Community Wildfire Protection Plan (www.bitterrootfireplan.info) prioritizes hazardous fuels treatment locations on the Bitterroot National Forest as directed in the National Fire Plan (PF-FIRE-001). The Westside project is located in the National Forest priority treatment area (CWPP Map #9).

Section 208 of the 1972 amendments to the Federal Water Pollution Control Act (Public Law 92-500)

This section of the Federal Water Pollution Control Act mandates identification and control of nonpoint-source pollution resulting from silvicultural activities.

Clean Water Act, Sections 303, 305, 319 and 404

Sections 303(d) and 305(b) directs states to list water quality impaired streams (WQLS) and develop total daily maximum loads (TMDLs) to control non-point source pollutants in stream segments not supporting beneficial uses. TMDLs for sediment, nutrients, and temperature have been developed for this part of the Bitterroot River watershed, and were accepted by EPA in 2011.

Section 319 directs states to develop programs to control non-point source pollution, and includes federal funding of assessment, and planning and implementation phases. At this time, no known Section 319 projects would be detrimentally affected by project activities.

Section 404 controls the dredge and fill of material in waterbodies of the U.S.; the current proposal for the analysis area does not contain any activities that fall under this regulation.

Designated Beneficial Uses of Local Waters

The Montana Department of Environmental Quality (MDEQ) has given all National Forest waters within proposed Westside project area its B-1 classification (ARM 16.20.604). The associated beneficial uses of B-1 waters are drinking, culinary and food processing purposes (after conventional treatment); bathing, swimming, and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl, and furbearers; and agricultural and industrial water supply. Period of flow must be considered when discussing beneficial uses. Intermittent streams will not support all beneficial uses for the entire year.

Water quality on National Forest is currently maintained and improved through the application of BMPs for controlling nonpoint sources of pollution to surface water. Use of BMPs is the foundation of water quality standards for the State of Montana. This is documented in ARM 16.20.603 and means “land and management activities must not generate pollutants in excess of those that are naturally occurring, regardless of the stream’s classification”. Naturally occurring as defined by ARM, is the water quality condition resulting from runoff or percolation over which man has no control or from developed lands where all ‘reasonable’ land, soil, and conservation practices (commonly called BMPs) have been applied. Effectiveness of these measures is rated through the State of Montana BMP audit process every other year on a mix of land ownerships where timber harvest has occurred. The results of these audits are published annually by the Department of Natural Resources and Conservation. In 2014, Streamside Management Zone BMP application on Federal lands was rated as 94 percent compliant and 96 percent effective (http://dnrc.mt.gov/divisions/forestry/docs/assistance/practices/bmp-executive-summary-2014.pdf).

The proposed action has minimal potential to affect the physical and biological quality of the waters within the project area. The associated water quality criteria that could be affected are:

- 2. No person may violate the following specific water quality standards for water classified B-1:
  - (d) The maximum allowable increase above naturally occurring turbidity is 5 nephelometric turbidity units except as permitted in ARM 16.20.633.
  - (e) A 1 degree Fahrenheit (1˚F) maximum increase above naturally occurring water temperature is allowed within the range of 32 to 66˚F;
  - (f) No increases are allowed above naturally occurring concentrations of sediment…which are likely to create a nuisance or render the waters harmful, detrimental, or injurious to public health, recreation, safety, welfare, livestock, wild animals, birds, fish, or other wildlife (ARM 16.20.633).

ARM 16.20.603

Best management practices (BMPs) are the foundation of water quality standards for the State of Montana. The Forest Service has agreed to follow BMPs in a Memorandum of Understanding with the State of Montana. Many BMPs are applied directly as general mitigations for this proposal. Implementation and effectiveness monitoring for BMPs is routinely conducted by contract administrators, and during other project implementation and annual monitoring events.

ARM 17.30 Sub-chapter 6

Sub-chapter 6 details water quality standards for the State of Montana. The Forest Service has primary responsibility to maintain these standards on lands under their jurisdiction in the State of Montana.

The Wilderness Act of 1964 (PL 88-577)

Both alternatives comply with the Wilderness Act of 1964. No treatments are proposed in the Selway-Bitterroot Wilderness.

36 CFR Part 294 Special Areas, Roadless Area Conservation; Final Rule

Both alternatives are consistent with 36 CFR Part 294. Alternative 2 treatments proposed in the Selway Bitterroot IRA are consistent with the 2001 Roadless Area Conservation Rule (Roadless Rule), as they would maintain or restore the characteristics of ecosystem composition and structure, such as to reduce the risk of uncharacteristic wildfire effects (36 CFR 294.13(b)(1)(ii))). Generally, small diameter timber would be cut and one or more roadless characteristics (36 CFR 294.11) would be maintained or improved.

Federal Noxious Weed Act of 1974 as amended in 1990

Under the 1990 amendment to the Federal Noxious Weed Act, federal agencies are directed to enter into agreements with appropriate state and local agencies to coordinate the management of noxious weeds. Specifically, the Act calls for federal agencies to: a) develop and coordinate a program to control such plants on the agency's land; b) complete and implement cooperative agreements with the States regarding undesirable plants on agency land; and c) establish

integrated management systems to control or contain undesirable plants targeted under the cooperative agreements.

This Act applies directly to the Westside project by implementing the terms of the current Participating Agreement with Ravalli County to control invasive plants in the project area on National Forest and prevent their spread onto private lands immediately east of the project area.

The Bitterroot National Forest Noxious Weed Treatment Project Environmental Impact Statement and Record of Decision, March 2003

The Bitterroot National Forest Noxious Weed Treatment Project Environmental Impact Statement (EIS) and Record of Decision (ROD) (March 2003) implemented Forest Plan direction and authorized the treatment of invasive plants on areas of the Bitterroot National Forest. The portions of the Bitterroot Forest that were analyzed, approved and prescribed for integrated plant prevention, control and treatment in the EIS/ROD includes the area encompassed by the Westside project and associated road system. Design features for invasive plant treatments in the Westside project follow the guidelines provided in the 2003 EIS and ROD.

Executive Order 13112 (1999)

Executive Order 13112 (1999) directs all federal agencies to conduct activities that reduce invasive plant populations and provide for their control. The EO applies to the Westside project by providing additional agency justification for design features or actions associated with the project that result in the reduction and control of invasive plants in the project area.

Forest Service Manual (FSM) 2500

Region 1 Soil Quality Guidelines and Region 1 Supplement 2500-99-1

All proposed activities are designed to meet the Region 1 soil quality guidelines and Supplement direction. These guidelines require that soil properties and site characteristics be managed in a manner consistent with the maintenance of long-term soil productivity, soil hydrologic function, and ecosystem health. Activities within harvest areas are designed to cause less than 15 percent detrimental disturbance in the activity area. None of the proposed activities in the Alternative 2 are estimated to cumulatively exceed the 15 percent guideline after treatments.

Forest Service Manual (FSM) 2900

Forest Service Manual (FSM) 2900 establishes code and a new manual for Invasive Species Management. FSM 2900 sets forth National Forest System policy, responsibilities, and direction for the prevention, detection, control, and restoration of effects from aquatic and terrestrial invasive species (including vertebrates, invertebrates, plants, and pathogens).

The 2900 Manual applies directly to the effects analysis and design criteria of the Westside Veg Project in the following ways: 1) the manual will direct that management activities employ actions that contain, reduce, or remove infestations of invasive species and 2) where necessary, will implement restoration, rehabilitation, and/or revegetation activities to prevent or reduce the likelihood of the establishment or spread of invasive species.

Chapter 2: Alternatives, including the Proposed Action

This chapter describes and compares the alternatives considered for the Westside project. This section also compares the alternatives to define their differences and provide a clear basis for choice by the decision maker and the public.

Alternatives

Alternative 1: No Action

Under the No Action alternative (Fig. 2-1), current management plans would continue to guide management in the project area. No timber harvest or thinning would occur and no roads would be constructed, re-routed, added to the National Forest System Roads (NFSR), or decommissioned at this time. However, prescribed burning under previous decisions would be implemented when weather and fuel conditions fit the prescription parameters. Current management of roads and trails would continue.

Alternative 2: Modified Proposed Action

All treatments in Alternative 2 occur within 1.5 miles of the boundary of an at-risk community as identified in the Bitterroot Community Wildfire Protection Plan (CWPP). NFSR 62958 is proposed for decommissioning and extends beyond the WUI. However, the treatment to decommission the road would occur at the junction with NFSR 496 and is in the WUI. The decommission treatment would prevent unauthorized motorized use but accommodate authorized winter use (snowmobile). The road template has revegetated and is stable so no additional treatments to decommission it, in or outside the WUI, are needed.

Alternative 2 (Fig. 2-2) is the proposed action that was modified based on comments received during the comment period. In Alternative 2, NFSR 62961 is retained and undetermined road, NFSR 62960, is added to the transportation system. A portion of NFSR 62960 would be used in this proposed timber sale and stored after use (Maintenance Level 1).

Under Alternative 2, approximately 2,327 acres of the 5,698-acre project area would be treated with commercial or non-commercial timber harvest, followed with prescribed fire (Table 2-1). Commercial timber harvest would occur on about 1,349 acres:

- 506 acres would be treated with improvement cuts (22 acres in the Selway-Bitterroot Inventoried Roadless Area (IRA))
- 799 acres would be treated with irregular harvest cuts
- commercial volume would be removed from 44 of the 92 acres of aspen treatment (Table 2-2)

Non-commercial timber would be removed from about 978 acres:

- understory ponderosa pine and Douglas-fir would be removed from 666 acres of forest (139 acres in the IRA)
- 206 acres of ponderosa pine plantation
- 48 acres of aspen
- 58 acres for meadow restoration (Table 2-2)

Prescribed fire on 2,098 acres would follow most of the treatments. The type of prescribed fire would be determined by post-treatment exams that measure fuel loads, canopy base height, stand structure, and tree diameters. Prescribed fire type would likely be pile and jackpot burning, underburning, or a combination of the three methods.

Trees would be whole-tree yarded to landings, which means the harvested trees would be dragged to the landing using a ground or skyline cable system. The limbs and tops would be removed at the landing and piled into landing piles. About 127 landings, totaling 19 acres, would be needed to limb and load the logs (Tables 2-1 and 2-2). Frequent, small (0.1 acre) roadside landings would be used for the skyline units. Ground-based yarding operations require fewer but larger landings, about a quarter acre each. Landings would be located on system and temporary roads.

Table 2-1: Unit Treatments in Alternative 2

UNIT NO.	ALTERNATIVE 2	AREA (ACRES)	YARDING METHOD		LANDINGS	
			GROUND	CABLE	#	ACRES
1	Improvement Harvest	42	42		1	0.25
2a	Irregular harvest	215	215		5	1.25
2b	Irregular harvest	136	136		4	1.00
2c	Irregular harvest	188	188		6	1.50
3a	Improvement Harvest	13		13	8	0.80
3b	Improvement Harvest	6		6	5	0.50
3c	Improvement Harvest	18		18	12	1.20
3d	Improvement Harvest	9	9		1	0.25
3e	Improvement Harvest	6	6		1	0.25
3f	Improvement Harvest	4	4		1	0.25
4a	Irregular Harvest	48	48		3	0.75
4b	Improvement Harvest	30		30	17	1.70
5	Improvement Harvest	85	85		2	0.50
6	Irregular Harvest	21	21		1	0.25
7a	Irregular Harvest	71	71		4	1.00
7c	Improvement Harvest	92		92	25	2.50
7d	Improvement Harvest	112	112		3	0.75
7e	Improvement Harvest	17	17		1	0.25
7f	Improvement Harvest	35	35		1	0.25
8	Irregular Harvest	10	10		1	0.25
9a	Irregular Harvest	18	18		1	0.25
9b	Irregular Harvest	59		59	21	2.10
9c	Irregular Harvest	27	27		1	0.25
9d	Irregular Harvest	6	6		1	0.25
10	Improvement Harvest	37	37		1	0.25

Unit No.	Alternative 2	Area (acres)	Yarding Method		Landings	
			Ground	Cable	#	Acres
11	Non-commercial Thin with Prescribed Burn	29	NA	NA	NA	NA
12	Non-commercial Thin with Prescribed Burn	26	NA	NA	NA	NA
13	Non-commercial Thin with Prescribed Burn	10	NA	NA	NA	NA
14	Non-commercial Thin with Prescribed Burn	12	NA	NA	NA	NA
15	Non-commercial Thin with Prescribed Burn	13	NA	NA	NA	NA
16	Non-commercial Thin with Prescribed Burn	21	NA	NA	NA	NA
17	Non-commercial Thin with Prescribed Burn	59	NA	NA	NA	NA
18	Non-commercial Thin with Prescribed Burn	23	NA	NA	NA	NA
19	Non-commercial Thin with Prescribed Burn	19	NA	NA	NA	NA
20	Non-commercial Thin with Prescribed Burn	9	NA	NA	NA	NA
21	Plantation Thin	173	NA	NA	NA	NA
22	Plantation Thin	33	NA	NA	NA	NA
23	Meadow Restoration	33	NA	NA	NA	NA
24	Meadow Restoration	18	NA	NA	NA	NA
25	Non-commercial Thin with Prescribed Burn	97	NA	NA	NA	NA
26	Non-commercial Thin with Prescribed Burn	27	NA	NA	NA	NA
28	Non-commercial Thin with Prescribed Burn	17	NA	NA	NA	NA
29	Non-commercial Thin with Prescribed Burn	106	NA	NA	NA	NA
33	Meadow Restoration	7	NA	NA	NA	NA
34	Non-commercial Thin with Prescribed Burn	171	NA	NA	NA	NA
35	Non-commercial Thin with Prescribed Burn	27	NA	NA	NA	NA
36	Aspen Enhancement	39	13	NA	NA	NA
37	Aspen Enhancement	4	3	NA	NA	NA
38	Aspen Enhancement non-commercial only	8	NA	NA	NA	NA
39	Aspen Enhancement	23	14	NA	NA	NA
40	Aspen Enhancement	14	12	NA	NA	NA
41	Aspen Enhancement	4	2	NA	NA	NA
	Total Area of Treatment	**2,327**	**1,131**	**218**	**127**	**18.6**

The interdisciplinary team (ID Team) reviewed the transportation system in the project area to determine the appropriate road system for current and future forest management. The review included National Forest system roads and undetermined status roads (PF-Transport-001). The project area between Gold Creek and Coyote Coulee is suitable for ground based logging but does not have National Forest system road access or roads that support log truck traffic. About 3.8 miles of new permanent road construction would be needed to commercially harvest Units 2a, 2b, and 2c and secure administrative access for future forest management. The new permanent roads would be part of the National Forest road system.

Much of the permanent road segments would be constructed on old roadbeds to the extent possible and designed to meet current National Forest road standards (PF-TRANSPORT-001). The new roads would be closed at the completion of the timber sale. The roads into Units 2a and 2b would be gated at the bridge across Camas Creek and available for administrative use. The road into Unit 2c would be stored by removing the drainage structures, stabilizing the road surface drainage, and seeding the road surface to protect it until the next entry. Where the road overlaps or crosses the Coyote Coulee trail system, it will be maintained, restored, or replaced in-kind to the original design according to the USDA Forest Service Standard Trail Plans and Specifications.

In addition to the new specified road, about 3.8 miles of temporary road would be needed from the new specified road and other system roads in the project area (Fig. 2-2). These roads would occur on old roadbeds to the extent possible and would be rehabilitated after use.

Table 2-2: Summary of Activities in Alternative 2 of the Westside Project.

TREATMENT	ALTERNATIVE 2	TREATMENT	ALTERNATIVE 2
Total Area Treated (acre)	2,327	Specified Road Construction (mile)	3.8
Irregular Harvest (acre)	799	Temporary Road Construction (mile)	3.8
Improvement Harvest (acre)	506	Store Roads (mile)	1.3.
Non-commercial Thin (acre)	666	Decommission Roads (mile)	5.2
Plantation Thin (acre)	206	Landings	127 (19 acres)
Meadow Restoration (acre)	58	Sawtimber Volume (MBF) (CCF)	6,500 (13,022)
Aspen Enhancement (acre)	92	Total Volume (MBF) (CCF)	7,200 (14,324)
Prescribe fire (acre)	2,098	Present Net Value – Timber sale only All expenditures ($)	-120,896 -828,604
Ground-based (acre)	1,131	Total timber sale expenditures ($)	479,991
Skyline (acre)	218	Total expenditures	1,321,344

Specified Road Location and Design

Appropriate sites for the bridge and drainage crossings, limiting disturbance of the historical railroad grade, and the location of existing road prism are factors considered when planning the road into units 2a and 2b. The proposed bridge location, at the end of NFSR 74967A, is preferred because the stream is relatively straight and the banks are relatively low and stable, the existing road approaches have a low gradient, and it avoids the railroad grade.

The proposed road into Units 2a and 2b crosses the historic railroad grade three times at previously disturbed locations and avoids new disturbance of the historic grade. The proposed roads cross Camas Creek, an ephemeral channel (in Unit 2a), and an intermittent channel (between Units 2a and 2b). The crossing sites were selected where side slopes are low or moderate, the approaches are gentle, and the stream banks are relatively stable.

The road to Unit 2c is from NFSR 74964. Side slopes from road 74964 are gentle, less than 20%, until the alignment reaches a saddle. The side slopes increase up to 50% near the crossing of Coyote Coulee and then decline again to moderate and more balanced design for easier road

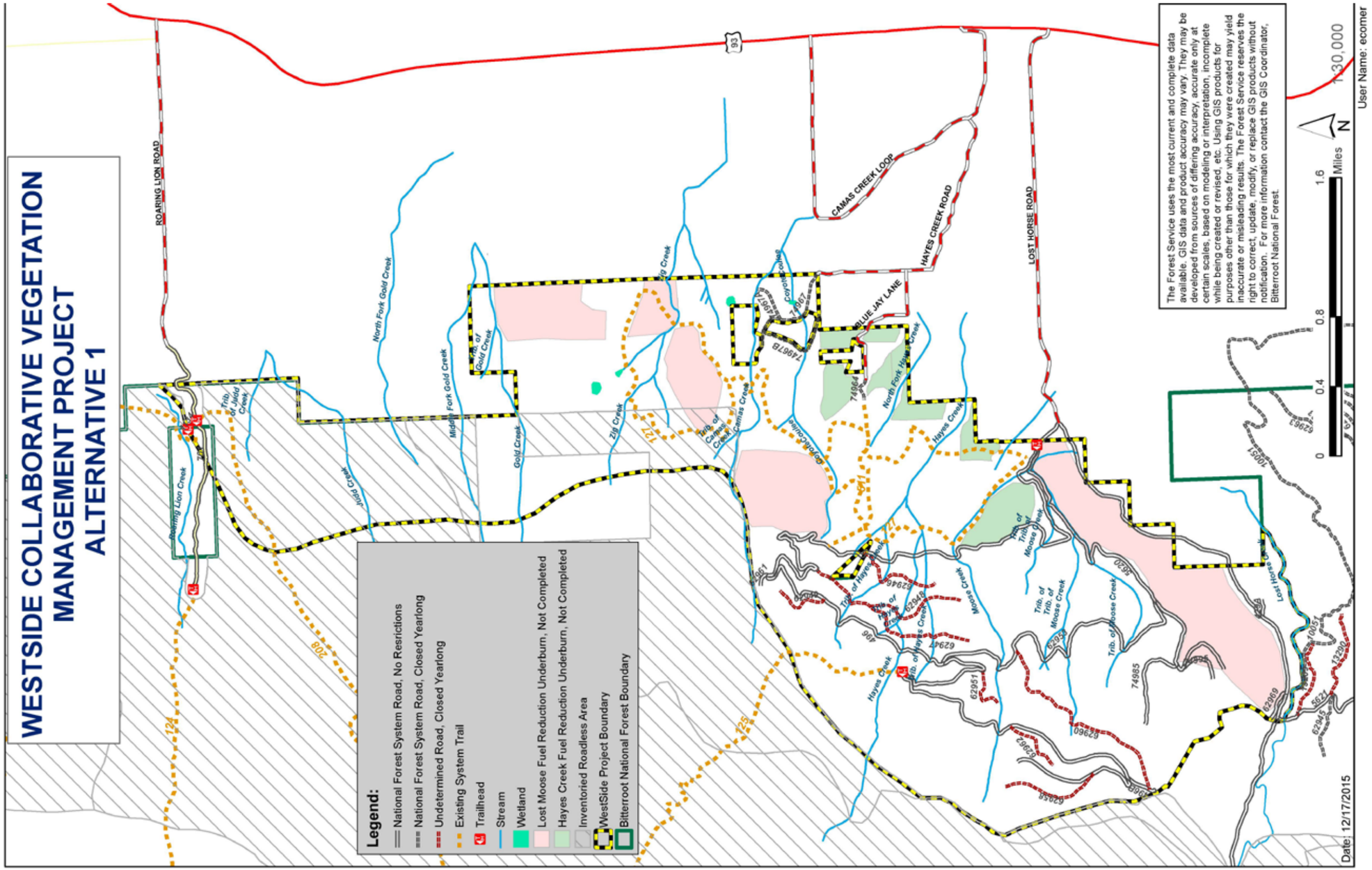

Figure 2-1: Current Activities, Road and Trail Systems in Alternative 1 of the Westside Collaborative Vegetation Management Project Area

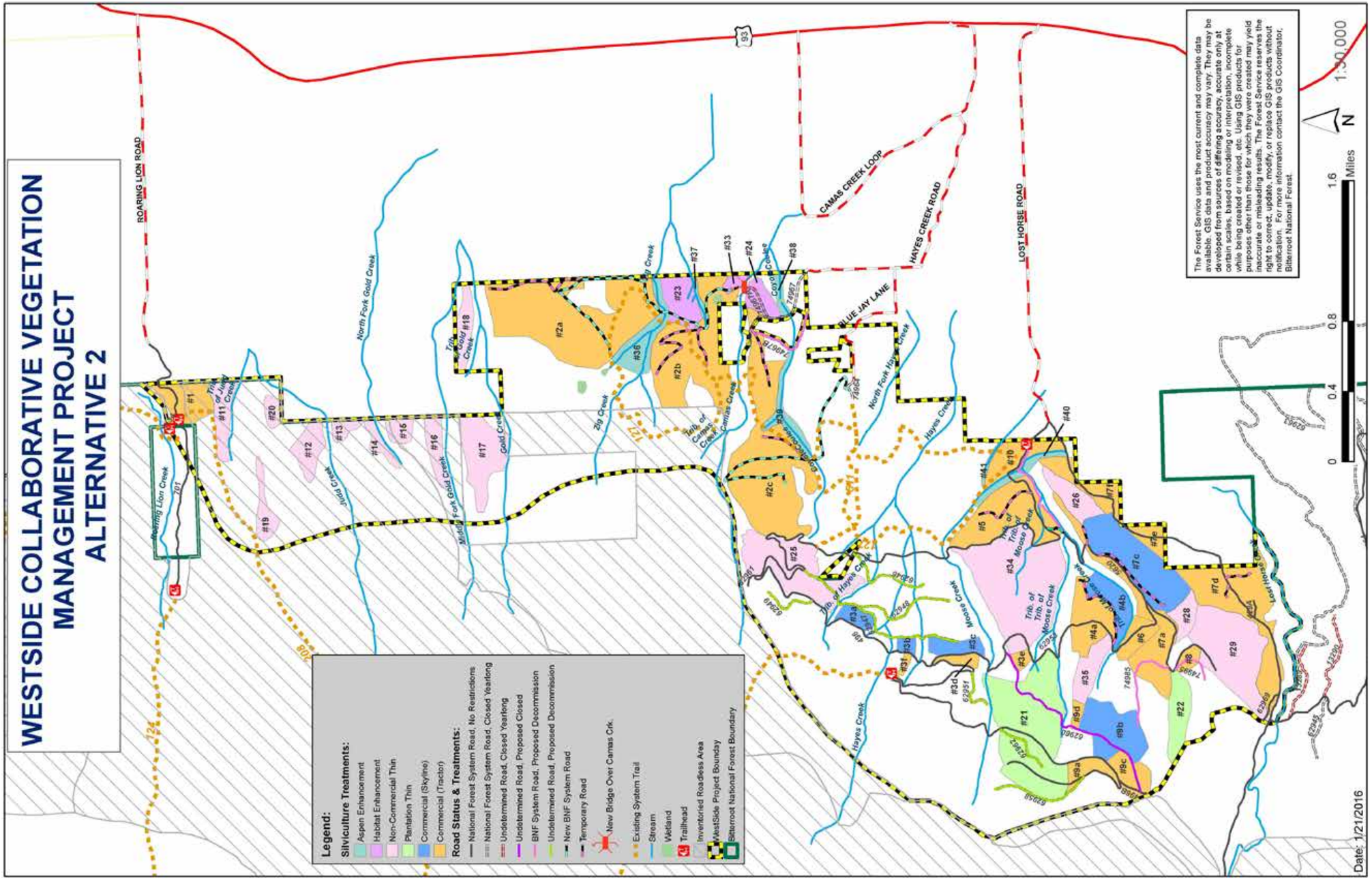

Figure 2-2: Proposed Treatments in Alternative 2 of the Westside Collaborative Vegetation Management Project.

building. The side slopes are steepest, about 50 percent, where the road alignment switches back to the end of the road.

The road prism design for all newly constructed roads would be out-sloped for drainage, have no inter-visible turnouts, 14 ft. minimum road widths, and curve widening, as needed. Culverts would be placed in drainages. Best Management Practices (BMPs) (Appendix A) would be incorporated into road design and construction.

Road Status in the Westside Project Area

The ID Team also identified about 1.3 miles of undetermined status roads that are necessary for forest management and propose they become part of the transportation system and stored after use. These roads would be opened to accommodate commercial harvest operations and log haul in units 3e, 9b, 9c, and 9d. Another 3.8 miles of undetermined status roads are not needed now or in the future and would be decommissioned (Table 2-3). Also, 2.0 miles of National Forest System roads are not needed for current or future management and would be decommissioned. The type of roadwork needed to decommission roads is described in Table 2-3.

The vegetation would be cleared and the road surface and drainage would be improved on roads reopened for use during this project (PF-TRANSPORT-001). After use, the roads would be stored by removing culverts and restoring natural drainage, scarifying the road surface (scarification less than 6 inches in depth), and seeding and fertilizing it. The entrances of the roads would be physically blocked with a gate, rock barrier, or the first 50 to 100 feet would be recontoured to prevent motorized access.

Temporary roads and landings would be rehabilitated after use. Rehabilitation would include removal of all structures, recontouring, slashing, and seeding to restore soil productivity.

The costs of road and bridge construction, road re-construction, and road maintenance are in the project file (PF-Transport-001).

Table 2-3: Status of Roads Proposed for Decommissioning in Alternative 2 in the Westside Project Area.

NFSR#	AREA	MILES	TREATMENT
62946	Hayes Creek	0.6	Obliteration treatments completed during Hayes Creek project. No treatment required.
62947	Hayes Creek	1.1	Stream crossing structures have been removed. Natural recovery present on approximately half of the road. Entrance has been blocked. Further treatment would require temporary stream crossings and disturbance of natural recovery that has occurred. No further treatments recommended.
62948	Hayes Creek	0.6	Stream crossing structures have been removed and natural recovery has occurred on much of the road. Further treatment would require temporary stream crossings and disturbance to natural recovery that has occurred. No further treatments recommended.
62949	Hayes Creek	0.3	Entrance has been recontoured and road is naturally recovering. No treatments recommended.
62951	Moose Creek	0.3	Road has been recontoured. No treatments required.

NFSR#	AREA	MILES	TREATMENT
62958	Moose Creek	0.6	Recontour road entrance to eliminate unauthorized motorized use. Closure of road entrance will be designed to accommodate winter-use (snowmobiles). Road is naturally recovering.
62962	Moose Creek	0.4	Recontour road entrance to eliminate unauthorized motorized use. Road is naturally recovering.
74985	Lost Horse (Old Mine)	0.6	Portions of this road in unit 7a will be used for ground-based yarding. Upon completion of yarding, the road/unauthorized trail segments will be fully recontoured, seeded, slashed, and fertilized
74995	Moose Creek	0.3	Road entrance recontoured and road is naturally recovering. No treatments required.
5620	Old Mine	0.6	Full recontour of abandoned road segments.
74967B	Coyote Coulee	0.5	Gate at entrance, road is naturally recovering. No treatments required.
	Total Miles	**5.9**	

Design Features and Mitigation Measures

In response to resource concerns expressed by the ID Team and public comments on the proposal, features are designed into the project to prevent or reduce potentially negative effects on resources. Mitigation measures are activities proposed to compensate for negative effects that cannot be avoided through project design or implementation. Most of the design features for the Westside project (Table 2-4) are applied during timber sale contract administration. Many of the design features have been applied in timber sales since 2000, have been refined through monitoring, and have proven to be effective (PF-Monitor-001)

Mitigation Measures

No mitigation measures are planned because negative project effects would be minor and limited in extent. There would be no need to compensate for resource effects.

Monitoring and Adaptive Management

Prescribed Fire

Stand conditions after harvest and thinning would be monitored, specifically, the continuity and amount of standing and surface fuels, and canopy bulk density. A site-specific prescribed fire plan would be prepared to achieve the objectives of the silviculture prescription. After the prescribed fire, the burn boss would monitor the burn area to verify that objectives were met. Monitoring criteria, based on the silviculture prescription, are identified in the burn plan, element 20.

Invasive Plants

Any Montana Priority 1A or 1B invasive plant detected during field surveys, sale activity, or post-harvest inspections and monitoring will trigger an immediate and sustained eradication response using standard treatment tools of Integrated Weed Management.

Soils, Water, Fish

The timber sale administrator (TSA) monitors the application of BMPs and design features required in the timber sale contract during project implementation. The TSA consults with the resource specialists if conditions approach specified expectations or thresholds. Corrective

Table 2-4: Design Features in Alternative 2 Westside Collaborative Vegetation Management Project

OBJECTIVE	DESIGN FEATURE
	SOILS
Minimize soil erosion and compaction	Activities will comply with Best Management Practices (BMPs) to minimize effects to soil resources. BMPs are listed in Appendix A. Complete descriptions are available in the Project File.
	Summer ground-based yarding will occur when soils are dry (test soil moisture by forming soil into a ball in your hand and lightly toss several times; if soil maintains ball shape moisture is too high for ground-based yarding, if soil crumbles moisture levels are low enough to allow ground-based yarding). Consult the Forest Soil Scientist when questionable moisture conditions are present.
	Winter operations could be utilized in the ground-based units if the following conditions are met: snow depth, distribution, and air temperatures must be such that ground-based operations maintain the following combination of snow depth and frozen soil conditions Depth of compacted (by equipment) snow under wheels or track tread — Minimum thickness of solidly frozen soil needed below compacted snow layer 10 or more inches — 0 inches 7 to 10 inches — 1 inch 4 to 7 inches — 2 inches less than 4 inches — 4 inches *Pre-trailing. Pre-trailing selected skid trails a day or so prior to skidding or other heavy trail use is a way to achieve this objective. If average, pre-compacted snow depth along the proposed trail is more than 15 inches, pre-trailing can be done whether or not the soil is frozen. If pre-compacted snow depth is 8 to15 inches; pre-trailing should be done only if the soil is solidly frozen in the top one inch or more. Otherwise, pre-trailing should be delayed until more snow falls to accumulate to the 15 inch or more depth. To further aid soil protection, pre- trailing should be done using an "easy-does-it" approach, including slow ground speeds and steady movements. Avoid spinning tires and bouncing equipment around on trails as much as possible. Adequate pre-trailing air temperatures generally are in the low 20's Fahrenheit or lower. For more information about pre-trailing conditions, consult with the Forest soil scientist.
	Skid trails will be designated and historic trails and road prisms will be used as skid trails to the extent feasible
Reduce detrimental soil disturbance (DSD)	Rehabilitation activities of temporary roads, skid trails, and landings would include recontouring cut and fill areas, slashing with readily available debris, and application of organic fertilizer and native plant seed. Use

<table>
<tr><th>OBJECTIVE</th><th>DESIGN FEATURE</th></tr>
<tr><td></td><td>local seeding guidelines for detailed procedures and appropriate mixes. Refer to the Bitterroot National Forest Seed Mix to determine which species to use (FSM 2070.3)</td></tr>
<tr><td></td><td>Pile burning should occur during moist conditions to minimize duff consumption and high severity burn impacts on soils.</td></tr>
<tr><td></td><td>Hand pile sizes, not associated with landings, will average 6-8 feet in diameter so localized areas of soil disturbance will be less than about 50 square feet.</td></tr>
<tr><td></td><td>Where feasible, pile and burn slash where detrimental soil disturbance (DSD) already exists, such as on old log landings, skid trails, and roads associated with the past harvest units. By piling and burning thinning slash in areas where soil disturbance currently exists, no new areas of DSD would result from the proposed activities.</td></tr>
<tr><td>Unit-Specific Design Criteria</td><td>Unit 3e – Existing detrimental soil disturbance in the unit requires that ground-based yarding be completed in the winter or the unit be yarded with a skyline or full suspension system.</td></tr>
<tr><td></td><td>All Proposed Ground-Based Yarding Units have inclusions of slopes that exceed 40% gradient. Forest Plan standards do not allow ground-based yarding equipment on slopes exceeding 40%. Directional felling, ground lead, or alternative methods of yarding will be required to remove trees from steep slope inclusions.</td></tr>
<tr><td>Maintain soil productivity</td><td>Coarse woody debris (CWD) larger than 15 inches in diameter will not be intentionally ignited during hand lighting. It is understood that once hand crews light the fire, fire may burn into and combust some large CWD.</td></tr>
<tr><td></td><td>Allow time for nutrients to leach from slash prior to burning. The slash will be left through one winter after cutting to allow for initial decomposition and nutrient leaching.</td></tr>
<tr><td></td><td>Upon completion of commercial harvest and prescribed fire activities, the following levels of coarse woody material (greater than 3 inches diameter) shall be left. This material will include the combination of standing dead as well as down woody fuels.
<table>
<tr><th>Fire Group</th><th>Coarse Woody Debris (CWD) (Tons/acre)</th></tr>
<tr><td>Warm, Dry Ponderosa Pine and Douglas-fir (FG-2 & 4)</td><td>5-10</td></tr>
<tr><td>Cool, Dry or Moist Douglas-fir (FG-5, 6)</td><td>10-20</td></tr>
<tr><td>Cool Sites Usually Dominated by Lodgepole Pine (FG-7) Dry, Lower Subalpine (FG-7) Moist, Lower Subalpine (FG-9)</td><td>8-24</td></tr>
</table>
CWD will generally be evenly distributed on each acre, unless otherwise agreed to by the Contracting Officer or their designee</td></tr>
<tr><td></td><td>Upon completion of prescribed fire or maintenance burning, at least 70 percent ground cover is necessary to prevent detrimental accelerated erosion and loss of soil productivity. In those cases where ground cover is less than 70 percent prior to burning, consumption and loss of ground</td></tr>
</table>

OBJECTIVE	DESIGN FEATURE
	cover should not exceed 15 percent. Ground cover includes duff, organic soil horizons, tree basal area, fine woody debris, coarse woody debris, and surface coarse fragments. In those cases where ground cover is less than 70 percent prior to burning, fuel consumption and ground cover loss should not exceed 15 percent. Fire prescriptions will be designed to meet these soil protection requirements.
	The silvicultural prescriptions will be designed to account for future large CWD (>15 inches diameter) recruitment that will meet acceptable levels in stands where CWD is less than minimum levels before treatment. CWD will be left in these stands to the extent feasible to meet minimum requirements that do not pose a fuels hazard. High amounts of small CWD (3-6 inches diameter) may present wildfire risks.
WATERSHED AND FISHERIES	
Ensure riparian- dependent resources receive primary emphasis in Riparian Habitat Conservation Areas (RHCAs.) And, ensure Montana Streamside Management Zone Laws are met.	The standard INFISH (USDA Forest Service 1995) RHCAs will be applied. A map of these areas is located in PF-Fish-001. They are: 300 feet on each side of fish-bearing streams 150 feet on each side of permanently flowing, non-fish bearing streams 100 feet on each side of seasonally flowing or intermittent streams 150 feet on each side of ponds, lakes or wetlands > 1 acre in area 100 feet on each side of ponds, lakes or wetlands < 1 acre in area 100 feet of landslide prone areas.
	RHCA boundaries will be designated and marked on the ground in consultation with the Fish Biologist or hydrologist.
	In RHCAs, trees can be felled when they pose a safety risk. Felled hazard trees will be left on-site (INFISH standard RA-2), unless their removal is deemed necessary for safety reasons by the Timber Sale Administrator (TSA).
	Generally, trees will not be harvested from RHCAs. Exceptions are trees that would likely improve the deciduous species left onsite, and can be directionally felled away from the channel. Trees leaning toward the stream that would reach a stream or intermittent channel may be felled, but would be retained onsite. The purpose of these proposed treatments in RHCAs are based on the treatments' contribution to promote the long-term ecological integrity of the deciduous species and associated wildlife, while having no effect on native fish (INFISH Standard and Guideline for Watershed Restoration and Habitat WR-1).
	Ground-based equipment will be prohibited from entering SMZs without the appropriate variance from Montana DNRC.
	Log landings, temporary roads, and skid trails will not be located in the RHCAs. Exceptions include areas where existing log landings occur.
	Generally, there will be no fuel storage, mixing of fuels, or refueling equipment in RHCAs. If there are no alternatives, refueling in RHCAs may occur, but must be pre-approved by the Fish Biologist or Hydrologist, and have an approved spill containment plan. Small pumps (for example, Mark III) and chainsaws can be refueled within the RHCA as long as proper spill containment actions are implemented (USDA Forest Service 1995).
	The TSA or resource specialists will monitor road conditions to ensure they do not contribute sediment to streams. Road maintenance activities

OBJECTIVE	DESIGN FEATURE
	(including snowplowing and dust abatement) will follow the requirements specified in the Programmatic Biological Assessment for Road-Related Activities (2014) and BNF BMPs (Appendix A).
Provide stable roads and conduct road maintenance to minimize sediment	Drainage from haul roads will be maintained, during all hauling periods. This includes, but is not limited to providing water access to ditches, inlets of ditch relief pipes, and outlets that are kept free of blockage. Holes in snow berms will be adequate to allow road drainage and completed prior to winter haul, and kept open throughout the duration of winter hauling. Conduct road maintenance activities specified in the Hydrologist's report prior to log hauling to insure proper road and ditch drainage
	Project-related traffic will be regulated during wet periods to minimize erosion and sediment delivery to streams (INFISH RF-2)
	Side-casting of road material (during road maintenance and snowplowing) into streams, wetland, and RHCAs is prohibited (SMZ Rule #8; INFISH RF-2(f)).
	Seed, fertilize, and slash decompacted or recontoured roads with a native seed mix and organic fertilizer. Weed-free mulch is required on sites located within sediment contributing distance of streams (about 300 feet).
Provide for diverse and productive native and desirable non-native plant communities in riparian zones	Protect and retain sub-merchantable trees and shrubs within 50 feet of streams and wetlands (SMZ Rule #5). If required, an application for Alternative Practice (SMZ Rule #10) would be submitted for manual thinning within the SMZ to include areas that are proposed to benefit aspen and associated species.
	Slash piles will not be created within 50 feet of streams and wetlands.
	Prescribed burning is proposed within 100 feet of streams. During development of the burn plan, the sites would be reviewed by the Fisheries Biologist or Hydrologist to ensure they met the riparian management objectives.
	Hand ignition would be allowed within the RHCA, but not within 50 feet of streams or within wetlands (SMZ Rule #3). Fire may be allowed to back into wetlands. Helicopter ignition would not occur within RHCAs. The need for an SMZ Law Alternative Practice would also be assessed when unit-specific burn plans are developed.
	Generally, hand fireline will not be dug in the RHCAs. If needed, hand fireline can be dug in the RHCAs and must 1) avoid wetlands, 2) contain proper drainage structures, and 3) be recontoured and covered with slash upon completion of the burn. Machine fireline is prohibited in RHCAs. Allowing prescribed fire to back into RHCAs and wetlands negates the need for firelines near these areas.
Avoid direct effects to native fish and risks associated with aquatic invasive species.	If drafting from streams occurs, intake hoses will be fitted with a screen mesh equal to or smaller than 3/32 inch.
	Prior to entering the project area all equipment that has the potential to come into contact with water must be inspected, clean and dry. Do not transfer any water, sediment, or vegetation when moving between drafting sites
	Protect active irrigation ditches during harvest.

OBJECTIVE	DESIGN FEATURE
Ensure that water-related beneficial uses are protected and that State water quality standards are me	The contract administrator will ensure application of Best Management Practices during timber sale implementation. Applicable BMPs are in the Project File and summarized in Appendix A.
	The design and construction of the Camas Creek bridge on FR 74967 would accommodate a 100 year flood, including associated bedload and debris, and provide passage for aquatic species (INFISH RF-4 & RF-5).
	Construction and management of new or temporary roads will use all applicable BMPs, including dewatering of work sites, proper culvert sizing, and use of mulch or other sediment control practices as needed
WILDLIFE	
Protect aspen clones during burning	After slashing non-merchantable conifers within aspen clones, drag slash 50 feet away from the clones to prevent high fire severity within the clones. Whole tree yard designated merchantable conifers from aspen clones by winching from outside the RHACA in accessible portions of Units 36, 37, 39 40, and 41.
Maintain snag density	Stand level prescriptions by a certified silviculturist and wildlife biologist will provide unit-specific snag retention requirements including spatial distribution, species, and snag sizes.
	Prescriptions will meet the proposed snag standards including the following number of snags over 9” DBH retained by Fire Groups if they exist in the unit prior to treatment. Fire Group: Snags (average number of trees per acre) 2,4: 2-5 6: 4-12 7, 8, 9: 10-15
	Irregular distribution and small clumps are desirable. Location away from open roads is preferable. Species preference in order is ponderosa pine, Douglas-fir, lodgepole pine, and true firs. Snags retained will include some from the largest diameter size class available within that unit. Larger snags are preferred over smaller snags for retention.
Protect signed wildlife trees	Protect trees identified with “Wildlife Tree” signs from cutting or other damage. Exceptions include compliance with the silvicultural prescription and trees that pose a safety hazard. Wildlife trees that must be felled for safety reasons will not be yarded.
Provide coarse woody debris for wildlife	Do not remove pre-existing down logs from cutting units.
	In areas with little CWD, meet CWD retention guidelines by leaving 5 to 10 boles > 8’ long in the 10 to 20” diameter range per acre, or 10 to 15 boles > 8’ long in the 3” to 10” diameter range per acre. Species preference for longer pieces of CWD is Douglas-fir or true firs, to avoid problems with Ips beetles.
	Leave 1 to 2 hand piles per acre unburned in areas where hand piling is used for slash disposal to enhance habitat for small mammals and birds.
Limit disturbance around active peregrine falcon and goshawk nests	Restrict project activities within ½ mile of any active peregrine falcon nest site between March 15 and August 31 and within ½ mile of any active

OBJECTIVE	DESIGN FEATURE
	goshawk nest between April 15 and August 31 to limit disturbance to nesting falcons. The Wildlife Biologist will determine occupancy.
SENSITIVE PLANTS	
Protect sensitive plant populations during harvest operations	Sensitive plant populations would be identified and buffered from project activities. Buffer widths are based on habitat requirements of the specific plant populations. Buffered sensitive plant populations will be mapped and identified in the field
	Machinery, fire ignition, tree felling, anchor trees, and slash piling would not occur within an identified sensitive plant buffer.
	Proposed alterations to locations of temporary roads and log landings will follow standard contact provisions for the protection of rare plants, along with the timely involvement of the Forest Botanist or alternate specialist designated by the Forest Botanist. Rare plant populations would be protected by a minimum 100' buffer. Use of existing roads within 100' of population is allowed.
	Prescribed fire would not be allowed to creep into buffered areas
	Treat invasive plants inside the sensitive plant buffers
INVASIVE PLANTS	
Reduce the risk of invasive plant introduction and spread into or out of the project area	Integrate invasive plant prevention and management in all proposed units and prescribed burning units (FSM 2080).
	Treat areas with high-risk invasive plants infestations (as defined in Regional Risk Assessment Factors and Rating protocol) before burning. Monitor treatment success after burning and retreat if necessary.
	Treat invasive plants before obliterating decommissioned roads; rehabilitate as described in soils section above.
	Remove all mud, soil, and plant parts from off-road equipment before moving into the project area. Off-road equipment will be inspected prior to entering the project area by a timber sale administrator or other Forest Service personnel.
	We strongly encouraged vehicles intended for travel on established roads are cleaned before their first entry into the project area. All vehicle and equipment cleaning must occur off National Forest System lands.
	Avoid locating hand-piled slash in the leafy spurge infested area of Unit 26.
	All gravel and borrow sources located outside the project area must be inspected and approved by the Forest's Invasive Species Specialist, Forest Botanist, or designated representative prior to transport into the area.
	Strongly encourage regular inspection, removal, and proper disposal of invasive plant parts and seed found on clothing and equipment.
Pre- and post-harvest treatment actions to suppress and contain the spread or increased density of existing invasive/noxious weed species (Herbicide application)	Haul routes will be treated prior to log haul.
	Haul routes will be treated following completion of log haul.
	Haul routes will be treated in subsequent years following completion of log haul, as necessary.
	New invasive plant sites will be treated following completion of the timber sale.

OBJECTIVE	DESIGN FEATURE
Biocontrol treatment	Initiate additional introductions of *Chrysolina spp*. into higher elevation infestations of St. Johnswort and 3 successive years of introductions in units 23 and 25 beginning in 2016
	Initiate *Cyphocleonus achates* releases in heavier density open overstory stands of spotted knapweed beginning in 2016
Revegetation	Re-establish vegetation using native species on sites with soil disturbed by timber harvest. Use methods and prescriptions shown to be highly effective at competing with invasive plants.
	Use only certified weed free seed and mulch during revegetation implementation. Certification must meet State of Montana standards for species content in any seed mix used. Timber purchaser is strongly encouraged to meet North American Invasive Species Management (NAISM) standards in seed mixes used in project area.
	Use only seed mixes, proportions, and application prescriptions approved by the Forest Botanist and included in the contract specifications. Proposed modifications to prescribed seed mixes must be approved by the Forest Botanist prior to purchase of the seed by the contractor.
HERBICIDE USE	
Protect water quality	Herbicides will not be used to control weeds within a 100-foot radius of any potable water spring development, stream, or diversion within the project area.
	Mixing and loading tanks will occur more than 300 feet from live water where possible. No mixing will occur within 100 feet of live water
	Use of herbicides and surfactants adhere to mitigation measures and design criteria in the Weed EIS (2003) O:\NFS\Bitterroot\Program\2900InvasiveSpecies\InvasivePlants\nepa\2003- FEIS, or updates to the document.
TIMBER MANAGEMENT	
Provide for public safety	Hauling Operations – Dust abatement for log hauling will be completed on sections of roads in the project area that are in the immediate vicinity of residences.
	Develop agreement with Ravalli County for managing traffic and maintaining Blue Jay Lane and Hayes Creek Road during timber sale.
Prevent the spread of annosus root disease	Apply borate to freshly cut ponderosa pine stumps greater than 12 inches in diameter (inside bark).
	Minimize damage to residual trees during harvest
Prevent bark beetle population increases	If extensive beetle activity is observed in green-attacked trees within one mile of harvest units, it is desirable to consider limiting timber harvest during the flight period in July and August.
Prevent pine engraver (Ips spp.) population increases	The most effective cultural practice to prevent Ips colonization is to avoid harvesting activities between October and June because it reduces the time Ips beetles have to complete their lifecycle. However, avoiding harvest during this period is not often feasible so the following methods would be used:

OBJECTIVE	DESIGN FEATURE
	Green slash exceeding 3” in diameter would be lopped into 2-3 foot lengths and scattered in areas with direct exposure to sunlight. Treating the slash in this way reduces Ips habitat quality because the slash dries out before the beetle brood can mature. All fresh slash and logs would be located several yards away from living trees.
	Piling slash in large-sized piles can provide suitable host material in the middle of the pile that lures Ips deeper into the pile. Ideally, piles should be at least 10 x 10 x 20 feet in height x width x length.
	Should small slash piles be constructed from October to June, infested material can be burned, chipped, or otherwise destroyed prior to beetle emergence in early July. Surveys of host material prior to July can indicate the risk of tree mortality or top kill to residual stems in treatment units. In high-risk areas where Ips mitigation options are limited, mass trapping of Ips with pheromone lures and Lindgren funnel traps may reduce Ips-related damage to residual stems.
	The silviculturist, wildlife biologist, and fuels specialist would conduct post-harvest exams before underburning units to evaluate the completeness of vegetation treatments
SCENERY	
Subordinate management activities to the natural character of the landscape and maintain trail aesthetics	Lost Horse Road (Units 7d, 7e, 7f, 10 26, 40); Roaring Lion Road and Trail #208 (Unit 1) - When feasible, minimize visible log landings, skid trails, and roads along Lost Horse Road, Roaring Lion Road, and Trail #208.
	Retain a vegetation buffer between Lost Horse road and the quarry and gravel stockpile on Lost Horse Road (Unit 7d).
	Cut stumps to 6 inches or less within 125 feet of Lost Horse Road, Roaring Lion Road, Observation Point parking area, and Trail #208 (includes Units 1, 7d, 7e, 7f, 9c, 10 26, 40)
	When feasible, new skid trails that cross travel routes should cross at right angles and curve after crossing. Lost Horse Road (Unit 7d, 7e, 7f, 10. 40); Roaring Lion Road and Trail #208 (Unit 1); Trail #125 (Unit 3f); Trail #127 (Unit 2a, 2b, 2c, 36 and 39)
	Lost Horse Road (Unit 7d, 7e, 7f, 10 26, 40,); Roaring Lion Road and Trail #208 (Unit 1); Trail #125 (Unit 3f); Trail #127 (Unit 2a, 2b, 2c, 20, 36 and, 39); Observation Point (Unit 9c) -
	Slash piles visible from Lost Horse Road, Roaring Lion Road, Observation Point, Camas Lake Trailhead, Ward Mountain Trailhead, and Trails #208, 125, and #127 will have priority for burning and will be burned as soon as feasible. Landings and slash pile locations will be rehabilitated as stated in the soils design criteria (includes Unit , 7d, 7e, 7f, 10, 26, 40,);Rehabilitate landings, skid trails, and temporary roads as described in soil design features and re-seed with plant species similar to those in the surrounding area (check with the Forest Botanist or Native Plant Coordinator).
	Remove slash and cut stumps to 6 inches or less within 50 feet of Trail #208, Trail #125, Trail #127 (includes Units 1, 2a, 2b, 2c, 3f, 36, and 39)

OBJECTIVE	DESIGN FEATURE
	Mask tree marking paint with paint color similar to the tree bark along Lost Horse Road, Roaring Lion Road, and Trail #208 and 127, if it is visible at the close of the sale (includes Units 1, 7d, 7e, 7f, 10).
	Transition the density of ponderosa pine on the edges of the aspen units and avoid straight lines and right angles to create a natural appearing edge between the two stand types, if needed (includes Units 36, 37, 38, 39, 40, 41)
	All units - Reduce the contrast between treated and untreated forest by softening the edges, retaining some understory trees, and blending tree density on the unit borders.
	Reduce visual contrast of skyline corridors. To the greatest extent possible locate skyline corridors so they are not directly aligned with sensitive views, using lateral yarding, vary the distance between cable corridors, or establish corridors more frequently than every 75 feet to allow for narrower (less visible corridors) (includes Units 3a, 3b, 3c, 7c, and 9b)
	Retain trees one tree-height below roads and landings (including cable landings) to screen them from Highway 93 corridor, where feasible. Avoid creating straight edges of trees by retaining clumps of trees and single trees with varied spacing (includes Units 2c, 3a, 3b, 3c, 3d, 4a, 4b, 5, 7c 9c, 9b, and 9d).
FIRE AND FUELS	
Control of prescribed fire	Prescribed fire will include protection measures for cultural or sensitive plant species prior to burning.
	Fire control handlines would be constructed as needed to protect specific resources. Existing roads, trails, drainages, wet meadows, rocky outcrops, and other natural barriers would be used as control lines, where possible. Handline would be rehabilitated post-fire
	Excessive slash and duff mounds around specific trees, slash may be pulled back to reduce scorch and/or mortality during burning.
	Landing and hand piles will generally be ignited during late fall or early winter.
AIR QUALITY	
Maintain air quality	The Forest Service will submit a burn plan and obtain burn approval from the MT/ID Airshed Group before igniting a burn and burn only when ventilation is rated good or better in compliance with our open burning permit.
	The Forest Service will notify residents within proximity to the burn areas by mail, email, message or phone, and/or press releases before burning. Signs warning of potential visibility impairment or temporary area closures would be posted as needed along roads during ignition operations.
	Larger burn blocks may be burned over multiple days in order to reduce short term smoke impacts. For pile and landing burning, short term impacts may be lessened by reducing the number of piles burned

OBJECTIVE	DESIGN FEATURE
	All prescribed burns will be monitored visually. If a prescribed burn appears to be generating an unacceptable level of smoke, ignition would be stopped as reasonably possible.
RECREATION MANAGEMENT	
Protect public safety	Place area closure signs and maps at trailheads and on trails during harvest and rehabilitation operations.
Prevent damage to existing trail features	All structures will be marked on the ground and the sale area map.
	All trees or posts with trail signs or related information shall remain in place or be replaced in-kind
	Use existing trails for skidding and temporary roads as much as possible
	All trails and their constructed features in the project area will be maintained, restored, or replaced in-kind to their original design according to the USDA Forest Service Standard Trail Plans and Specifications.
Reduce disruptions of public use on trails	Identify alternative parking areas for trails when operations are near trailheads.
	Timber sale operations should be completed within 3 years, except as required by contract obligations
	Seasonal timing of the project and log hauling may be restricted as agreed by the District Ranger and Contracting Officer. Otherwise, log hauling will not occur on weekends or holidays
Protect trail aesthetics	Existing unauthorized trails used in timber sale operations but are not part of the trail system will be obliterated and rehabilitated by subsoiling, seeding, fertilizing, and covering with slash
Prevent unauthorized trail development and motorized access through newly logged units and on skid trails	Use signage, slash, downed logs, earthen humps or berms, or boulders as well as increased agency presence in the area
HERITAGE RESOURCES	
Protect historic logging railroad grades	Ground disturbing activities over historic logging railroad grades will be restricted to previously disturbed portions of those grades.
Protect cultural sites within the project area	No ground disturbance or pile burning would occur on known archaeological sites or historic structures. Report new discoveries of cultural material to the Forest Heritage specialist. Consult with the Forest Heritage Specialist during road and cutting unit design, and when fuels treatments will occur in areas where heritage sites are present.
Protect cambium-peeled trees.	No removal of cambium-peeled ponderosa pine trees. No ground disturbance or herbicide use within the dripline of cambium-peeled trees. Employ directional falling of trees within one-and-a-half tree lengths of cambium-peeled trees. Employ hand removal of shrubs, ladder fuels, and surface duff layers prior to underburning. Report new discoveries of cambium-peeled trees to the Forest's Heritage specialists.

Monitoring and Adaptive Management (continued from pg. 8)

Soils, Water, Fish (continued from pg. 8)

actions are implemented immediately if conditions exceed expectations or thresholds. Standard operating procedure is to require the contractor to have all BMPs in place before a unit is officially closed.

If standard BMPs and timber sale administration are not effective and management activities impact water resources (e.g., sediment-bearing overland flow from harvest units or skid trails, excessive soil disturbance), measures are taken to eliminate the impact or reduce it to a minimum (PF-MONITOR-001 and PF-MONITOR-002). These measures would include corrective actions, control treatments using machine or hand crews, or where appropriate, delay of treatment or change in methods.

Soil monitoring of Westside harvest activities will be part of the annual soil-monitoring program on the Bitterroot NF. To accomplish this task, soils will be evaluated against definitions and guidelines provided in the Forest Plan, as well as Forest Service Manual 2550 (Amendment No 2500-90-2 and Region 1 Supplement 2500-99-1), and Handbook 2509.18 (WO Amendment 2509.18-91-1 and Region 1 Supplement 2509.18-2005-1). Treatment units will be randomly selected and monitored for implementation and effectiveness of mitigations, BMPs, and Soil and Water Conservation Practices. Detrimental soil conditions will also be monitored to determine if post-harvest activities are within Region 1 standards and guidelines.

Alternatives Considered but Not Carried Through Analysis

Several alternatives to the proposed action were suggested during the public scoping and comment period (Table 2-5). These alternatives were considered but not carried through the analysis for the reasons also stated in Table 2-5.

Table 2-5: Proposed Alternatives Considered but not Carried through Analysis and the Reasons they are not Analyzed.

PROPOSED ALTERNATIVE	REASON NOT ANALYZED
OUTSIDE THE SCOPE OF THE PROJECT	
Develop a plan to enhance recreation opportunities at lower elevations on the forest	The main purpose of the Westside project is to improve forest resilience to insects, disease, and fire, and trend forest conditions toward those typical of the landscape. Enhancing recreation opportunities does not change forest conditions that would modify insect and disease infestations or fire behavior. Recreation opportunities affected during project implementation are assessed in the effects analysis.
extending the Coyote Coulee trail system	Extending the Coyote Coulee trail system does not change forest conditions that would affect the project purpose and need.
developing a plan to restore fully functioning fish habitat	To restore fully functioning fish habitat is outside of Forest Service jurisdiction and beyond the scope of this project. This alternative would require removing ditches, diversions, and impoundments on National Forest and private

PROPOSED ALTERNATIVE	REASON NOT ANALYZED
	lands that are beyond Forest Service regulatory jurisdiction.
re-introducing cattle	Cattle would consume fine fuels and may inhibit regeneration within the project area but they do nothing to decrease stand density, modify fuel arrangement, or consume large woody debris that would carry fire or increase forest resilience to insects and disease.
extend the project boundary north to include another 250 acres	Though the need to treat this area may be present, the Westside project boundaries are based on geographical features that are readily identifiable on the ground. Extending the project area to include these 250 acres would increase the project size by almost 7,700 acres and substantially increase the complexity of the analysis. In addition, an analysis of this type would likely dilute the effects of the current project. Environmental analysis of the treatment for these 250 acres may occur at a later date when funding and priorities allow.
DOES NOT MEET THE PURPOSE AND NEED	
use only non-commercial thinning in areas that do not have road access	Non-commercial thinning would only remove trees less than 7 inches DBH. This treatment would not remove enough trees to improve stand resilience to mountain pine beetle or affect fire behavior. In some cases, the diameter limit can be increased to 10 inches DBH but can create excessive ground fuels and increase potential fire behavior. Falling commercial-sized trees (7-10" DBH) but leaving them on site would increase dead and down fuel and create more continuous fuel arrangement that would sustain combustion and fire spread. These conditions would increase fire behavior.
use prescribed fire only	Stand density and fuel concentrations are too high to use only fire to achieve restoration objectives. Stands need to be thinned to minimize damage to merchantable timber and the forest. Burning without harvesting or thinning timber first could create fire behavior that would threaten adjacent private forested land, infrastructure, and residences.
eliminate any impacts on the Coyote Coulee trail system	Coyote Coulee trail system is in MA 2 and 3a. Timber harvest is a compatible use in these management areas. Though it is not possible to eliminate all impacts to the trail system and meet the project purpose and need, design features will greatly reduce their effects and duration. Avoiding the Coyote Coulee trail system would

PROPOSED ALTERNATIVE	REASON NOT ANALYZED
	not reduce stand densities or fire risk adjacent to the trail or National Forest boundary. One portion of the trail system is not proposed for treatment at this time because it was treated in the last 10 years with similar design features.
light thin only directly adjacent to the National Forest boundary	This treatment would not reduce fuel loads and composition enough to measurably change fire behavior. This type of treatment would not decrease stand susceptibility to future infestations of pathogens and bark beetles.
an alternative proposed that would exclude: o Any management actions that directly affect habitat, soils, or water in the Selway-Bitterroot IRA or other unroaded areas; o Any new road construction (including temporary and system roads), except that proposed to replace the poorly located road, as long as its access need has been legitimately determined using the Transportation Analysis Process (36 CFR 212) and as long as the replacement road has been legitimately identified as part of the forest-wide MRS; o Maintaining existing roads so that the Forest Plan elk habitat effectiveness standard is not met; o Any activities that would affect bull trout critical habitat in the Lost Horse Creek watershed; o Any activities that require a Forest Plan Amendment regarding scenery. o Road building "through the middle of (the goshawk) nest cluster."	The effects associated with this alternative have been analyzed in the no action alternative. This is essentially the no action alternative (Alternative 1) because management by definition affects wildlife habitat, soils, and water. Effects of activities proposed in Alternative 2 would be within standards. 71% of the area would not be treated if no roads are built. Stand densities would not be reduced enough to alleviate bark beetle risk or reduce fuel loads and meet the purpose and need. Alternative 2 brings the Lost Horse 3rd order drainage closer to compliance with the elk habitat effectiveness (EHE) standard but does not change EHE in the Hayes Creek 3rd order drainage. Another alternative that addresses effects on bull trout is not needed because the no action alternative has no effect on bull trout critical habitat. Alternative 2 includes design features that would have some positive effects on bull trout and limits negative effects to the level of “May Affect, Not Likely to Adversely Affect”. Treatments are proposed to enhance the resilience of the forest to bark beetle infestation and fire. The effects of the proposed treatments on scenery are analyzed in the environmental effects. There are no standards or regulations that prevent building a road near goshawk nest clusters. Goshawk typically build several nest clusters and rotate their use.
winter log only	The combinations of snow and frozen soil depths needed for winter logging would seldom be met in the low elevation project area and make it extremely difficult to achieve project objectives in a reasonable time frame. There is also potential that an unnecessary requirement of this nature would overly encumber the project to a point it is not economically viable to implement.

PROPOSED ALTERNATIVE	REASON NOT ANALYZED
educate the adjoining landowners on mitigating fire hazard	Public education on the topic of mitigating fire hazard and creating defensible space is an active campaign for the Forest Service and their partners. Evidence of this can readily be seen on private lands adjacent to the project area where landowners have treated portions of their properties (Ch. 3 Table 7). The purpose and need for the Westside project is to treat National Forest.
PROPOSED CHANGES OR ALTERNATIVES TO THE PROPOSED ACTION	
proposed alternative route to Unit 2c as a temporary road from Camas Creek Road (NFSR 496)	The Forest Service considered constructing a road from NFSR 496 (Camas Cr. Rd) into Unit 2c but decided against it because the slopes are steep, the road would require several switchbacks that would be highly visible from the HWY 93 corridor, and road maintenance would be expensive. The proposed road location would be easier to maintain on gentler slopes and less visually intrusive. The proposed road is necessary for future forest management and would be managed as a permanent road.
prevent new weed infestations and restore native plant populations	The design features for Alternative 2 identify strategies to prevent, control, and eradicate new weed infestations. Included in the design features are requirements to inspect and wash off-road equipment, minimize soil disturbance, introduce biological controls to target specific invasive plants, apply herbicides in specific areas before and after timber harvest, reseed disturbed areas with local, native seed and in some cases re-plant with native vegetation.
A proposal to helicopter yard Units 2a, 2b, and 2c to avoid road building into these units and prevent impact to the Coyote Coulee trail system	Helicopter logging is a method of yarding timber from the forest to a landing where the logs can be loaded on the log truck for transport to the mill. The feasibility analysis of using helicopters to yard logs from the units indicates the sale would be deficit 1.1 million dollars (PF-Econ-001). Though helicopter yarding would reduce the amount of road construction, a bridge and road across Camas Creek would still be needed because of the yarding distance capabilities of helicopters (PF-Econ-004). Locating helicopter landings on private land could reduce road construction, but does not necessarily make helicopter logging a viable alternative. A temporary access agreement can be easily revoked by the landowner for a variety of reasons, such as a change in ownership. Revoking the agreement would potentially derail an active timber sale contract and subject the

PROPOSED ALTERNATIVE	REASON NOT ANALYZED
	government to lawsuit from the timber purchaser for lost revenue. Other concerns, though not considered in the feasibility analysis, are safety hazards and noise. The noise level of a helicopter logging operation can exceed 100 decibels whereas log trucks are around 50 decibels. Safety hazards associated with helicopter yarding include the potential for knocking over snags, tree limbs, or other loose debris with the rotor wash and dropping loads. Though these hazards can be managed, they need to be considered when working in areas with high public exposure.
A proposal to harvest more intensively in the Selway-Bitterroot IRA between Roaring Lion Creek and Gold Creek.	In the development of Alternative 2, treating north-facing slopes was considered but not proposed because of the potential for these treatments to adversely affect inventoried roadless area character, limited wildlife habitats in the area, and visual resources. Field inventories on these slopes indicate trees are generally of commercial size and would require commercial harvest. Removing the timber from the area would require a new road system in the Selway-Bitterroot IRA. Though the 2001 Roadless Rule allows road construction in IRAs for certain activities, these activities are in cases of imminent threat, or needed to meet reserved or outstanding rights. In addition, the removal of timber must be generally small diameter and maintain or improve one or more of the IRA characteristics (PF-Roadless- 003). The VQO for the IRA is retention and commercial treatment of these slopes would generally require skyline yarding. The visual effects of the road system and cable corridors would not meet the retention criteria in addition to having a high potential of degrading one or more of the Selway-Bitterroot IRA characteristics. In addition, the north-facing slopes maintain vegetation and habitat diversity that support a goshawk nest cluster used since 1996, fisher and marten habitat corridors, and elk security habitat. Cutting large trees from the canopy and leaving them on site would increase the surface fuel loads and be counterproductive to the project purpose and need. Yarding the logs with a helicopter was also considered but met with the same economical, logistical, and environmental constraints identified in the proposed alternative above.

PROPOSED ALTERNATIVE	REASON NOT ANALYZED
	Given the potential to adversely affect IRA characteristics, visual character, and wildlife habitat, the Interdisciplinary team chose to focus on non-commercial restoration treatments of meadows (predominately located on south facing aspects) in the IRA.

Comparison of Alternatives

This section provides summaries of how the alternatives meet the purpose and need and of their relative effects. Table 2-6 provides a numerical summary of how the alternatives address the purpose and need. The basis for this summary is Chapter 3.

Table 2-6: Comparison of Alternatives in the Westside Collaborative Vegetation Management Project at Meeting the Purpose and Need.

PURPOSE AND NEED CRITERIA	ALTERNATIVE 1	ALTERNATIVE 2
Area of bark beetle risk(acre)	3,922	1,349
Fire type: (acre) surface passive (torching) crown	 2,454 3,124 95	 3,742 1,925 6
Area of meadow	58	58
Area of aspen	92	92
Direct Jobs[1]	0	44
Total Jobs	0	77

[1]Direct and Total jobs are not new jobs but jobs attributed to the project.

Table 2-7 provides a brief overview and comparison of the quantitative or qualitative effects of Alternatives 1 and 2. The effects are described in depth in Chapter 3.

Table 2-7: Comparison of Effects between Alternative 1 and Alternative 2.

RESOURCE	ALTERNATIVE 1	ALTERNATIVE 2
Area of reduced bark beetle risk(acre)	0	1,131
Area of reduced dwarf mistletoe infection (acre)	0	218
Continues management of previous treatments	No	Yes
Fuels	Fuel levels increase beyond historic ranges	Fuel levels maintained within historic ranges
No Restriction, Open Yearlong to street legal motorized	19.9	18.7
Undetermined roads closed yearlong	5.1	0
NFS roads closed yearlong to all motorized	1.7	6.0

RESOURCE	ALTERNATIVE 1	ALTERNATIVE 2
Decommissioned roads, no motorized travel	0	5.9
Recreation trails	No Effect	Disrupt recreation use for 3-5 years on Coyote Coulee trail and for a few weeks at Ward Mtn. trailhead.
Roadless Expanse	No effects on Selway-Bitterroot IRA or unroaded expanse	No effects on Selway-Bitterroot IRA. Proposed activities would affect 2.3% of the roadless expanse. All activities in the roadless expanse would occur in the unroaded area.
Snags	Snag #s would continue to increase due to insects and disease.	Snag #s would decline in both short and long terms due to harvest and reduced risk of mortality due to insects and fires.
Elk Habitat Effectiveness	No Change	Improves in one 3rd order drainage; no change in other 3rd order drainages
Elk Security	No Change	Declines due to reduction of hiding cover.
Marten Habitat Quality	No effect in short-term; potential loss of habitat in severe fire	Minor, short-term loss of habitat; Long-term habitat improvement
Fisher Habitat Quality	No impact	May impact individuals or their habitat; not likely to lead to trend towards listing or loss of viability
Pileated Woodpecker Habitat Quality	No effect in short-term; potential loss of habitat in severe fire	Declines due to reduction in # of large trees and potential for CWD.
Goshawk Habitat Quality	No effect in short-term; potential loss of habitat in severe fire	Short-term decline in goshawk; long-term improvement in goshawk and their habitat
Overall effects to the fish, aquatic habitat, beneficial uses and water resources	No Effect	Minor negative and minor positive effects
Effects to bull trout and their critical habitat	No Effect	May affect, not likely to adversely affect
Effects to westslope cutthroat trout, a sensitive species	No Impact	May impact individuals or their habitat; not likely to lead to trend towards listing or loss of viability
Effects to western pearlshell mussel, a sensitive species	No Impact	No Impact
Overall effects to the fish and aquatic habitat resources	No Effect	Minor negative and minor positive effects
Scenery	No Change	Skyline units (3a, 3b, 3c, 4b, and 9b, and 7c) meet VQO of modification but not partial retention or retention, respectively.

RESOURCE	ALTERNATIVE 1	ALTERNATIVE 2
Detrimental soil disturbance (acre)	No Effect	147 (All proposed activities will meet R1 Soil Quality Standards)
Rare Plants	No Effect	No Effect
Invasive Plants	No Effect	In the short- and long-term, design features reduce opportunities to introduce invasive plants and inhibit their spread in the project area
Cultural Resources	No Effect	No Effect
Present Net Value -- Timber sale only ($) All restoration activities		-120,896 -828,604
Sawtimber Volume (MBF) (CCF)	0 0	6,500 13,022

Chapter 3: Environmental Consequences

This section summarizes the physical, biological, social, and economic environments of the affected project area and the direct, indirect, and cumulative effects on the environment from implementation of the alternatives. Summaries of analysis methods, data collection, and models are included in this chapter but detailed information is in the project file. This information is typically the same in these types of analyses and tends to obscure the environmental issues and effects (40CFR Ch. V §1500.2). The spatial and temporal boundaries of cumulative effects analysis areas are described by resource. Existing base line, or benchmark, conditions and possible thresholds are also identified. This section also presents the scientific and analytical basis for comparing the alternatives presented in Table 2-7 in Chapter 2.

Silviculture

Affected Environment

The forest is described relative to the processes that shape its evolution and in terms of its attributes, composition, and structure. We evaluate current conditions in the context of the ecological processes that create the wide range of forest conditions and describe the trends. Understanding ecological processes and the effects of management activities, helps define desired stand conditions.

Existing Condition

Existing conditions are described by vegetation response units (VRUs), historical and current forest composition, and disturbance agents of fire, insects, and disease.

Vegetation Response Units (VRUs)

The vegetation response unit (VRU) is the basic environmental stratification that connects repeatable landscapes to predictable ecological processes (USDA 1999). They are aggregations of land with similar biological capacity, natural disturbances and processes, and potential for management (USDA 1999). Region 1 habitat groups (HG) (Pfister 1977) are the foundation for the VRU classification. VRUs have similar patterns of potential plant communities (habitat types), soils, hydrologic functions, and landforms. VRUs provide a way to interpret vegetation response to natural disturbance processes, project landscape conditions, and are the foundation for landscape design. Understanding disturbance ecology, the role of disturbance in ecosystem dynamics, and the appreciation that ecosystems are constantly changing identifies management opportunities to achieve desired conditions. To ignore disturbance or presume a steady-state condition compromises ecological resiliency.

The combination of climate and geophysical features such as soil create habitat types that represent the ecosystem. Habitat types are assigned to Fire Groups, which are based on the response of the dominant tree species to fire and the roles of these trees species during successional stages (Fischer and Bradley 1987). Also, the historic fire regime of a given ecosystem can be characterized by the average fire frequency, fire severity, and fire size (Perry 1994)

Landscape ecology considers interactions between spatial patterns and ecological processes (Fettig et al. 2007). The interaction of these processes creates a vegetation mosaic across the landscape. Within a VRU, the proportion of age and size classes, successional stage, impacts of

fire and disease change in response to disturbances. These changes directly or indirectly affect other aspects of the environment such as wildlife populations, biological diversity, insect pest populations, and potential fire behavior. VRUs have a typical scale of disturbance that should be mimicked by management.

Disturbance strongly influences individual species, natural communities and ecosystems, and is attributed to both natural and human causes (Landres et al. 1999). Fires historically burned in a range of sizes, intensities, and intervals throughout an area, which created a mix of stand ages, structures, and species. Insects, forest pathogens, and other disturbances also changed vegetation through time. This diversity of vegetation species, ages, and structures across the landscape is desirable because forest conditions are more resilient to disturbance. Not all vegetation size and age classes are subject to the same disturbance processes. Managing for biologically diverse and resilient forests is our best long-term, sustainable response to the multitude of stressors: insects and disease outbreaks, fires that are unprecedented in severity, and drought. It is only by managing for diversity and resilience on a landscape-scale that we can meet the challenge to "sustain the health, diversity, and productivity of the nation's forests and grasslands to meet the needs of present and future generations" Gillette, et al. 2014.

Vegetation Response Unit 1

Vegetation Response Unit 1 (Fig. 3-1) is a mix of forest and non-forest sites in a warm, dry setting. Where tree cover is present, it is composed of large ponderosa pine in open park-like stands with grassy understories and occasional shrubs. Trees tend to be clumped where soil development is adequate. Though the growing season is long, high solar exposure and shallow soils cause the soils to dry out early in the growing season. This lack of soil moisture creates harsh growing conditions in late summer and low vegetation productivity.

Fuel loads tend to be light compared to other fire groups. The most abundant surface fuel is cured grass. This is especially true for mature, open grown stands of ponderosa pine. Numerous studies of historic fire frequency in the ponderosa pine forests indicate fire occurred frequently in forests adjacent to grasslands. These studies show the fire return intervals of 5 to 25 years (Fisher Bradley 1987). On the Bitterroot National Forest, Arno (1976) and Arno and Peterson (1983) reported fire frequency of 2 to 20 years. Approximately 11 percent of the project area is in VRU 1 (Table 3-1).

Table 3-1: Vegetation Response Units (VRU's) within the Westside Project Area

Habitat Group	Old Growth Habitat[1]	Climate Modifier (Region 1 Groupings)	Vegetation Response Unit	Primary Fire Group Code	Area (acres)	Project Area (%)	Proposed Treatment (%)
HG 1	A	Warm and Dry	VRU 1	2, 4	620	11	15
HG 2	B, C	Moderately Warm and Dry	VRU 2	6	3603	63	68
HG 3	G, C	Moderately Warm and moderately Dry	VRU 3	11	497	9	10
HG 4	D	Moderately Warm and Moist	VRU 4	11	43	1	0
HG 7	E	Cool and Moist	VRU 7	9	130	2	1
HG 9	H	Cool and Moderately Dry	VRU 9	8	654	11	6

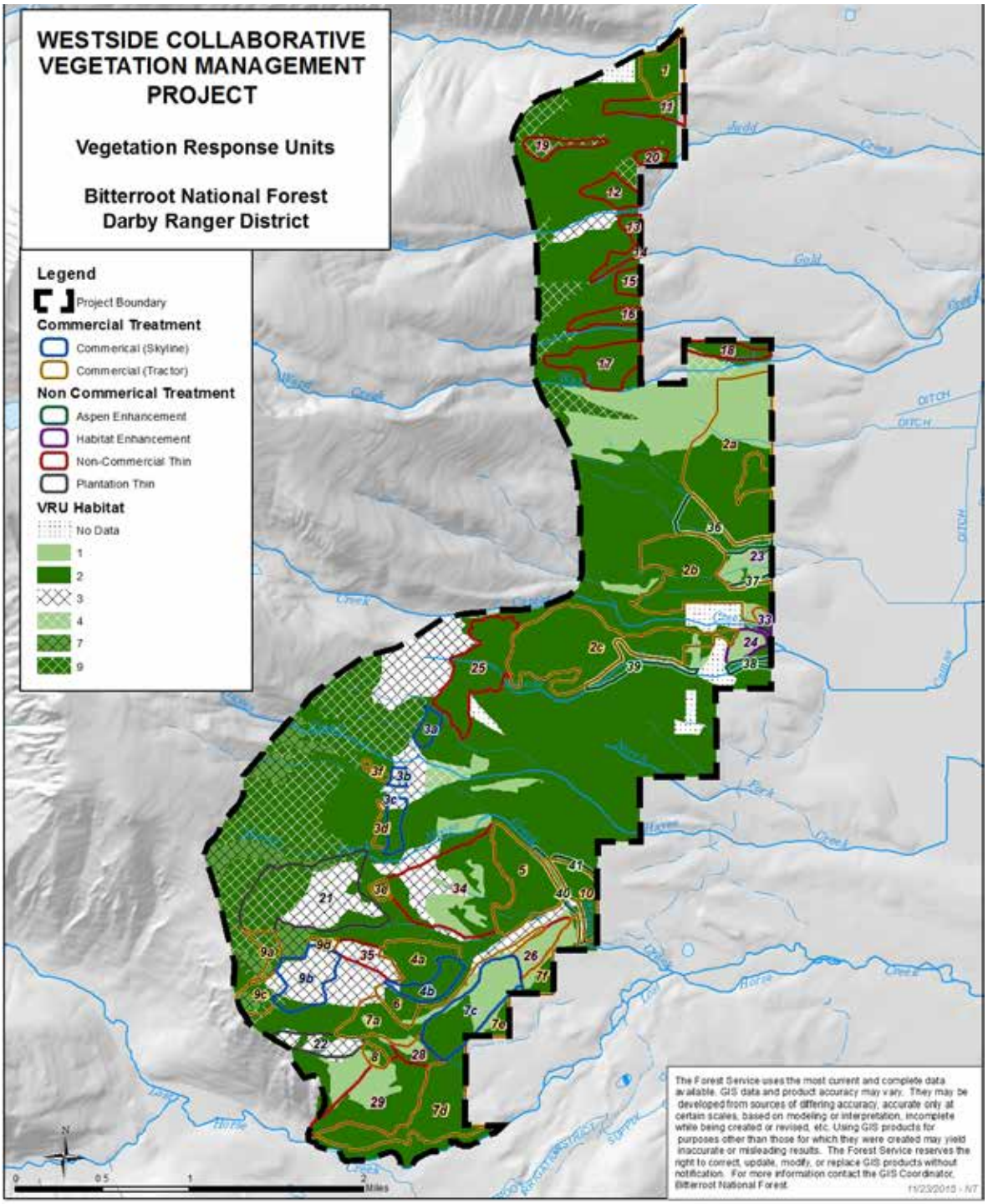

Figure 3-1: Vegetation Response Units (VRUs) in the Westside Collaborative Vegetation Management Project.

Vegetation Response Unit 2

Vegetation Response Unit 2 is moderately warm and dry and transitions between warm, dry grasslands and moderately cool, dry, upland sites. The dry, lower elevations are composed of mixed Douglas-fir and ponderosa pine in well-stocked to overstocked stands. On the higher elevation, moist sites, ponderosa pine is less evident and the forest is a mix of Douglas-fir and

lodgepole pine. Ponderosa pine is more prevalent on south and west aspects. The amount of Douglas-fir, ponderosa pine, and subalpine fir regeneration in the understory varies. Many stands in the Westside project area have forest insect and disease conditions such as Armillaria root disease, dwarf mistletoe, spruce budworm, mountain pine beetle, and Douglas-fir bark beetle.

The primary fire group in VRU 2 is fire group 6 with a minor amount of fire group 4. Prior to fire suppression, fire was an important disturbance agent in this VRU and controlled forest density and species composition (USDA 1999). Low severity fires are representative of the warm, dry sites with a fire return interval between 5 and 25 years. These low severity fires burned in a non-uniform, mosaic pattern, and generally consumed litter and undergrowth. They created an open ponderosa pine and Douglas-fir forest with small canopy gaps in the overstory. These small openings created areas for ponderosa pine and Douglas-fir regeneration. Structural diversity remained high under these mosaic conditions. Ponderosa pine was favored because of its fire tolerance and ability to regenerate under frequent, low severity fires (USDA 1999). On the cooler and moister sites, non-uniform mixed severity fires burned every 15 to 45 years (Fischer and Bradley 1987). Stand replacement fires occur in the moist microclimates or overstocked stands where fuels have increased during a fire-free interval of 150 to more than 400 years (Arno et al. 1995). Topography, habitat type, and tree species mix influence the variability of the fire return interval. High severity fires typically occur in overstocked stands or draws where high fuel loads accumulate during the long fire-free intervals. A dense understory creates a fuel ladder that carries fire into the crowns and throughout the stand (active crown fire). Although not uniform or expansive, these patchy fires resulted in overall stand replacement with even-aged stands. Stand replacement fires are outside the representative range of variation for this VRU but need to be considered given the fuel loads in the existing stands and their predisposition to high severity fires. Stand replacement fires are a larger threat on steep slopes because the ease with which the fire transitions from a ground fire to an active crown fire. Because fire has been absent from this landscape, a larger proportion of the project area is predisposed to high severity fires. Fuel loads on representative habitat types of Fire Group 4 and 6 averaged 11-12 tons per acre (Fischer and Bradley 1987). Approximately 63 percent of the project area is in VRU 2.

Vegetation Response Unit 3 and 4

Vegetation Response Unit 3 and 4 are described as one unit because of their common features. VRU 3 is moderately warm and dry, and has characteristics of both the drier, warmer Douglas-fir habitat type and warmer, moister grand fir habitat type. VRU 4 is represented by the warmer, moister grand-fir habitat type. The habitat types classified within these VRUs typically occur on well-drained, lower to mid-slope benches and slopes. These VRUs contain highly variable assemblages of habitat types that reflect their wide distribution. Most of the habitat types are within the grand fir series. Douglas-fir is a major tree component of seral stands in the represented habitat types and ponderosa pine is a minor seral component in specific areas. However, across the gradient of habitat types, the mixture of tree species includes ponderosa pine, Douglas-fir, lodgepole pine, and grand fir in both seral and climax stands. Douglas-fir is a major seral component and grand fir is the potential climax tree species. The nature of varying fire regimes creates mosaics of seral and climax species forests. Habitat types on the drier and warmer borders of VRUs 3 and 4 are in the Douglas fir series, and on moister borders are in the subalpine series. Floristically, these VRUs are the most diverse because of vegetation composition and structure. Fire research indicates there are three relatively cool dry grand fir habitat types within this VRU that undergo a post disturbance sequence that fits fire group 11 as

described in Fischer and Bradley (1987). However, their fire ecology differs due to the variation in temperature and moisture. One of these habitat types in the project area is grand fir/beargrass (*Abies grandis/Xerophyllum tenax*, ABGR/XETE). This particular habitat type has a higher fire frequency, experiences more underburning and fewer stand replacement fires, and the shade-tolerant understory consists of Douglas-fir and grand fir. Arno and Peterson (1983) estimate a mean fire return interval of 30 years for grove-sized stands on the Bitterroot National Forest.

Fire severity in these VRUs is non-uniform and includes both mixed severity and low severity fires. Mixed severity fires promote highly diverse landscapes because of the variation in fire frequency, severity, and spread patterns, especially in fire group 11 (Barrett 1996). The diversity of fire severity results from the temperature and moisture variation between habitat types. Overall, these VRUs are shaped by the combination of fire severities.

In Fire Group 11, average fuel loads are estimated to be 25 tons per acre, which exceeds that of any other fire group in Western Montana (Fischer and Bradley, 1987). Most of the down, woody fuel results from accumulated deadfall and natural thinning, but grand fir also produces a relatively heavy load of twigs and small branches. Because the habitats are moist, fire hazard is low to moderate despite the relatively high fuel loads under normal conditions (Fischer and Bradley 1987).

Grand fir on moderately moist (mesic) sites stays cooler and moister throughout the growing season than on drier sites. Fuels are also moister on these sites and thus, reduce the potential for large or severe fires. Although mesic sites experience lightning strikes, few lightning strikes result in large wildfires. Many stands within this VRU have scattered larger old remnant ponderosa pine. Armillaria root disease is actively killing large and small Douglas-fir and Douglas-fir bark beetle populations are endemic.

Seral species are poorly represented because fire free intervals on mosaic sites are often longer than the average lifespans of seral tree species (Ferguson 1991). VRUs 3 and 4 represent about 10 percent of the project area.

Vegetation Response Unit 7

Vegetation Response Unit 7 occurs in the moist, lower subalpine forest setting and is common on northwest to east facing slopes, riparian, and poorly drained subalpine sites in the Westside project area. This VRU occupies a broad subalpine zone that is bordered by subalpine fir and lodgepole pine on cooler and drier elevations found in VRU 9. Douglas-fir, lodgepole pine, and Engelmann spruce often form the overstory with a dense understory of subalpine fir and some spruce. While grand fir is present, much of the VRU is at its upper elevation limit.

The general succession for fire groups 8 and 9 is quite similar. Both groups share many of the same seral and climax tree species, and have much the same fire response. However, the two are primarily distinguished by fire frequency and severity. Fire group 8 experiences more frequent, generally less severe fires than fire group 9. Vegetation in fire group 9 has less chance of burning than vegetation in fire group 8 because of the more mesic conditions. These sites are so cool and moist, there are limited times when broadcast burns can be effective. The moisture content of the duff must be low enough to allow the fire to expose bare mineral soil (Fischer and Bradley 1897). Often, such favorable moisture conditions occur only during late summer.

Most habitat types in VRU 7 are in Fire Group 9. Fire plays an important role in the development of species composition in this VRU. Research indicates that non-uniform, stand replacement

fires are the most common and occur in mosaics of low severity and mixed severity fires (USDA 1999, Fischer and Bradley 1987). Arno (1980) estimates the fire return interval longer than 100 years in the lodgepole pine/Douglas-fir cover type and Fischer and Bradley (1987) estimate fire return intervals longer than 120 years. Non-uniform, mixed severity fires are less common, but occur at a frequency of 38-120 years in lodgepole pine/Douglas-fir cover types (Losensky 1993). These types of fires create large canopy gaps and mosaic conditions that included patches of even-aged stands, with surviving groups and individual trees. The natural development of this VRU has not been affected by past fire suppression (Fischer and Bradley 1987). Management objectives of these areas are orientated toward non-consumptive use such as roadless areas and big game sanctuary.

Down, dead, woody fuel averages about 25 tons per acre but can be much higher (Fischer and Bradley 1987). This VRU comprises 2 percent of the project area. Minor amounts of this VRU are proposed for commercial harvest.

Vegetation Response Unit 9

Vegetation Response Unit 9 is cool and moderately dry with a short growing season and early summer frosts. Lodgepole pine is the seral dominant in most stands, with Douglas-fir occurring as scattered overstory relics. Englemann spruce and subalpine fir are minor stand components, particularly where stand replacement fires have been absent. Whitebark pine may occur as a minor seral species.

Within VRU 9 fire groups 7 and 8 are represented and each has a different fire regime. In the Westside project area, fire group 8 represents the habitat types in this VRU. The overstory of the dry, lower subalpine habitat type, subalpine fir/beargrass (*Abies lasiocarpa/Xerophyllun tenax*, ABLA/XETE) is composed of mixed species that include lodgepole pine. Arno (1985) reports that 40 to 67 percent of mature stands in subalpine fir/beargrass habitat types showed evidence of periodic underburns, particularly in upper elevations of the lodgepole pine cover type (Barrett 1982). Barrett (1982) found that fires originating at high elevations, in these habitat types and fire group, tend to be small and burn at low severity. Stand replacing fires generally average 100 years with some mixed severity burns occurring between 50-130 years (Fischer and Bradley 1987).

Where timber production is not a management objective, opportunities may exist for the use of prescribed fires to accomplish fire management objectives and create vegetative mosaics reducing the probability of widespread wildfire (Fischer and Bradley 1987).

Down, dead, woody fuel averages about 20 tons per acre but can be as high as 80 tons per acre (Fischer and Bradley 1987). This VRU comprises 11 percent of the project area. Commercial harvest is proposed on less than 10 acres and the other proposed treatment is non- commercial plantation thinning.

Forest Composition

It is essential to understand the influences of ecological and climatic processes on forest vegetation diversity and changes over time. Understanding these processes allows us to compare historical and current forest compositions, and determine changes in existing forest vegetation and the degree of change. The term natural in this analysis represents the vegetation present at the time that large numbers of European-Americans settled the area. The vegetation structure was at least somewhat stable as documented with fire history investigations and bog analysis (Losensky 1995). Historical conditions can provide a valuable reference for managing contemporary landscapes (Reinhardt et al. 2008). Due to the wide range of ecosystem

conditions that may have occurred in the past, it is better to restore stand structure to within the range and variation of historical conditions on the entire landscape (Reinhardt et al. 2008). Historical conditions provide excellent reference points of changing forests over time and climate variations, and they inform the evaluation of landscape health (Reinhardt et al. 2008).

Historical

It is evident from early photographs, accounts of early forest conditions (Lieberg 1899), and fire history studies (Arno et al. 1997, Gruell et al. 1982) that lower elevation forests in the Westside project area were uneven-aged and largely self-perpetuating stands of large ponderosa pine before logging and the advent of fire suppression in the early 1900s. These stands had fire return intervals of 3 to 30 years (Arno 1976) (Figure 3-2). Within the ponderosa pine cover type, over 78% was in mature to over-mature structural stages (Table 3-2).

Field observations and photos by Leiberg (1899) and historical timber data from the Anaconda Copper Mining Company (ACMC) indicate large ponderosa pines had grassy understories with frequent fire. The pre-1900 fire regime brought about the development of uneven-aged stands of ponderosa pine. Douglas-fir saplings are more readily killed by surface fires, whereas some ponderosa pines often survive. Because of the higher ponderosa pine sapling survival rate, there was continual selection against Douglas-fir. According to Arno (1995) these overstory pine often could live up to 600 years old. When they died, openings occurred and they were replaced by groups of regeneration. Fire chronologies for photo points within Lick Creek determined that 42 fires between 1600 and 1900 had occurred yielding a mean fire return interval of 7 years (USDA 1999). Additionally, aerial photos from 1937 show old fire scars in the project area and surrounding area in the present day inventoried roadless area (Figure 3-3).

Logging, similar to fire, has affected forest composition and structure. Logging in the Bitterroot Valley began in the mid-1800s. The Bitterroot lumber industry expanded from subsistence logging and milling for local use to providing mass quantities of timber for hard rock mines, railroads, and growing cities.

Table 3-2: Historic and Existing Forest Structure by Cover Type in the Westside Project Area.

COVER TYPE (LOSENSKY)	NONSTOCKED		SEEDLING/SAPLING[1]		POLES[2]		MATURE[3]		OVER-MATURE[4]	
	HIST. (%)	FS VEG (%)	HIST. (%)	FS VE (%)	HIST. (%)	FS VEG (%)	HIST. (%)	FSVEG (%)	HIST. (%)	FSVEG (%)
ponderosa pine	4	0	10	2	8	2	11	35	67	26
Douglas-fir	4	0	18	0	31	0.5	23	24	24	8
lodgepole pine	9	0	34	0	43	3	11	0.2	3	0
SAF[5]/Grand fir	0	0	<1	0	20	0	24	2	57	0

[1]Seedling'Sapling structure is 1-40 years old and up to 4.9 inches diameter-breast-height (DBH)
[2]Pole structure is 41-100 years old
[3]Mature structure in 101-150 years old
[4]Over-mature structure is 151 years and older and over 15 inches DBH
[5]SAF = subalpine fir (Abies lasiocarpa)

Aerial photographs from 1937 show most of the area surrounding and within the Westside project area had some type of harvest. The amount and extent of harvesting was not the same throughout the area. Portions of the project area were extensively logged with the removal of most of the forest, as indicated in 1937 aerial photos (Figures 3-4, 3-5).

B. YELLOW-PINE FOREST IN THE BITTERROOT VALLEY NEAR KAMAS CREEK; CAPACITY OF THE TRACT PICTURED, ABOUT 15,000 FEET B. M. PER ACRE.

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A. YELLOW-PINE FOREST NEAR THE OUTLET OF OVERWHICH CREEK, ABOUT 700 ACRES IN THE TRACT, AVERAGING NEARLY 8,000 FEET B. M. PER ACRE.

Figure 3-2: Typical Ponderosa Pine Forest Structure Resulting from Fire Return Intervals of 3-30 years. (Leiberg photographs 1899)

Figure 3-3: 1937 Aerial Photo of the Westside project area. Note sections 21 and 28 with fire scars in the Inventoried roadless area. Section 27 has substantial harvest, which is now unit 2a.

Old-Growth

The historical composition was mature to over-mature structural stages (Table 3-2). In western Montana stands of ponderosa pine, the term 'old growth' often refers to late seral, mature subclimax forests 200 to 500 years old, maintained originally in an open-canopied savanna state by frequent ... low-intensity ground fires" (Habeck 1988). As described by Lieberg et al., old-growth stands occurring on sites classified within the frequent fire regime were historically dominated by ponderosa pine. Many of these historical old-growth stands were characterized

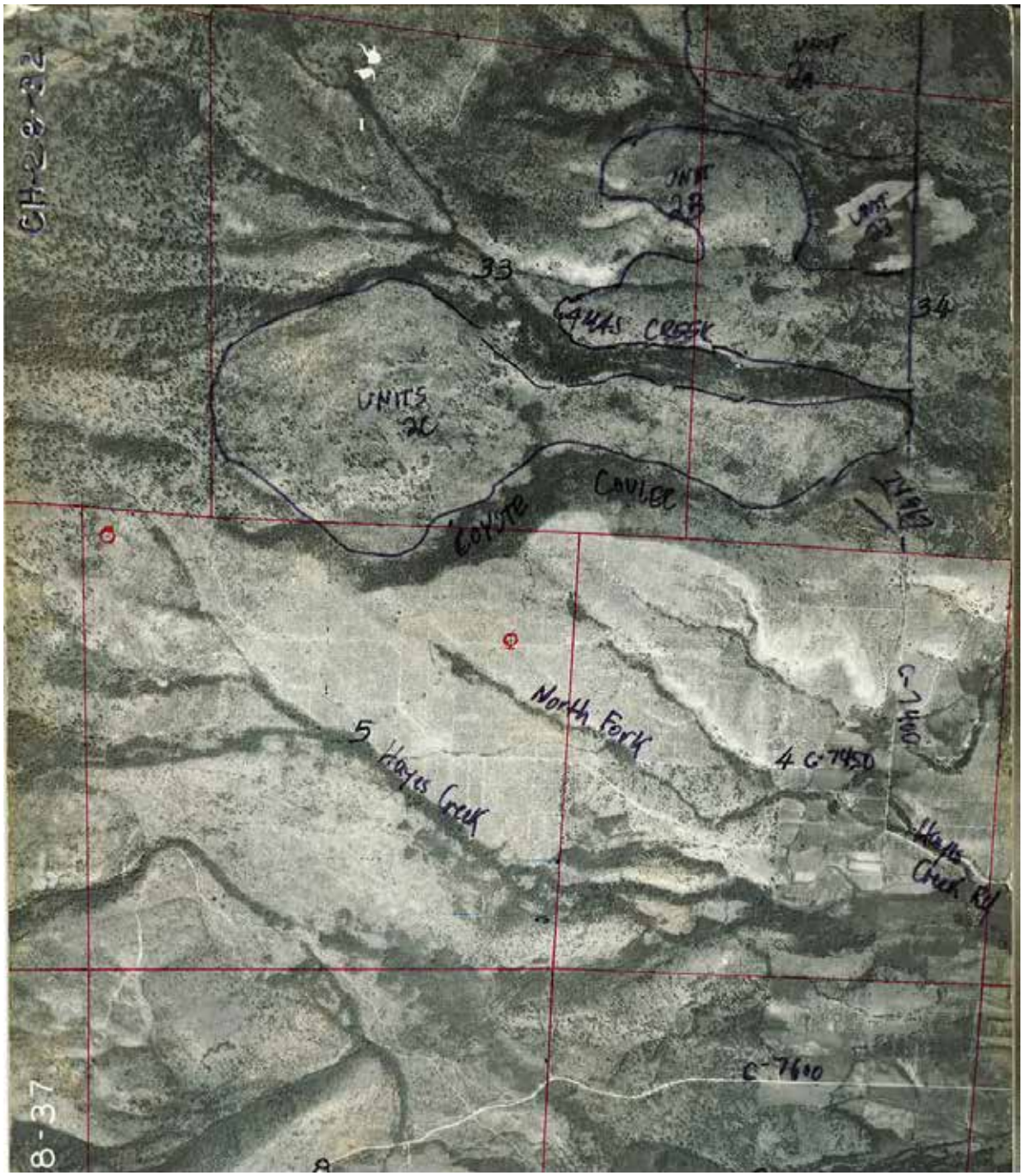

Figure 3-4: 1937 Aerial photograph of Westside project area showing intensive and extensive areas of timber harvest in sections 5, 8 and 33. Note little to no harvest in stream corridors.

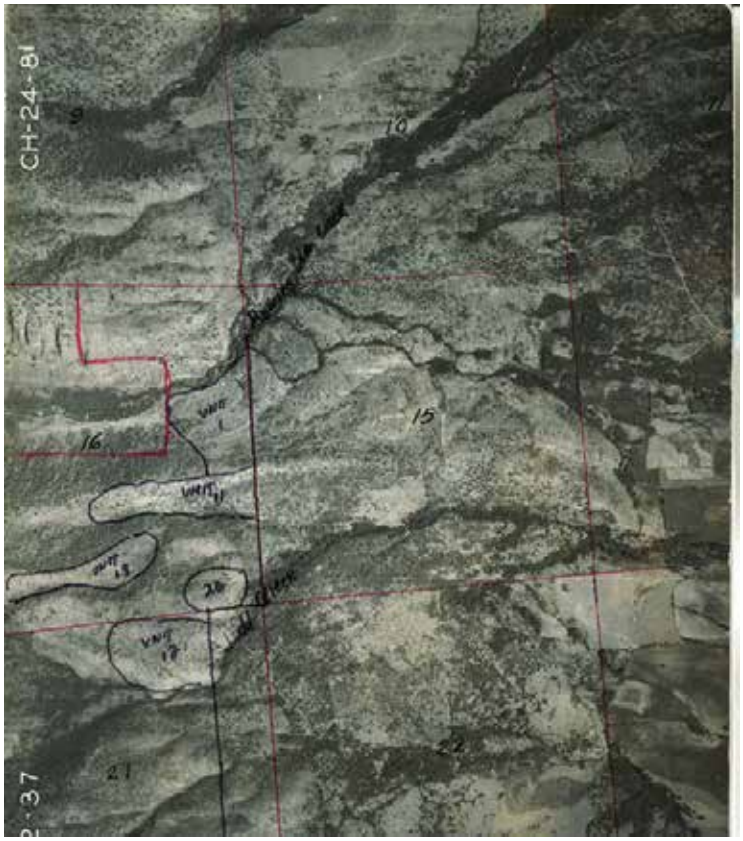

Figure 3-6: 1937 Aerial photograph showing intensive and extensive timber harvest in and adjacent to the current Westside Project area.

Figure 3-5: 1937 Aerial photograph of Roaring Lion Creek and intensive and extensive timber harvest and fire scars.

by clumpy to random spatial arrangement (Cooper 1961, Morgan et al. 2002). Reviewing historic data, Greene et al. (2005) determined that the bulk of the pre-settlement upland old-growth in the Northern Rockies was in the lower elevation, ground-fire maintained ponderosa pine/western larch/Douglas-fir habitat types as reflected in Table 3-2.

Mixed conifer forests also develop as old growth and are not in landscapes with frequent fire. Mixed conifer old growth forests occur on moderately cool to moderately dry, warm, moist sites that are predominately Douglas-fir and grand fir, which are modestly represented in the project area (Table 3-2). These forests border riparian areas and sometimes were not easy to harvest due to slope. These areas are well depicted on 1937 aerial photographs (Figures 3-3, 3-4, 3-5, 3-6) where stand structure show as denser than surrounding areas. The stands were multistoried with shade tolerant trees regenerating in the understory because fire was less frequent and fire severity was variable in these stands. These stands often formed a complex and intricate mosaic on the landscape. Forest mosaics across the landscape create forest diversity by the presence of different successional stages. The proportion of successional stages would have varied over time.

Current

Losensky (1995) provides a reference point for evaluating changes over time that result from management practices or the control of natural processes, such as fire, in his report, “Historical Vegetation Types for the Interior Columbia River Basin.”

Table 3-2 displays the historic and existing cover types by structure class. This table provides a reference for inferring appropriate cover types and structure classes in the Westside Project area. The historic data set includes the entire Ecological Subsection M332B of almost 5 million acres. Current cover types, stratified by age structure class, were derived from the FSVeg database. The existing condition percentages were calculated on National Forest in the Westside project area, excluding private land. The area of the Westside Project data set is less than 1% of the total area of Subsection M332B. While a one-to-one comparison cannot be made due to differing data set scales, accuracy of the historic data set, and accuracy and limitations of the FS-Veg data set, the general trends reflected in the table support trends identified through field reconnaissance of the project area by the silviculturist and foresters.

The decreasing trend in the over-mature tree component, as defined by size class, is readily apparent on the landscape. Most of the old, large diameter ponderosa pine and Douglas-fir trees were harvested over a century ago into the late 1950s. The mature size class in ponderosa pine and Douglas-fir currently is in range of historic percentages because trees retained in the mid-1800s up to present day are currently in the mature and over-mature size classes (Figure 3-3, 3-4, 3-5, and 3-6).

The lack of any forest structure especially in the seedling/sapling and pole cover type in all forest types is attributable in part to fire exclusion and reduced forest management, either by harvest or prescribed fire, and perpetuates mosaics of cover and forest types that differ from historical conditions. By the late 1930s, fire suppression had become effective in reducing the annual extent of fires, even in large wilderness areas in the northern Rocky Mountains (Barrett et al. 1991; Brown et al. 1994). A study of fire regimes in Glacier National Park concludes that fire suppression was very effective in areas that had a mixed severity fire regime, but much less effective in areas of stand replacement fire regimes (Barrett et al. 1991). On the landscape, the effects of fire exclusion tend to include greater uniformity in stand ages and in stand composition and structure.

The existing stands in the Westside project area are a product of succession in the absence of disturbance. This has created a gradual trend toward the potential natural vegetation (climax habitat type). Higher densities of shade tolerant species are more prevalent, especially in the understory. The density of trees increases dramatically (Arno et al. 1997) as does the physiological stress and the opportunity for extensive mortality caused by epidemics of insects and diseases (Fellin 1980, Monning and Byler 1992, Biondi 1996).

Currently, many of the stands are vulnerable to increasing insect infestations and disease rates because of high stocking densities. The presence of mountain pine beetle in parts of the project area is directly caused by the uniformity and density of mature ponderosa pine. The lack of structural diversity in the project area affects all cover types. Field observations indicate high departures from reference conditions in the smaller size classes. The seedling/sapling and pole size class are less common and almost nonexistent. There is a definite loss of multi-aged stands of seral tree species.

Ponderosa pine is the dominant cover type in the project area on 49 percent of the forested land (Table 3-3). Most of the cover type is mature to over-mature. Douglas-fir accounts for 39 percent of the project area. Mature ponderosa pine and Douglas-fir cover types would be the focus of proposed timber harvest.

Table 3-3: Existing Cover Type of proposed Timber Harvest and Prescribed Fire by Alternative in the Westside Project Area.

FOREST TYPE	PROPOSED TREATMENT		TOTAL FOREST TYPE (ACRE) (%)
(FS VEG)	PROJECT AREA	PROPOSED TREATMENT	PROJECT AREA
ponderosa pine	2806	1523	2806 (49)
Douglas-fir	2237	600	2237 (39)
lodgepole pine	186	75	186 (3)
sub-alpine fir	115	41	115 (2)
Aspen	60	44	21 (0.3)

Old Growth

Current percentages of old growth show a decline as compared to historical numbers as represented in Table 3-2. An obvious reason for decline is based on past timber harvest. Since the area has been void of any large stand replacing fire since 1900, timber harvest conducted in the area selected for large ponderosa pine and reduced the amount of old-growth habitat at lower elevations. However, not all old-growth has been removed. There are stands of old-growth in the project area but not in proposed treatment units. They are predominately ponderosa pine or mixed conifer with various amounts of Douglas-fir, grand fir, and ponderosa pine as listed in Greene et al. (2006). Also, many stands of mature trees could become replacement old growth but may not be sustainable without intermediate treatments.

Mixed conifer old growth, represented by Douglas-fir and grand fir, shows a decline in the 'over-mature' structural class (Table 3-2). The existing amount of mixed conifer old-growth is below reference condition as it relates to density, structure, and species composition. The mixed conifer old-growth types occur on moderately cool to moderately dry warm moist sites on north slopes and along riparian areas. They are multistoried, have high amounts of downed woody material, and optimal numbers of snags.

Disturbance

Ecological processes and disturbances directly affect the diversity of plant and animal communities within an area over space and time. The better we understand this interrelationship, the better we will be able to plan our actions to maintain healthy, properly functioning ecosystems. Ecological processes and disturbances include nutrient and biomass cycling, forest succession, weather events, insects, pathogens, fire, and human influences (i.e. timber harvest). The primary disturbances or factors of change, influencing forests in the project area include fire, insects, diseases, and timber harvest. The following discussions of disturbances provide information specific to the Westside project area. More detailed information of the functions of disturbance in ecosystems can be found in the project file (PF-SILV-016).

Fire

The historical frequency and intensity of fires were highly variable across the Bitterroot landscape, depending upon such factors as elevation, aspect, vegetation and fuel conditions, terrain, and weather. Most fires were lightning-caused. However, fires set by indigenous people played a significant role particularly in the lower elevation forest types (Arno 1976, Barrett 1981). In some of the drier ponderosa pine forests, low intensity fires burn through the stand every six to seven years (Arno 1976). Generally, as you move into the moister and cooler forests, intervals between fires increase and high severity fires are more common.

Perry et al. (2011) state that a "large amount of edge and clumpiness in forest structure, composition, and seral status within and among patches provides a rich intermingling of habitats for early, mid-, and late-successional specialists as well as a variety of individual species." The authors also state that forests evolving with mixed-severity fire regimes "exhibit temporal as well as spatial variability." This indicates that heterogeneity should be introduced into management designs to address a variety of integrated objectives.

Several studies found a marked decrease in the number of fires occurring in the Bitterroot Mountains since around 1920 and a corresponding increase in fire intensity (Arno 1976, McCune 1983, Brown et al. 1994). A detailed study of the entire inland portion of the northwestern United States also concludes that areas historically in low or mixed severity fire regimes have shifted into stand replacement regimes (Arno et al. 2000).

Possible reasons for this change are increased fuel loads, weather, and successful fire suppression, especially of lower intensity fires. Suppression of fire in these ecosystems during the 20th century may be the factor affecting the largest proportion of vegetation across the Bitterroot landscape.

Insects and Diseases

Most insects and diseases are endemic and vital to ecosystem function. One of their main roles is to recycle nutrients in the forest ecosystem. Endemic levels of insect and disease are accepted in forest management. Stands outside historical conditions are at a higher risk for insect infestations and disease infections increasing to epidemic levels.

Dwarf mistletoe

Douglas-fir dwarf mistletoe (DFDM) is a parasitic flowering plant that diverts water and nutrients from infected trees. It reduces tree diameter and height growth, changes tree form, reduces seed production, and increases susceptibility to other insects and diseases. DFDM can directly kill treetops and cause whole tree mortality in small trees with stem infections, and trees of all sizes with severe infections (Hadfield et al. 2000). DFDM stimulates production of large, often globose, witches'-brooms (a proliferation of branches) with long, thin pendulous branches (Figure 3-7).

Figure 3-7: Douglas fir dwarf mistletoe witches brooms (FHP photo)

Abundance of DFDM has increased over the last 100 years and more due in part to fire suppression (Alexander and Hawksworth 1975). Fires historically kept DFDM in check by replacing severely infected stands and removing small, infected trees and low hanging witches' brooms in less intense fires. Since dwarf mistletoes require living hosts, they are eliminated by stand replacing fires. Additionally, selective harvests, which often left poor quality, infected Douglas-fir, contributed to increased abundance of the disease. Both fire suppression and poor harvest practices have been important in development of heavily infected stands in the western Montana.

Thinning in areas of non-infected or lightly infected (dwarf mistletoe rating (DMR) 0 – 2) trees may improve growth of current overstory trees (Knutson and Tinnin 1986). However, where infections are well distributed, as they are in most of the project area, DFDM infection rates can be expected to intensify with any type of thinning treatment. Dwarf mistletoe suppression in Douglas-fir is not effective under uneven-aged management (Merrill et al. 1988). If timber volume is a priority for these stands, the best practices to address DFDM over the long-term include stand replacement and emphasis of non-host species such as ponderosa pine. Shelterwood and seed tree harvests can be done with retention of uninfected or lightly infected (DMR <3) seed trees; however, these trees should be removed or girdled as soon as the understory is established. Generally, overstory trees should be removed before regeneration is 3 feet tall or 10 years old since little infection is expected before then. Leaving an infected overstory will perpetuate volume losses currently caused by DFDM in these stands.

Forest Health Protection personnel (MFO-TR-15-17) recommend removing infected Douglas-fir trees to eliminate the infection source. If volume production is the primary management objective, non-host species should be planted after regeneration harvest. If Douglas-fir must be maintained as the primary species, losses will continue from DFDM. Since DFDM is well distributed throughout the project area, openings regenerating with Douglas-fir would be infected by trees along the opening perimeter. Therefore, larger areas with smaller perimeter to area ratios will provide greater protection from dwarf mistletoe infections. Long, narrow strip

harvests should be avoided. Reducing dwarf mistletoe infections is generally most effective with circular or square regeneration harvests of at least 20 acres. Infection rates and volume losses increase over the rotation relative to the size of the opening; the smaller the opening, the greater the infection rate and higher the volume losses. Roads, natural openings, non-host trees, and treeless ridge tops can be used as barriers to DFDM spread when identifying harvest unit boundaries.

To retain DFDM infected wildlife trees without spreading the infection, a Douglas-fir regeneration-free zone would need to be created and maintained. The Douglas-fir regeneration-free zone would need to be at least 40 feet around the trees and the zone expanded below infected trees on slopes. The effectiveness of this practice hinges on continual maintenance by removing Douglas-fir ingrowth since this is the primary regenerating species in the stands.

DFDM is expected to continue causing high growth losses until large tree-free openings (greater than 20 acres) are created by either timber harvest or fire. Thinning would intensify dwarf mistletoe infections in most areas. Where little to no DFDM is detected, thinning may increase tree growth, but increased infections in future Douglas-fir regeneration should be expected until larger openings occur. If treatments are undertaken and Douglas-fir is left for wildlife trees, leave trees should be girdled before regeneration is three feet tall or ten years old, whichever comes first, to minimize future DFDM infections.

Risk of Bark Beetle Predation

Populations of western pine beetle (Dendroctonus brevicomis LeConte) and Douglas-fir beetle (Dendroctonus pseudotsugae Hopkins), are currently low in the project area. However, forest conditions are suitable for populations of mountain pine beetle (Dendroctonus ponderosae Hopkins) to increase and increase tree mortality. Current conditions within the project area such as host species, tree size, and stand density, create moderate to high conditions beyond the historic range.

Mountain Pine Beetle (Dendroctonus ponderosae Hopkins)

Mountain pine beetle attacks all western species of pine, native and introduced. The larvae feed on the inner bark and often kill the tree. Populations can build up to very high levels (epidemic) and cause large-scale mortality when forest conditions are in favorable, “high risk” conditions (Randall and Bush 2010). Ponderosa pine is susceptible to a number of tree killing bark beetles including mountain pine beetle, the western pine beetle, and the pine engraver beetle (Ips pini). Mountain pine beetle and western pine beetle are most likely to affect mature stands of ponderosa pine. Bark beetles respond to stressed ponderosa pine. Stands most susceptible to bark beetle attacks have a high composition of susceptible host, or dense stands of large diameter ponderosa pine. More detailed information about bark beetle hazard ratings is in the project file (PF-SILV-016).

Mountain pine beetle has been active in the project area for about ten years. Recent mountain pine beetle activity has significantly declined (MFO-TR-15-17) however; current stands are rated moderate to high hazard because of high basal areas and high tree densities. In 2014, both ground surveys and Aerial Detection Surveys show that mountain pine beetle is still very active in the project area killing approximately 4-5 trees per acre and small groups of 5 to 40 trees in both LPP and ponderosa pine. Currently, mountain pine beetle is primarily attacking small and mid-size trees. In most of the small ponderosa pine trees examined (>5 inches), there was no viable brood. Forest Health Protection specialists found 3rd and 4th instar larvae in the mid-size trees (11 to 18 inch DBH) during their site visit. Very little to no brood is produced when smaller

trees are attacked, thus they create a population sink and may indicate population decline. Although mountain pine beetle activity appears to be declining, additional tree mortality may occur in stands with higher stocking densities and should be treated to reduce hazard and maintain sustainability (MFO-TR-15-17).

Stand density, as measured by basal area (BA), ranges between 120-180 square feet per acre. Ponderosa pine stands exceeding 150 BA and average DBH greater than 8" are highly favorable to mountain pine beetle outbreaks (Schmid et al. 2007). Also, weather patterns over the next few years will partly determine future mountain pine beetle trends on the Bitterroot National forest (MFO-TR-13-02).

Schmid et al. (2007) found that unlike in lodgepole pine, mountain pine beetle in ponderosa pine attack a range of diameters. Therefore, silvicultural treatments with endemic or building populations can be designed to leave some of the larger trees in ponderosa pine stands. Schmid et al. (2007) and Olsen et al. (1996) found that mountain pine beetle attacked trees in clusters and the hazard rating for stands with clumpy distributions is increased. In other words, even in stands with densities of 80 BA but uneven tree distribution, groups of trees growing in denser clumps, mountain pine beetle-caused mortality may occur in those clumps and lead to additional mortality in the stand. Olsen et al. (1996) suggests that the competition between trees in clusters places stress on individual trees and predisposes them to attack. A more evenly spaced tree distribution reduces inter-tree competition and creates different microclimates. It may also increase the time it takes for a low-density stand to become susceptible to mountain pine beetle-caused losses. Schmid et al. (2007) and Olsen et al. (1996) suggest that thinning to 80 BA or less will reduce the competition between trees and reduce mountain pine beetle-caused mortality in lodgepole pine.

Size of a partial-cut unit is also important. Over the long-term, larger units will sustain less mountain pine beetle-caused mortality. The long-term solution to mountain pine beetle management is to create a mosaic of stands across the landscape with a variety of tree species, size classes, and age classes. Silvicultural treatments followed by natural and prescribed fire can achieve this objective. Any treatment that lowers the stand density, amount of pine, or average stand diameter will reduce beetle-caused tree mortality during an outbreak. Reducing the susceptibility of high hazard stands through silvicultural treatments can reduce the susceptibly of surrounding low and moderate hazard stands within a drainage (MFO-TR-13-02).

Douglas-fir Bark Beetle (Dendroctonus pseudotsugae Hopkins)

Douglas-fir bark beetle (DFB) is an aggressive bark beetle that causes tree mortality generally in Douglas-fir greater than 14"DBH growing in mature, dense stands. It also attacks smaller trees when DFB populations are very high (Negron et al. 1999). Douglas-fir bark beetle populations can be triggered by other events such as wildfire, windstorms, and climatic stressors such as drought.

Within the project area, DFB is actively killing larger Douglas-fir trees. Aerial detection flights in 2003 had few polygons outside the project area averaging 17+ fader trees per polygon. The latest aerial detection map had a tremendous increase in the number of attacked trees, averaging 5-10 trees per acre. Unlike previous years on the Bitterroot National Forest, there are noticeable levels of DFB activity. During field reviews, many of the larger Douglas-fir trees are currently being attacked by DFB.

Tree mortality is greatest in Douglas-fir or mixed-species stands that are mature to over-mature, densely stocked, and have a high percentage of Douglas-fir. Douglas-fir beetle predation plays a

role in forest succession. Depending on the site and the role of Douglas-fir in the forest, bark beetles can weed out the mature and over mature trees, maintain the seral tree component on the site, or create sites for regeneration and the transition to climax plant communities (Negron et al. 1999). More detailed information about the role of DFB in forest succession is in the project file (PF-SILV-016). Prevention bark beetle outbreaks is best accomplished by reducing host size, age, occurrence, and stand density that are associated with high risk conditions (Hood et al. 2007).

Root Disease

Armillaria Root Disease (Armillaria ostoyae (Romagn.) Herink)

Root disease in the project area is classified as Mode II Armillaria (Hagle 2008). Mode II patterns cause "highly significant losses usually requiring species conversion" (Figure 3-8). Resistant species should be favored for retention and planting when reduced impacts from root disease are desired. Douglas-fir, subalpine fir, and grand fir are most susceptible to Armillaria root disease in the project area.

Figure 3-8: Armillaria root disease in Unit 9c

Armillaria root disease is considered a "disease of the site" because established Armillaria mycelia are essentially permanent. The best management option for minimizing losses is to manage for tree species that are most tolerant to the disease. In general, Douglas-fir and true firs are the most susceptible species in the Inland Northwest, and pines, western larch and cedar are the most tolerant. Tolerance and susceptibility are not finite characteristics, but exist as a continuum. It is important to observe how the disease is behaving on site, and what species appear to be most susceptible and most tolerant.

It is also important to know that even tolerant species can succumb to Armillaria root disease when under great stress such as from drought, over stocking, or growing under the presence of large amounts of root disease on site.

A regeneration harvest would initiate natural regeneration of Douglas-fir, which would continue the root disease and increase the tree mortality in the affected units. We know that even very large trees that are not killed outright by *A. ostoyae*, would have lower timber volume and quality due to the disease (Cruickshank 2010). In areas designated for timber management, the units should be converted to a less susceptible species, such as ponderosa pine, if possible. Another possibility is to create openings around ponderosa pines and under burn or create other soil disturbances that will discourage Douglas-fir regeneration and eventually encourage ponderosa pine natural regeneration.

Annosus Root Disease (Heterobasidion annosum ((FR.) Bref.))

This root disease is widely distributed in North America, and harvesting practices have increased its incidence and impacts (Rippy et al 2005). The disease is spread by the fungus Heterobasidion annosum ((FR.) Bref.). Its primary mode of spread is by airborne spores landing on fresh cut

stumps. The spores germinate and colonize the wood if conditions are favorable (Lockman 2006). The disease can also spread across root contacts if the neighboring tree is a susceptible species (Lockman 2006). This root disease often occurs in stands with other root diseases so root diseases are treated as a complex with the management recommendation of promoting root disease tolerant species. Ponderosa pine is the main host for the p-type annosum and design features would be applied to prevent annosus spread (Table 2-4). Fresh cut stumps of ponderosa pine, greater than 12 inches in diameter, would be treated with a borate compound, which prevents the germination of annosus spores on the stumps (Lockman 2006). Also, preventing damage to residual trees during harvest would greatly reduce the incidence of annosus infection (Rippy et al. 2005)

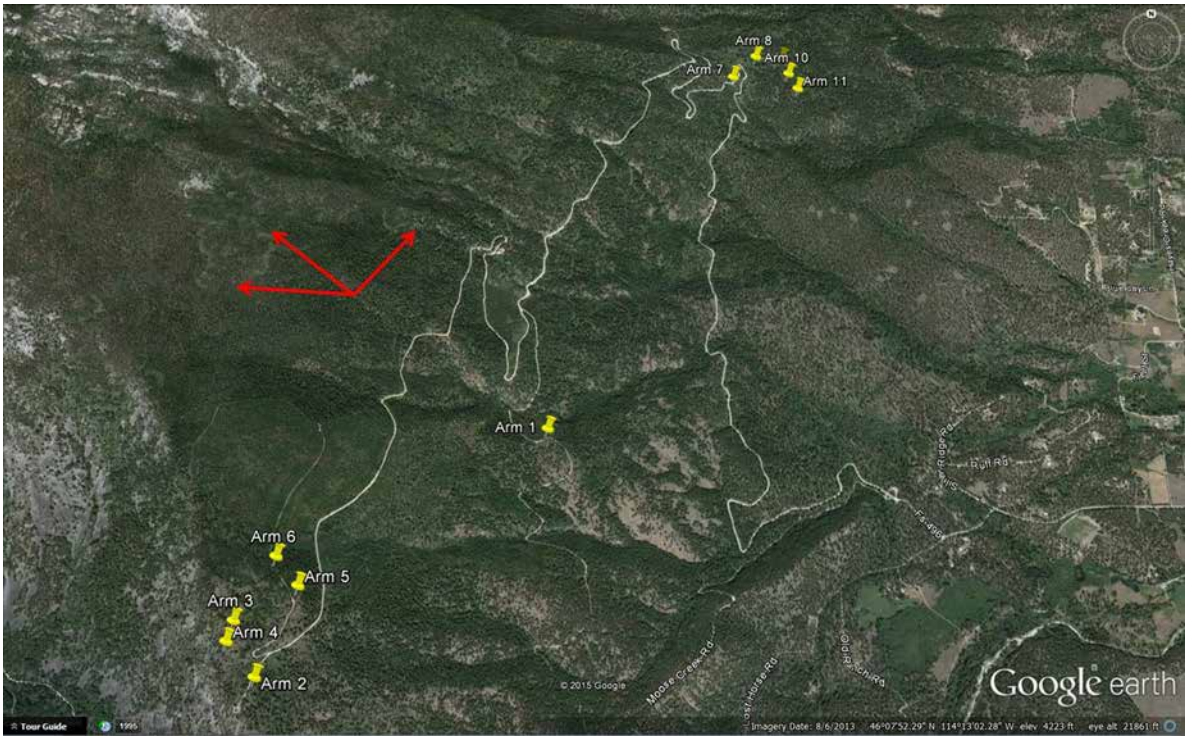

Figure 3-9: Root disease locations in the Westside Project area. Pushpins indicate confirmed Armillaria root disease and arrows indicate root disease observed from Google earth images.

Schweinitzii Root and Butt Rot, Phaeolus schweinitzii

Infection of Douglas-fir by *Phaeolus schweinitzii* (*P. schweinitzii*) predisposes trees to attack by Douglas-fir beetles, and also to infection by Armillaria root disease. The presence of *P. schweinitzii* in the project area warrants caution with regard to thinning. *P. schweinitzii* causes decay in the heartwood of roots and the butt of the tree. This decay decreases the uptake of water and greatly compromises structural roots, causing infected trees to be more susceptible to falling or breaking. Thinning frees up resources for the residual trees, but thinning also removes the protection from wind offered by crowns of neighboring trees, making leave-trees more susceptible to breakage and wind throw during wind events. Douglas-fir seems to suffer the most damage from this butt rot, but all conifer species are susceptible.

Miscellaneous Insect and Diseases

Western Spruce Budworm (*Choristoneura occidentalis* Freeman)

Western spruce budworm (*Choristoneura occidentalis* Freeman) larvae consume buds and foliage of Douglas-fir, subalpine fir and spruce. They will feed on larch and pine when outbreaks are severe. Cones and seeds are also destroyed. Tree growth can be reduced after several years of heavy defoliation. After four to five years, branch dieback, top kill and tree mortality can occur.

Good budworm habitat consists of dense, multiple layers of host species. The upper canopy provides a good food source and refuge from predation, while the lower canopy intercepts budworm spinning from the upper layers and provides sanctuary from predators on the forest floor. Dense stand structure may also favor budworm survival by limiting the diversity of bird predators (Langelier et al. 1986) and reducing efficiency of some insect parasites.

Western spruce budworm has co-evolved with the forests of the Northern Rockies, and regular population fluctuations have always occurred. High population levels occur periodically, largely influenced by climatic conditions. Though climate may influence the probability of an outbreak, stand conditions will determine the duration and intensity. Several studies have found that the intensity and duration of budworm outbreaks have increased over the past 50-100 years (McCune 1983; Stipe 1982; Blais 1983; Carlson et al. 1983, and Anderson et al. 1987). The cause of this change may be stand structures and species compositions created by past partial cutting practices and fire suppression (Schmidt 1985; Wulf and Gates 1987). Spruce budworm now has far more area of desirable dense, multi-canopied Douglas-fir forest available.

Although western spruce budworm has historically been the most prevalent insect defoliator in the Northern Region (Region 1), the current outbreak has been building since 2000. The outbreak started in 2000 with 440 acres of visible defoliation on the Helena NF and expanded to more than 879,000 acres in 2008. However, less than 1,200 acres were recorded on the southern end of the Bitterroot NF (Gibson 2009). Typically, western spruce budworm damage and tree mortality were restricted to smaller size classes. The current trend indicates western spruce budworm-caused tree mortality in the intermediate and co-dominant Douglas-fir and true fir forests.

Western spruce budworm damage appears to be increasing in the project area. Both regeneration harvest and intermediate harvest can be used to reduce impacts from budworm. Reducing the amount of Douglas-fir and true firs and creating stands containing vigorous trees with less budworm damage will reduce habitat components favorable to western spruce budworm and reduce associated damage and potential tree mortality. Retaining trees with less visible damage would select for apparent genetic resistance to budworm feeding, which is a heritable trait (Brooks et al. 1985).

Thinning and reducing the number of canopy layers increases western spruce budworm larval mortality, especially during the dispersal stage. It also improves individual tree vigor and improves resistance to damage from both western spruce budworm and Douglas-fir beetle.

Comandra Blister Rust (*Cronartium comandrae* Peck)

This disease is killing the tops of both understory and overstory ponderosa pine. The causal fungus needs two types of hosts to complete its life cycle. Spores from infected alternate hosts (bastard toadflax (*Comandra umbellata*) in our area) are released from midsummer to early fall. These spores are windborne and infect pine needles and shoots of hard pines, ponderosa, and lodgepole pines. The fungus then spreads into the inner bark, and after several years causes a

diamond shaped canker. Spores from infected pines develop in late spring and summer and infect the alternate host, thus completing the life cycle. Outbreaks of this disease are sporadic, due to variations in the distribution of the alternate host and the periodicity of environmental conditions necessary for infection. The most serious damage has been observed in nurseries and plantations where rapid stem girdling results in high mortality. It is more common to find it acting as a topkill agent in older trees in our area. The recommended management tool is to select against infected trees during any entries.

Management Options

Managing multiple insect and disease agents in mixed conifer forests is challenging. However, several silvicultural treatments could be implemented to reduce impacts of the various insects and diseases found in the project area. In stands with heavy infections of DFDM, thinning from below would reduce mountain pine beetle impacts in the pine portion of the stand but exacerbate DFDM. In stands with significant root disease, thinning from below could also exacerbate root disease. Therefore, regeneration harvests followed by planting of root disease tolerant and DFDM resistant conifers are recommended. Creating larger openings in areas with high levels of DFDM can reduce long-term impacts and improve species diversity, which would be more resilient to insects and diseases over time. Group selection harvest or thinning from below can be used to reduce impacts of western spruce budworm when DFDM and root disease are not detectable or host species are a minimal component of the stand. In areas with pine or no detectable DFDM and root disease, thinning from below may also be appropriate to reduce long-term mountain pine beetle hazard. Creating a mosaic of age and size classes and species diversity is the best long-term solution to mountain pine beetle management.

All ponderosa pine stumps 12 inches or greater in diameter should be treated with a registered borate salt if they are moist at the time of tree removal to prevent *H. irregulare*.

Timber Harvest

Most of the Westside project area was harvested in the 1900s and the result of this intensive timber harvest is evident in aerial photos flown in 1937 (figures 3-3, 3-4, 3-5 and 3-6). Most of the current timber harvest, 1,749 acres, occurred between the 1960s and 1980s (Table 3-4). Much of this material over the decades was ground skidded with minimal amounts of skyline yarding (Refer to Soils analysis).

Timber harvest has occurred on 4,154 acres (31%) of the project area over 5 decades. Past harvests, from the 1960s to the present, include 2,922 acres of intermediate treatments (commercial thin, liberation, and sanitation/salvage); 465 acres of clearcuts with and without reserves; and 497 acres of uneven-aged management. Table 3-4 displays the areas of harvest by decade within the Westside Project area. More detailed information about intermediate harvests is in the project file (PF-SILV-016).

Desired Stand Conditions

The legacy of past management practices, harvesting, fire suppression, and changes in tree species composition and density, explains the current need to reduce fuel and stocking levels. Cumulative changes now place current forest conditions at high risk of severe fire or insect and disease events. The lower elevation ponderosa pine and Douglas-fir cover types are especially at risk since these fire regimes have been altered the most. Most of vegetation treatments proposed in the project area are located in lower elevation ponderosa pine and Douglas-fir.

Desired Forest Conditions within a VRU

The objectives for stand treatments in the Westside project are focused specifically on:

- improving tree resilience to mountain pine beetle
- reducing tree densities in both young, regenerated timber stands and mature stands
- improving forest resilience to disturbance
- reducing fuel loads and maintaining prescribed fire throughout the project area.

The following conditions are options the Silviculturist considers in prescribing treatments to shift the landscape within the VRUs towards a more desirable and sustainable condition. The landscape attributes are achievable under average conditions and are based on applied research, scientific findings from the Interior Columbia Basin Ecosystem Management Project (ICBEMP), and local forest conditions. While there is considerable information presented on historic forest conditions, the emphasis is on sustaining the biological processes that produce these conditions. The extent and scale of vegetation management depends on project level resource objectives. Where vegetation management is used to move towards desired landscape conditions, most silvicultural systems are applicable.

The desired stand conditions are formulated to achieve project objectives. Similar VRUs are combined when they represent a small part of the project area (Table 3-1). The desired landscape conditions are broken into categories within the VRU such as vegetation, ecosystem health, fire, fuels, and habitat features.

Table 3-4: Past Timber Harvest in the Westside Project Area. (Source: FACTs database)

HARVEST TREATMENT (ACRES)	1930	1940	1960	1970	1980	1990	2000	2010
Even-age System								
Shelterwood Establishment			66			16		
2-age Shelterwood						61		
Shelterwood Removal								
Seed Tree Cut								
Clearcut				173	180			
Clearcut with leave trees						112		
Intermediate Harvest								
Commercial Thin				115		210	271	
Liberation Cut	17	117	175	685	847			
Improvement Cut								
Sanitation-Salvage						619		
Special Cut								
Uneven-age System								
Single Tree Selection		57				333	164	
Group Selection								

Vegetation Response Unit 1 and 2:

Forest structure has a primary influence over ecological function and ultimately the inherent biological diversity. Frequent disturbance processes are largely responsible for the forest

structure that has developed in this vegetation response unit. Stand structures and the distribution of trees are also strongly influenced by the soil type and other physiographic features. As a product of frequent low to moderate severity fire and occasional stand replacement events, these VRUs are generally a mosaic of stand ages and forest types.

Vegetation

- Mosaic of stand conditions such as stocking, age class, and species composition relative to historic range of seral and climax tree species
- Within the VRU strive to maintain 15-25% seedling/sapling, 15-35% pole, 10-30% mature, and 20-50% over-mature structural stages based on ICBEMP findings (USDA, 1996)
- Largely multi-storied and two-aged dependent on forest type
- Stands are dynamic and harvest will continue to be needed at regular intervals to reduce densities and create openings that favor regeneration of ponderosa pine
- Species composition of approximately 70 - 85% ponderosa pine and 15 - 30% Douglas-fir
- Stand density relatively low, between 40 – 80 BA (ft^2/acre), depending on aspect

Fire/Fuels

- Create small openings (2-5 ac) within an irregularly shaped, treatment area (20-200 ac); to emulate variation that occurs from mixed severity fires
- Average fuel load generally ranges from 5-15 tons per acre
- Non-uniform, relatively open community of late seral ponderosa pine and Douglas-fir sustained through prescribed fire and timber harvest at frequencies consistent with natural fire returns
- Implement prescribed fire at regular intervals across the landscape
- Desired forest structures reflect the product of frequent low to moderate severity ground fires
- Break up the layer of abutting crowns in the overstory to reduce the potential for wildfire to spread through the upper canopy

Ecosystem Resiliency/Habitat Features

- Maintain key cover areas for dependent wildlife. Maintain wildlife travel corridors to provide connectivity between habitat features
- Retain existing snags, broken-topped live trees, and down logs to provide for a variety of wildlife species
- Maintain tree health, vigor, stocking, species, and age class diversity
- Thin denser, overstocked stands of trees, favoring early seral species as much as possible
- Retention of large diameter trees as snag replacements and seed sources as they represent a unique component of the VRU that typically survived low severity fires

Vegetation Response Unit 3 and 4:

This VRU is composed of moist, cool grand fir habitat types, which occurs on benches, ravines and reflects the influence of the inland maritime climate affecting forest development and the role of fire. These VRUs are transitional including characteristics of surrounding VRUs such as VRU 2 and VRU7.

Vegetation

- A mosaic of stocking levels, age class distribution and species composition would exist representing varied structural attributes. Appear as a mix of open stands with large diameter overstory and well stocked stands of mixed conifers

- Generally, stand density is moderate, between 80 – 140 BA.
- Within the VRU strive to maintain 15-25% seedling/sapling, 20-40% pole, 15-35% mature, and 15-40% over-mature structural stages based on ICBEMP findings (USDA, 1996)
- Species mixture should include 70 - 90% Douglas-fir and lodgepole pine and 10 - 30% other species
- A variety of successional stages relative to historic ranges of seral and climax species. Relatively open, single storied, late seral conditions would be expected on ridgelines. Multistoried, late seral conditions on gentle slopes and riparian areas

Fire/Fuels

- Desired forest structures would reflect conditions of both non-uniform mixed severity fires and infrequent stand replacement fires
- Where ponderosa pine and Douglas-fir are dominant seral components, maintain historic fire frequency using prescribed fire or prescribed natural fire. Promote the development of fire-adapted species
- In moist grand fir habitat types, the use of prescribed fire would be imitated as part of a fuel treatment following a regeneration harvest
- Average fuel loading generally ranges from 10-20 tons per acre

Ecosystem Resiliency/Habitat Features

- Maintain tree health, vigor, stocking, species, and age class diversity
- Maintain key cover areas for dependent wildlife, maintain travel corridors to provide connectivity between habitat features
- Retain snags, broken topped live trees, and down logs
- Natural fires, root disease, and periodic bark beetle mortality provide conditions for cavity habitat
- Where old growth forest character is desired, stands should be located in settings representative of their functional purpose
- Maintain thermal cover, particularly along riparian areas by retaining shrubs and dense canopy cover where snow depth may be restrictive

Vegetation Response Unit 7:

This VRU occurs in the moist, lower subalpine forest setting and is common on northwest to east facing slopes, riparian, and poorly drained subalpine sites in the Westside project area.

Vegetation

- Generally, stand density is moderate in treated stands between 80-140 BA
- A variety of successional stages relative to historic ranges of seral and climax species, mostly even aged single storied and some two storied stands
- Within this response unit strive to maintain 15-25% seedling/sapling, 20-40% pole, 15-30% mature, and 15-45% over-mature structural stages based on ICBEMP findings (USDA, 1996)

Fire/Fuels

- Desired forest structures would reflect conditions of both low severity fires and infrequent stand replacement fires of the moist lower subalpine habitat types
- Maintain historic fire frequency using prescribed fire or prescribed natural fire. Promote the development of fire-adapted species
- Average fuel loads generally range from 12-25 tons per acre

Ecosystem Resiliency/Habitat Features

- Relic overstory would be left in aggregated or dispersed fashion wherever possible
- Maintain tree health, vigor, stocking, and species and age class diversity

Vegetation Response Unit 9:

Vegetation

- Generally, stand density is moderate in treated stands between 80 – 140 BA
- A mix of even and multi-aged stands of mainly of shade tolerant trees: subalpine fir, Englemann spruce, Douglas-fir, and lodgepole pine with stocking ranging from fairly open to dense with a mix of even-aged lodgepole pine stands
- A variety of structural stages based on ICBEMP findings (USDA, 1996) indicates 20-40% in seedling/sapling, 40-60% in pole, and 15-20% in mature across the vegetation response unit

Fire/Fuels

- Desired forest structures would reflect a mosaic of stand conditions similar to conditions created naturally by frequent low severity and mixed severity fires, and low to moderately extensive stand replacement fires as discussed for fire Group 8 in dry lower subalpine habitat types
- Create small openings, less than 5-10 acres to mimic canopy gaps from mixed severity fires
- Use prescribed fire where possible to maintain sustainable fuel conditions within historic ranges
- Average fuel loads generally range from 12-25 tons per acre

Ecosystem Resiliency/Habitat Features

- Retain large diameter reserve trees that are important as snag replacements and seed sources since many snags are typically small diameter because the prevalent species are lodgepole pine and subalpine fir
- Connectivity is relatively high and largely attributed to large patch size providing hiding cover
- Maintain serotinous cone lodgepole pine ecosystem by maintaining fire
- Maintain tree health, vigor, stocking, and species and age class diversity

It is also important to ensure that potential treatments will result in a healthy and sustainable condition in the forest and ecosystem. The desired conditions should be within the range of natural variability – that which we might expect under natural disturbance and succession regimes. The desired future condition includes forest structures, composition, and processes that would have been present historically. Fire plays an important role in the sustainability of these ecosystems. Prescribing timber harvest or understory thinning in advance of prescribed fire allows fire to be reintroduced into the project area without causing high levels of tree mortality. Prescribed fire will reduce the vulnerability of the forest to possible severe and undesirable effects from wildfire, insects, or disease. It creates a forest more resilient in the face to inevitable change and future uncertainties, and provides for a wide variety of resource and management needs. A resilient forest is one that has the ability to withstand and maintain normal function through natural disturbances, such as fire, insects, disease, or climate change. Harvesting would be designed to maintain the larger diameter trees.

Quaking Aspen (*Populus tremuloides*)

At a landscape scale on the Bitterroot NF, aspen and other Populus species, such as cottonwood, are not well represented by numbers or percentage of area. Although there is very little documentation on historic coverage of aspen or cottonwood on the Bitterroot NF, one would expect that they have declined particularly in numbers of young stems. The site characteristics of cottonwoods are often wet and they are more of a riparian species compared to aspen which is found in upland areas and drier sites. The regeneration process of Populus species can be sexual and asexual. Most regeneration in established forests is asexual, by root suckers or coppice sprouts (Stettler, et al. 1996). This is commonly referred to as a clone, which is defined as shoots or stems that sucker from the interconnected root system and produce new stems that are genetically identical (Jones and Debyle 1985).

The presence of aspen, and the biodiversity and habitat it provides, is very important at a landscape scale and it is desirable to maintain its presence or increase it. Since the fires of 2000, the amount of aspen has expanded and young aspen stands are developing (regenerating) in many areas.

Maintaining healthy aspen stands increases the vegetation diversity in the project area. To achieve this vegetation diversity, the age and size class diversity of aspen stands needs to increase. Removing conifer overstories removes the shade that suppresses the growth and development of the aspen clone. Releasing aspen from the shade of the overstory promotes clone regeneration and improves the size class and age diversity of the clone.

Reserve trees and two-aged systems are used to create structural diversity in aspen clones. These systems provide a range in both age and size class. Aspen clones with low levels of insects and disease reduce the risk of losing clones. Vigor, to some degree is a factor of age. Some decadence is desirable, particularly when the overstory aspen are retained to enhance structural diversity or create a two-aged system. Young stands of aspen do not tend to exhibit uniform spacing. This degree of aggregation diminishes with age; however, populations tend to remain highly aggregated. Thus, the density across the clone varies, which is natural and desirable.

Environmental Consequences

This summary of environmental effects compares the alternatives based on the purpose and need and desired forest conditions (Chapter 1).

Alternative 1 is the no action alternative and no stand treatments would occur. Forest stand density would continue to increase and facilitate the growth of bark beetle populations and forest disease inoculum. Alternative 1 would not meet the purpose and need of improving forest resilience to natural disturbances or reduce fuel loads and lower passive and active crown fire hazard.

Alternative 2 treats much of the ponderosa pine and Douglas-fir cover types and improves forest resilience to insects, disease, and fire. Proposed treatments would change stand composition and structure through harvest and prescribed burning.

Improvement harvests are similar to commercial thins; however, they focus on improving species composition and forest health rather than improving growth and yield. The objective is to improve the existing stands by featuring the largest diameter classes, promoting fire-resilient stands, and reducing the number of trees. A combination of thinning from below and crown thinning is called variable-density thinning. Variable density thinning is designed to remove trees from the understory and progress into the overstory until a prescribed outcome is reached.

The purpose of variable density thinning is to open the canopy and favor the development of the healthiest trees.

Irregular selection harvests would create openings or gaps in the forest canopy creating structural and age diversity. The gaps would be created by removing mistletoe-infested Doulas-fir or reducing vegetation around large remnant ponderosa pines. The creation of small openings can disrupt fire behavior as well. A passive crown fire may initiate, but it would not gather momentum when disrupted by areas of wider tree spacing and canopy gaps, and will drop back to the ground. If the fire weather and fuels conditions align for the fire to climb into the canopy, the fire would hit an opening and drop back to the ground (Jain et al. 2012)

The effects of the various commercial treatments would reduce the amount of shading on surface fuels, increase wind speeds and reduce relative humidity at the forest floor, increase the fuel temperature, and reduce fuel moisture. These effects may increase the probability of ignition and surface rates of fire spread, depending on weather conditions, but the reduced fuel levels and arrangement of fuels would reduce fire severity and increase opportunities for wildfire management (Peterson et al. 2005). Surface fires, even high intensity surface fires, have less potential to progress into active crown fires when ladder fuels are reduced. Reducing canopy bulk density lowers the potential that individual 'torch' trees (passive crown fire) would progress into an active crown fire. Lower overall fireline intensity would increase options for safe wildfire management (Van Wagner 1977, Rothermel 1983, 1991).

Proposed treatments would decrease the risk of ponderosa pine tree mortality from mountain pine beetle and western pine beetle infestation by reducing stocking levels on 1,523 acres of ponderosa pine.

Methodology

This section describes the methods, models, and data used in this analysis. Information that is standard for this type of analysis is not included in this EA but is in the project file

Stand Diagnosis

A stand diagnosis is the preliminary documentation of current stand and site conditions in the project area. The stand diagnosis includes such items as slope, aspect, elevation, land type, habitat type, vegetation characteristics, accessibility, and potential obstacles to logging. Desired vegetation conditions and treatment options are recorded, and a preferred treatment selected. Diagnoses were made for individual stands, as well as, proposed treatment units, which may be composed of several stands. Detailed stand exams or walk-through exams were started in the summer of 2009 for all commercial treatment units and were completed in the fall of 2013. Information used in the diagnosis was gathered from various sources and a variety of ways including aerial photographs, 'walk-throughs', stand exams, and data from past stand exams (Timber Stand Management Record System (TSMRS) data base). More detailed information on the collection and use of data, and assumptions and limitations of the analysis is in the project file (PF-SILV-016).

Alternative 1 – No Action

Direct and Indirect Effects

There would be no direct effects on vegetation in the short term. The area would continue to change with natural forces determining stand conditions. The composition of the stand would change in direct relation to future disturbances. Ecosystem processes would continue and forest composition would change in direct relation to them. However, forest conditions would likely be

very different from what they were historically. The potential natural vegetation in the project area is Douglas-fir, grand fir, and subalpine fir. Although this is the theoretical climax forest, it is not what existed historically in the ponderosa pine cover types and is not likely to persist with climate change. Periodic fire maintained the seral species mix and structure historically, and fire would eventually burn these stands. With climate becoming warmer and drier, dense forest will be stressed and subject to insect and disease outbreaks, as well as, fires.

Though insects and pathogens are an inherent part of the forest, shifts in stand composition to climax species, increases in forest density, and forest structure with more ladder fuels would threaten ecosystem resilience and maintenance of biological functions. Dense, multi-storied stands are susceptible to and capable of supporting populations of western spruce budworm and dwarf mistletoe infections. The density of ponderosa pine stands range between 120-180 BA and are highly susceptible to mountain pine beetle outbreaks (Schmid et al. 2007). Mountain pine beetle has been active on the Bitterroot NF for the past 10 years killing both lodgepole and ponderosa pines. Although the number of trees killed and forested stands impacted on parts of the forest has been significant, the current level of MPB-caused tree mortality is greatly reduced. However, it is still killing individual trees in stands/forests where hazard to mountain pine beetle remains high. Flight dispersal distances of mountain pine beetle are variable; however, mountain pine beetles often attack trees within 180 feet of the tree they emerge from (Robertson et al. 2007). Conditions that influence beetle-caused mortality fluctuate annually and may change rapidly. Overall, 30% or more ponderosa pine mortality would be expected without treatment assuming conditions remain favorable for beetle reproduction and host colonization (Gibson 2008).

Without a landscape approach to treating stands, the Westside Project area could see an increase in mountain pine beetle-caused mortality (Schmid and Mata (2005) that could spread to previously treated stands.

Past regeneration units would not be thinned. Many of these forest plantations have successfully regenerated into high-density stands. These areas are too dense to achieve optimal growth rate and size. Without treatment, they may become suppressed and at risk of mountain pine beetle attack or stand replacement fire. The investment made to regenerate these plantations would be lost and the rotation would be set back.

Dense, continuous fuels will increase with the higher stand densities, decadence, and tree mortality. The higher fuel levels would increase the risk of high fire severity. In the event of an ignition, fire would rapidly change from surface to active crown fires (Monnig and Byler 1992).

In the absence of fire, shade-tolerant Douglas-fir, grand fir, and subalpine fir would increase in the understory. The multistoried stands of ponderosa pine and Douglas-fir are under stress from overstocking. Continuous, multiple vegetation layers of Douglas-fir with interconnecting crowns would continue to develop and increase the fire hazard. As stand structure becomes denser, so would competition for growing space and water. Inadequate growing space and water would increase tree stress and decrease tree resistance to insect and disease infestations. Ponderosa pine would decrease and eventually be replaced by shade-tolerant species. Fire-adapted native shrubs, grasses, and forbs would decline. These factors would continue to interact and create conditions highly susceptible to fire. Low-severity fires would be less likely due to the buildup of ladder fuels and downed woody material. Canopy gaps will occur due to mortality of individual trees and clumps of trees.

When fire does return to this landscape, it will most likely be of high severity. The fires of 2000 burned in similar stands with many of these same vegetative conditions. Much of the area had 70-100 percent tree mortality. The lack of seed, severe seedbed conditions, and competition from grasses and shrubs make regeneration extremely difficult. Invasive plants already present in the stands would increase relative to native species.

Cumulative Effects

If a stand replacing or mixed severity fire occurred, the resulting landscape would be similar to those on the Bitterroot National Forest that burned in the fires of 2000. Mixed severity fire events could lead to epidemic insect and disease population levels. Bark beetle-caused tree mortality could become significant following a large fire as occurred after the fires of 2000.

In addition, healthy trees in the beetle dispersal area can be mass-attacked as bark beetle populations' increase in the low vigor and injured trees (Oliver and Larson 1996, Hessberg et al. 2004). These large-scale disturbance events, fire and beetles, would change the forest character with the resulting landscape condition persisting for a long time. Natural regeneration would take longer than usual due to the lack of seed producing trees, and some areas may regenerate to a less ecologically desirable species. Active reforestation to establish site-adapted tree species may be limited if money to support such efforts is unavailable. Ecologically, this impact would occur most in ponderosa pine since it is the most seral tree species. Forest Plan goals and desired conditions would not be met for decades.

Alternative 2

This section describes the effects of Alternative 2 with the design features applied as described in Chapter 2 (Table 2-4). Detailed descriptions of the design features are in the project file (PF-SILV-016).

Direct and Indirect Effects of Silvicultural Treatments

The proposed treatment would change stand composition and structure through harvest and prescribed burning (Table 3-5). There would be clear changes to forest composition, structure, and successional stages in treated areas. Alternative 2 proposes to thin stands to reduce overstocking and favor more drought and fire resistant ponderosa pine. The treatment goal is to promote stand resilience to disturbance and stress factors, such as insects, disease, competition, and fire in the project area. The intent is to maintain insects and diseases at endemic levels and modify potential fire behavior, by reducing burn severity. Proposed timber harvest followed by prescribed fire would create vegetative conditions where ecological processes interact as they have historically. Ecological processes such as wildfire are more severe now than what they were historically (Hessburg et al. 1994, Steele 1993) and harder to contain and control, which increases the risks to lives and property.

The proposed treatments would alter forest structure by reducing surface fuels, increasing crown spacing, reducing stocking levels, and retaining large, fire-resistant tree species. Beneficial effects of the proposed treatments would be apparent for approximately 10-20 years. Though treatments would reduce stand densities and lower risks of insect and disease infestation, tree growth rates would dictate when the infestation risk level is reduced (Schmid et al. 1994). Reduction in stand densities would be an ongoing management practice in order to maintain forested conditions at a lowered susceptibility level. More than one treatment may be needed to reduce fuels and restore ecosystems. It may take up to seven treatments to return the area to acceptable conditions that mimic the historical range (Reinhardt et al. 2008). Fuel

treatments would be designed and implemented at the landscape level to reduce fire severity and intensity to create landscapes in which fire can occur without devastating consequences.

Thinning and harvesting create more open forest conditions and reduce tree-to-tree competition and remove stressed or unhealthy trees (Romme et al. 2006). The changes in forest conditions prevent insect and disease infestations by modifying key components of their habitats. Prevention reduces the risk of an attack getting started in a forest stand (Romme et al. 2006). Forest management is unlikely to prevent all outbreaks because it is not feasible to intensively manage the entire forest and many factors are beyond our control such as drought and climate change.

Table 3-5: Summary of Proposed Activities in the Westside Project Area

ACTIVITY	ALTERNATIVE 2
TOTAL COMMERCIAL HARVEST	**1347**
Intermediate Treatments (Improvement Cut)	506
Irregular Selection Cut	798
Aspen	43
TOTAL NON-COMMERCIAL THINNING	**2311**
Plantation	206
Slashing before Prescribed Fire	666
Non-commercial thinning associated with timber harvest units	1347
Aspen	92
TOTAL PRESCRIBED FIRE	**2013**
Prescribed fire associated with commercial harvest	1347
Prescribed fire with slashing	666
TOTAL AREA TREATED[1]	**5671**

[1]Total Area Treated is not the sum of total commercial harvest, total non-commercial thinning, and total prescribed fire because treatments overlap between these categories. In other words, several types of treatment occur in the same units.

Rather than view conditions resulting from insects and pathogens as static and unpredictable, we should manage the land with an understanding of the processes of change, recognize the probability of its occurrence, and manage vegetation that is resilient to insects, disease, and fire.

Commercial Harvest

Commercial harvest treatments are the intermediate and irregular harvests.

Intermediate Harvest

Intermediate harvests in the Westside project are improvement cuts. The objectives of them are:

- Thin the understory from below
- Thin the overstory from above favoring the best tree crown classes
- Removal of dead, dying and high risk trees to improve stand health, and recover value while maintaining appropriate numbers of snags, broken live topped trees and down logs for wildlife and future CWD needs

- Retain cover for wildlife by leaving untreated pockets and rejuvenating declining willow and other shrub species
- Maintain desired stocking levels by VRU and provide more growing space for seral tree species
- Maintain the large tree component of the overstory
- Break up the homogenous and continuous horizontal and vertical structures to create non-uniform structure
- Increase space between the overstory crowns to reduce the potential spread of active crown fire
- Create stands with low to moderate mountain pine beetle hazard rating
- Improve the health and vigor of larger trees, and reduce the impacts of forest insects and disease

Improvement cuts are similar to commercial thins except they focus on improving species composition and forest health rather than improving growth. The objective is to improve the existing stands by featuring the largest diameter classes, promoting fire-resilient stands, and reducing the number of stems, without incurring regeneration (Smith 1962). Improvement cuts would thin stands by removing diseased and less desirable tree species. The treatment units are a mix of tree species or densely stocked second growth ponderosa pine. Changes in forest structure caused by improvement cuts would be most evident in areas with high stocking and multiple layer canopies, and less evident in areas with lower stocking. Improvement cuts in a multiple layered canopy would create a more open canopy, reduce the number of trees per acre, and keep the largest diameter trees as much as possible. We recognize that some large trees would be cut and removed. The combination of thinning from below and crown thinning is called variable-density thinning. Variable-density thinning is designed to remove trees from the understory and then progress into the overstory until the desired spacing (or other prescribed outcome) is reached. The purpose of variable density thinning is to open the canopy and favor the development of the healthiest trees. To maintain forest structure, the understory would not be eliminated. Variable density thinning reduces fuel continuity within the canopy, increases canopy base height, and reduces canopy bulk density thereby reducing active crown-fire hazard.

Additionally, we expect there would be a balanced mix of shade intolerant species (ponderosa pine) and mid-tolerant species (Douglas-fir). Following treatment, the units would contain a mix of diameter classes if they are present and trees would be well spaced. The long-term goal of this treatment is to maintain a range of age classes, and adjust for mortality and growth by providing space for trees to grow into different size classes. Intermediate thinning treatments, would favor retaining the ponderosa pine on the drier sites and Douglas-fir on the moister sites. These types of treatments have been successfully used on other areas on the Bitterroot National Forest, including Hayes Creek, Haacke Claremont, Elk Bed, Larry Bass, Sweeny, Lower West Fork, Horse Lick, and Trapper Bunkhouse timber sales. Treatments would leave fewer trees, reduce ladder fuels and crown bulk density, and break up fuels and crown continuity. The residual trees would be larger, have thicker bark, and higher base crown heights making them more fire resistant. These tree characteristics would reduce the potential of passive and active crown fire and severe fire effects (Pollet and Omi 2002).

Within the proposed units, dead and dying trees may also be removed. Removal of some of the dead and dying trees would enhance the health of residual trees and increase the growing space, and capture the value of the material. Snags and potential snags would be retained in numbers appropriate to the habitat types to meet the needs of soil and wildlife resources.

Thinning stands can reduce damage from western spruce budworm overtime by reducing the number of canopy layers. Because of the heritability of resistance to feeding, improvement cuts can improve stand conditions by retaining trees that show little damage from budworm feeding during an outbreak. Thinning these trees improves individual tree vigor because fast growing vigorous trees do not provide favorable habitat for budworm as opposed to stressed trees.

Larger older ponderosa pine (remnant pine) would be treated in a manner to retain and perpetuate old-growth characteristics in this forest cover type. The senescent condition of many trees in stands makes prospects for restoration uncertain. The potential for mechanical or fire damage during treatment could reduce the number of old trees. There are no management guidelines for the appropriate density targets in restoration. However, historical conditions from 1900 provide reasonable density targets. Work by Covington et al. (1994) in the Southwest, and Arno et al. (1995) in the Northwest indicate that older ponderosa pine stands prior to 1900 had basal area densities less than 100 ft^2/ac. Improvement cutting in the overstory would reduce stand basal area and the amount of Douglas-fir. Understory thinning treatments would reduce the density of saplings and poles. Though reserve basal areas of 40-60 ft^2/ac are recommended for younger forests and uneven-aged stands to ensure regeneration of ponderosa pine, higher reserve densities can be sustained in older stands. Site utilization is less per square foot of basal area for large trees than for small trees (Fielder and Culley 1995). In other words, it takes fewer old growth trees to create a specific forest density than smaller trees so there will be more space between the larger, older trees than the smaller ones.

Thinning is needed before low severity surface fire can be safely reintroduced to many of the ponderosa pine stands in the Westside project area. More commonly, prescribed burning will be conducted as a follow up to harvest to reduce natural fuels and those generated by harvest. Reintroducing fire would be challenging in the old-growth forests because they have not experienced fire in more than 100 years (Harrington and Sackett 1992). Harrington and Sackett (1992) note that reducing decades of fuel buildup in a single burn could result in the loss of 20-50 percent old-growth trees in a stand. Current older ponderosa pine forests are vastly different from their pre-settlement counterparts that sustained frequent surface fire.

No old growth units would be treated under this alternative so there would be no direct, indirect, or cumulative effects on old growth forest.

Irregular selection

The objectives of irregular harvest are:

- Thin the overstory from above and retain the best crown classes
- Removal of dead, dying and high risk trees to improve stand health, and recover value, while maintaining appropriate numbers of snags, broken live topped trees and down logs for wildlife and future CWD needs
- Maintain desired stocking levels by VRU that provides for space and conditions favoring regeneration
- Create areas for the development of vertical structures for aesthetics, recreation and wildlife
- Maintain the large tree component of the overstory
- Break up the homogenous and continuous horizontal and vertical structures with canopy gaps of 2-20 acres
- Improve larger tree health and vigor and reduce the impacts of forest insects and disease

- Increase space between the overstory crowns to reduce the potential spread of active crown fire in the overstory
- Create stands with low to moderate mountain pine beetle hazard rating

Irregular selection is a combination of patch clearcuts (with and without reserves) and shelterwood with reserves integrated with variable density thinning. These combined types of harvest are used in predominately even-aged stands where more uneven-aged structure is desired. Patch clearcuts and shelterwood harvests are even-aged regeneration methods in which a new age class develops beneath the moderated micro-environment provided by the residual overstory. Retained trees would moderate post-harvest site conditions for the new regeneration, provide on-site, locally adapted seed sources, provide an on-site source of snag and coarse woody debris, maintain biological legacies of the past stand, and moderate the visual effects of the proposed harvest. The spatial arrangement of retained trees would be variable. Irregular harvest treatments establish and develop new age classes and ultimately, stand structure will be characterized by a diversity of vertical crown structure and cohorts.

Edges of patch clearcuts would be “feathered” by retaining 15-35 trees per acre adjacent to the openings in order to blend the edges of the openings. Opening sizes are estimated to range from 2-20 acres with the larger openings having irregular shapes (as opposed to squares or rectangles). Variable density thinning would be applied to the remaining portions of the identified treatment units retaining 40-60 BA of ponderosa pine and Douglas-fir.

These combined treatment activities are intended to develop at least 3 age classes within each associated treatment unit. In order to develop staggered age classes, additional entries would be planned in the next 15-20 years. Some areas within associated treatment units would be retained in an unharvested condition (retention). Many of the retention areas will be associated with drainage features, thereby protecting these features and maintaining mature trees where they are most likely to naturally persist for extended periods. Other retention patches will be associated with overstory forest conditions.

Patch clearcuts and shelterwood harvests should comprise no less than 20% of the area or greater than 50% of the area in the first entry cycle. The initial entry will develop openings while subsequent entries would primarily expand the initial openings and increase growing space and visible sky for shade intolerant ponderosa pine. Non-commercial thinning of the regeneration would occur as needed to ensure that the desired species survive to maturity through the intense competition that will occur on these growing sites throughout the first 20-30 years of stand development.

Irregular selection would also be used to remove Douglas-fir trees heavily infested with dwarf mistletoe. Removing these heavily infested trees reduces disease spread by reducing the infection source and increasing the space between trees. Within selected groups removal of all mistletoe trees may be prescribed. Removal of the heaviest mistletoe infections and thinning to favor tree species not affected by Douglas-fir dwarf mistletoe, such as ponderosa pine, would improve the overall health of the stand (Hadfield et al. 2000). Removing the dwarf mistletoe-infested trees creates open growing space and supports tree regeneration. The patch clear cuts would be large enough for successful seed germination and development of mistletoe-free seedlings.

Douglas-fir trees with lesser amounts of mistletoe would remain on the landscape following treatment. We recognize that eradication of dwarf mistletoe is not possible or desirable. The

openings would also support grasses, forbs, and shrubs that are largely absent under canopy cover.

Another type of irregular selection used in the Westside project is the removal of Douglas-fir and true firs in areas of high root rot infections that are surrounded by ponderosa pine. The impacts of root disease would be reduced by creating openings, under burning, and selecting for resistant tree species such as ponderosa pine.

Timber Harvest followed with Prescribed Fire

Commercial harvests would reduce the amount of shading on surface fuels, increase wind speeds, and reduce relative humidity at the forest floor, increase the fuel temperature, and reduce fuel moisture. These effects may increase the probability of ignition and surface rates of fire spread, depending on weather conditions, but the reduced fuel levels and arrangement of fuels would reduce fire severity and increase opportunities for wildfire management (Peterson et al. 2005). Surface fires, even high intensity surface fires, have less potential to progress into passive or active crown fires when ladder fuels are reduced. Reducing canopy bulk density lowers the potential that individual 'torch' trees (passive crown fire) would progress into an active crown fire. Lower overall fireline intensity would increase options for safe wildfire management (Van Wagner 1977, Rothermel 1983, 1991).

Prescribed fire is a tool for periodically reducing fuels and maintaining vegetative composition and structure in the VRUs. Timber harvest before prescribed fire allows fire to be reintroduced into the project area without causing high levels of tree mortality. Reinhardt et al. (2008) suggest that a realistic approach to fuel treatments is to "focus on creating conditions in which fire can occur without devastating consequences." This approach to fuel reduction requires achieving the final fuels objective through a series of treatments.

Timber harvest alone, without follow-up prescribed burning, does not alter wildfire behavior. Fuel loading reductions would reduce fire hazard through the combination of prescribed fire and mechanical treatments. Whole tree yarding followed by prescribed fire would reduce existing surface fuel loads and activity fuels to acceptable levels by removal, then consumption. Reducing surface fuels using prescribed fire and timber harvest lowers the risk the overstory would ignite in a wildfire (Graham et al. 2004). Reducing understory tree density and ladder fuels through slashing facilitates underburning and protects individual trees from scorch. Thinning and fuel treatments reduce fire severity and crown scorch (Pollet and Omi 2002).

Promoting regeneration of seral tree species such as ponderosa pine is another purpose for prescribed burning after harvest. Prescribed fire reduces accumulated duff, prepares seedbeds, and removes competing vegetation. Research shows natural regeneration of seral tree species is more prevalent on harvest and prescribed burn units then on harvested and unburned units (Jain, et al. 2012).

The season of burning differentially affects both the site and trees remaining after harvest. Spring burning is favored because smoke dispersal is generally good, treated areas with heavy fuels can be burned more safely, soil damage is minimal because forest floor and duff materials are only partially dried, spotting is reduced because surrounding areas have "greened" up, mop-up is cheaper, and it is easier to retain coarse woody debris. One disadvantage of burning in the spring is the roots of old trees and crowns of all trees are actively growing and especially vulnerable to fire damage (Fielder et al. 2007).

Fall burning better approximates natural fire because understory vegetation is cured or dormant. In the fall, more of the fuels and duff would be consumed. Greater duff reduction benefits the

regeneration of ponderosa pine. However, fall burning is harder to implement because atmospheric inversions greatly limit the number of burning days. Atmospheric inversions prevent smoke from dispersing and achieving air quality standards. Burning conditions for the appropriate fire severity may also be harder to achieve because fuels are dry.

In mixed conifer forests, it may not be possible to reduce surface and ladder fuels enough to prevent transitions to active crown fire. To harmonize competing management objectives, a mix of treatments such as removing canopy fuels, creating small openings, and preserving patches of trees with tighter crown spacing may be necessary. In this way, a passive crown fire may initiate, but would not gather momentum. The canopy gaps would constantly disrupt the passive crown fire and it would drop to a surface fire. If the fire weather and fuels conditions align so the fire burns back into the canopy, the fire will hit another opening and drop back to the ground (Jain et al. 2012)

We cannot change slope, aspects, general wind conditions, lightning strikes, or the time of day that a fire moves through an area. We can however modify fuels and therefore, change factors that affect fire behavior or burn severity. Agee and Skinner (2005) state the fundamental principles important for fuel reduction treatments are reducing surface fuels, raising the base height to live crown, decreasing crown density, and retaining large trees of fire-resistant species.

Fuel treatments never “fireproof” or create fire barriers. Under the right burning conditions, fires can burn through treatments or “spot” over them. But, treatments could greatly reduce the behavior of individual wildfires and overall fire patterns as they accumulate across the landscape or are strategically located (Finney 2001).

Non-Commercial Thinning with Prescribed Burning

Prescribed fire with non-commercial thinning would occur mainly in VRU 2 and 3. Low severity burn units are proposed because it is important to restore and maintain fire as a process of change on the landscape. Prescribed fire is a valuable tool for periodically reducing fuels, and restoring and maintaining vegetation. When vegetation attributes such as species composition and structure are within the historical range, prescribed fire without any prior harvest or thinning is appropriate to maintain these attributes.

Current stocking levels are relatively low to moderate in many units and burning could be accomplished with minor amounts of tree mortality because they are fairly open with south and southeast aspects. These units are primarily ponderosa pine, have open canopies, and limited and patchy ladder fuels. Prescribed burning is desired to reinstate ecosystem burning and restore burning cycles. Stocking levels would not appreciably change with this treatment, therefore, increased resiliency to insects and diseases would be minor. Prescribed burning would recycle nutrients into the soil where they would be available for uptake by vegetation. This flush of nutrients would enhance tree growth and other metabolic functions. As long as the burn is accomplished within prescription parameters, insects and diseases should remain at endemic levels and not increase.

Non-commercial thinning removes trees up to 10” DBH, depending on the site, and favors seral species. The felled trees would be lopped (cut into short sections) and scattered on the site. In some areas with heavy concentrations of slash, fuels less than 4” in diameter (mainly limbs and tops) would be piled and burned. The non-commercial thin units have scattered overstory and all trees greater than 10”DBH would be retained. The non-commercial thin units are not plantations except for Units 21 and 22. Prescribed fire is not planned in these younger plantations.

Targeted stand structure can be created more precisely with non-commercial thinning than with prescribed fire alone (van Wagtendonk 1996, Weatherspoon and Skinner 1996, Stephens 1998, Agee et al. 2000, Miller and Urban 2000) because specific trees are removed or retained. By itself, noncommercial thinning can effectively reduce the vertical fuel continuity that initiates active crown fires, especially when the removal of smaller trees is emphasized. In addition, thinning small material targets ladder fuels and specific components in the ladder-fuel stratum, and are more precise methods than prescribed fire alone. The net effect of removing ladder fuels is that surface fires are less likely to ignite the overstory canopy fuels. However, noncommercial thinning does little to reduce surface fuels, unless the fuels are compacted, crushed, or masticated during the thinning process. Noncommercial thinning may add to surface fuels and increase surface fire intensity unless the fine fuels are removed from the stand or otherwise treated with prescribed fire (Alexander and Yancik 1977).

Stand density in the understory would be reduced by 40-70 percent in the non-commercial thin units. Many, of these units have high densities of Douglas-fir in the pole size class. Most of the Douglas-fir trees in the understory are suppressed and not growing vigorously; they would not "release" even if they were retained. Due to high stem density in various units, these sites are experiencing high levels of competition and making the overstory susceptible to mountain pine beetle.

Units 21 and 22 are ponderosa pine plantations with current mountain pine beetle activity. After treatment, prescribed fire would be considered when beetle activity is low. Ponderosa pine trees would be thinned on a spacing that would reduce competition for water, nutrients and light, and increase growth and vigor on residual stems.

Overall, non-commercial treatments would retain trees 10"DBH and greater and no timber would be removed from the site. Non-commercial thinning would increase stand resilience to disturbance in the short-term and favor shade-intolerant trees addressing shifts in species competition that have occurred at the landscape level. Non-commercial thinning would move the landscape towards the desired future condition by retaining key tree species and structure.

Aspen Treatments

The objective is to improve existing aspen stands in Units 36, 37, 38, 39, 40, and 41 by featuring aspen and removing conifers within the clones (Table 3-5). Prescribed fire would be allowed to creep through the units.

Aspen clones occur as a component within the conifer dominated landscape of Westside project area. Most aspen clones are seral and can be replaced entirely by conifers without a periodic disturbance to kill old stems and trigger regeneration of new ramets (Sheppard, 1996). Aspen will generally be replaced by conifers because shade prevents suckering. Regeneration in aspen requires a disturbance that interrupts the balance between the roots and shoots causing stimulation of root buds (suckering). Disturbance can be caused by fire, disease, timber harvest, or temporal disturbance such as defoliation. To sucker, aspen require openings relatively free of an overstory canopy so sunlight can penetrate directly to the forest floor and warm the soil. The treatments would promote aspen regeneration to enhance age and size class distribution. The proposed treatments of removing competing conifers and prescribed burning the units would help restore aspen diversity across the landscape.

Cumulative Effects

Past Timber Harvest

Historic logging practices and changes in disturbance regimes within the lower elevation ponderosa pine and dry Douglas-forests have altered the look of the forest vegetation seen today as compared to 100 or more years ago. Historically this area was composed of large size ponderosa pine in a fairly open forest. Frequent disturbance processes kept these forests in the more open seral stage except on northerly facing slopes where typical disturbance processes were not as harsh. From the late 1890s through the early 1900s, all accessible land (based on logging methods at the time) was harvested. The logging removed most of the trees over six inches in diameter, from the valley floor up to 6,000 feet in elevation. Much of the project area was substantially harvested at the turn of the century as shown in figures 3-2, 3-3, and 3-4 and is not documented in the database.

Clearcut, shelterwood, or seed tree harvests since the 1960s created openings in the forest (Table 3-5). These silvicultural methods reduced forest homogeneity on the landscape by adding disturbance to the system. Treatments increased age class and species diversity by establishing young, shade intolerant stands. Openings were then planted or seeded in with a desired species, such as ponderosa pine and Douglas-fir. Current reforestation methods have evolved to hand planting with specific micro-sighting and using local seed.

In areas where intermediate treatments were done, the stands were thinned to reduce stocking levels or salvage harvested from fire, insects, or disease. Early intermediate treatments high graded some of the remaining large ponderosa pine with liberation harvests. More recent intermediate harvest treatments in the 1990s thru the 2000s focused on fuel treatments such as Hayes Creek and Lick Creek sales.

Uneven-aged harvest activities in the project area created openings within the stand where the objective was to allow regeneration to occur naturally. As an example, the Lick Creek Sale in the 1990s focused on single tree selection and a result of this activity is a mixture of size and age classes.

Table 3-4 displays the harvest activities that are documented in the FACTs database from the 1930s to the present day in the project area and immediately adjacent to the area. It is conceivable that additional harvest activities may have been implemented but not documented in the database because activities weren't tracked reliably until the 1960s.

Past Planting, Site Preparation, Natural Regeneration, Prescribed burning, and Timber Stand Improvement Activities

Post sale activities include prescribed burning, site preparation, planting, and timber stand improvement treatments such as broadcast burning, burning piles, rearranging fuels, or non-commercial thinning (Table 3-6). Generally, reforestation treatments beginning in the 1960s followed harvest activities on the same ground. In some cases planting followed immediately after harvest while in others, there was a time lag. In some areas, site preparation and planting activities successfully established regeneration before it could be outcompeted by regrowth of shrubs, herbaceous plants, or non-desirable tree species. Non-commercial thinning followed in 10 to 20 years and reduced the competition between trees, increased growth, and enhanced the development of commercial forests.

Small tree plantations are stocked with young, healthy seedlings and saplings. These plantations are the primary contributor to the age and size class, and species diversity in the project area. Where regeneration harvest occurred, the sites have regenerated to the desired species and

stocking levels from locally adapted seed. Alternative 2 continues the next phase of treatments previously implemented to maintain the fuels within their historic ranges and maintain healthy, vigorous stands. Combined with past treatments and treatments in adjoining watersheds, this alternative would increase productivity, vigor, and resilience on a greater landscape scale. Alternative 1 does not accomplish this.

Table 3-6: Past Planting and Timber Stand Improvement Activities-1960-2010

Fire and Fuel Treatments (acres)	1960	1970	1980	1990	2000	2010
Underburn			413	170		122
Broadcast Burn		33	700	170		
Burning of piled material			147	71	564	96
Rearrangement of Fuels					1047	11
Piling of Fuels, hand or machine	87	364	140		1136	11
Site Prep for Nat. regen-Burning						258
Site Prep for Planting-Burning						
Cultural Treatments (acres)						
Reforestation-Planted and Natural	26	332	467	1		
Non-Commercial Thin	174	318	211	40	86	72
Site Prep for planting-other		352	23			

Timber stand improvement usually occurred within the managed stands and consisted of spacing the desired trees, and lopping the thinned or slashed material. In more visually sensitive areas, the thinned material may have been piled and burned. Currently, the follow-up timber stand improvement of non-commercial thinning is difficult to accomplish due to budgetary constraints that creates a backlog of vegetative treatment needs. However, the Forest is able to complete a modest amount of TSI acres each year.

More recently, management focus has shifted from one of growth and yield to a desired condition reflective of the treatment objective. Within timber stand improvement projects, this shift focuses on thinning the small diameter trees (ladder fuels), and reducing slash created during timber harvest but keeping enough wood in the soil to replace nutrients. Thus, enough woody material is on the ground after treatment, such that follow-up burning is successful. Prescribed fire burns activity fuels or reduces natural fuels to their historic levels.

Specific to Unit 2a, broadcast (underburning) burning covered 538 acres and was completed in 1988 and 1989 (PF-Silv-018, PF-SILV-019). In 2005 approximately 134 acres of piles were burned following non-commercial thinning along the WUI boundary. The treatment has yet to be completed and some piles remain on the site. These past treatments have reduced ladder fuels by thinning the understory but have not reduced mountain pine beetle risk because the basal area (stand density) in the unit remains moderate to high. Understory thinning alone has not reduced the potential for mountain pine beetle-caused mortality.

Prescribed fire is a valuable tool for periodically reducing fuels, and restoring and maintaining vegetation as accomplished by the 1980 burns. Prescribed fire is successful when vegetation attributes such as species composition and structure are within the historical range of the VRU. Unit 2a does not have vegetation attributes within the historic range of VRU 2. Because Unit 2a was last harvested in the late 1800s and early 1900s, stocking levels are higher than is typical for VRU 2. Understory burning conducted under current conditions would create high levels of tree mortality.

Climate Change

Recent and projected changes in climate are likely to substantially stress many forest communities and tree species (Parry et al. 2007; Soja et al. 2007; Breshears et al. 2005, Field et al. 2007). At the regional scale, warming average annual temperatures, declining mountain snowpacks, and earlier spring runoff have been noted in the Pacific Northwest, which includes western Montana (Mote 2003, Stewart et al. 2004). Future changes are less certain, though an increase in average temperatures in commonly projected (Mote et al. 2005). These climatic trends suggest that forests in the project area, particularly the drier forest types, may continue to experience increased drought stress in future decades, much as has occurred in recent past decades. As discussed at length in other portions of this chapter, this stress is exacerbated by increasing tree densities and competition for limited water, weakening the trees and increasing their susceptibility to insects and disease infestation. In addition, climate trends in the Pacific Northwest, and indeed throughout much of the western United States, suggest that the risk of high intensity wildfires would continue (Westerling et al. 2006; Running 2006), intensified by increased forest density and fuel loads.

The proposed treatments in the Westside project area are designed to improve stand health and resiliency by altering forest composition, structure, density, and fuel loads. The treatments would maintain seral tree species that are well-adapted, long-lived, and fire resistant. Reducing forest density would improve tree vigor, which would improve forest adaptability and maintain its integrity through climate changes, and associated changes in insect, disease, or fire frequency. In lieu of the ability to dramatically alter climatic trends (at least in the short term), and with the inherent uncertainty regarding what specific long-term climatic changes may be, this is one of the best options to maintain intact, healthy, functioning forests that can provide for a variety of future resource and social needs.

Forest Carbon

Forests mitigate the effects of greenhouse gas emissions by removing carbon from the atmosphere and sequestering it in biomass. The proposed treatments would remove some carbon currently stored within live and dead trees. A portion of the carbon removed would remain stored for a period in wood products (US EPA 2009, Depro et al 2007). Harvest of live trees could temporarily convert some stands from a carbon sink that currently removes more carbon from the atmosphere than it emits, to a carbon source that emits more carbon through biomass decomposition than it absorbs through tree growth. As stands continue to develop the strength of the carbon sink would increase until peaking at an intermediate age and then gradually decline but remain positive (Pregitzer and Euskirchen 2004). Carbon stocks would continue to accumulate, although at a declining rate, until impacted by future disturbances. Over the long-term (centuries) net carbon storage is often zero because re-growth of trees recovers the carbon lost in the disturbance and in decomposition of trees killed by the disturbance (Kashian et al. 2006).

Management actions designed to maintain or restore forests to healthy and productive conditions would help maintain carbon stocks and sequestration rates. Increases in disturbance events such as wildfires and insect outbreaks, can release large amounts of carbon to the atmosphere (short- and long-term) and reduce carbon stocks (Field et al. 2007). The potential for future disturbances (insect, disease, fire) and the expected severity of those events in the Westside project area have been disclosed in the discussion of direct and indirect effects. Birdsey et al. (2006) indicate that forest management technologies that may reduce carbon dioxide emissions or increase productivity include: nutrient management, residue management

and utilization, thinning and better utilization of the resulting wood products, low-impact harvesting, and species or genotype selection. Though the proposed prescribed burning in the Westside project would reduce standing carbon stocks and result in atmospheric emission of carbon, it would be far less when compared to the amount of carbon that would be released during a wildfire (Finkral and Evans 2008).

Ultimately, it is not possible to specifically determine the cumulative impact on global carbon sequestration and atmospheric concentrations of carbon dioxide from the proposed Westside project activities. What is apparent is that these effects would be miniscule, particularly in the context of the 66,600 teragrams of carbon currently contained in U.S. Forests. The short-term change in carbon stocks and sequestration rates resulting from the proposed action are imperceptibly small on global and national scales, as are the potential long-term benefits.

Fuels and Fire Management

Affected Environment

The Western region fire risk assessment (Wildland Fire Executive Council 2012) rates the mean burn probability in Ravalli County as high (PF-Fire-011). This means, areas in Ravalli County have a high probability of burning in any given fire season.

Fire Regimes and Fire Groups

Fire regime is a general classification of the role fire would play on a landscape in the absence of human intervention. Fire regimes are based on the average number of years between fires (average fire return interval) and the characteristic fire severity. Fire groups (Fisher and Bradley 1987) summarize the ecological influence of fire on forest habitat types in western Montana. They incorporate fire regimes at a finer scale in the project area and identify the ecological role of fire in forest succession. Three fire regimes and six fire groups are represented in the Westside project area. Fire regime I includes fire groups 2 and 4 and has a high average fire return frequency (up to every 35 years). Fire severity tends to be low to mixed in these warm, dry ponderosa pine or Douglas-fir habitat types, depending on the interval between fires, and fuel accumulations. Fire regime III includes fire groups 6 and 8 and has a lower average fire return interval of 35-200 years. The fire severity in these Douglas-fir or lower subalpine habitat types however is also low to mixed because site conditions tend to be moist. Fire regime IV includes fire groups 9 and 11. The average fire return interval is 35-200 years but fires tend to be high severity, forest replacement (Fisher and Bradley 1987, National Interagency Fuels, Fire, and Vegetation Technology Transfer 2010). Most of the Westside project area is in fire regime III as represented by fire group 6 (3,603 acres). The typical fire severity is low with mixed severity fire in the moister, cooler, or overstocked sites.

Fire Behavior Fuel Models

Fuel models in the Westside project area transition from grass at low elevations to timber at higher elevations. Fuel models in the project area are:

- GR2 - Low Load, Dry Climate Grass (dynamic)
- GS2 – Moderate Load, Dry Climate Grass-Shrub
- SH2 – Moderate Load, Dry Shrub
- TL3 - Moderate Load Conifer Litter
- TU5 - Very High Load, Dry Climate Timber-Shrub (Landfire 2012, Scott and Burgan 2005)

Fuel conditions were modeled using typical summer conditions (dead fuel moistures less than 5%, live woody and herbaceous fuel moistures of 60% and 30%, respectively) at a range of wind speeds (Figure 3-10). At mid-flame wind speeds of 1 to 7 miles per hour, fuel models TU5, GR2, and L8 have flame lengths over 4 feet. This indicates potential fire behavior in these fuel types could be severe and difficult to control with hand crews and direct attack.

Fire History and Occurrence

Fire has been the major influence on vegetation patterns, composition, structure, function, age and development of both individual stands and the larger landscape (Habeck and Mutch 1973; Arno 1976; Arno 1980; Fischer and Bradley 1987). The mixture of forest types found in Montana developed under a variety of fire regimes, varying with moisture, temperature, and vegetation composition. While insects and disease are important disturbance agents as well as fire, their activities often contribute to the severity of fire.

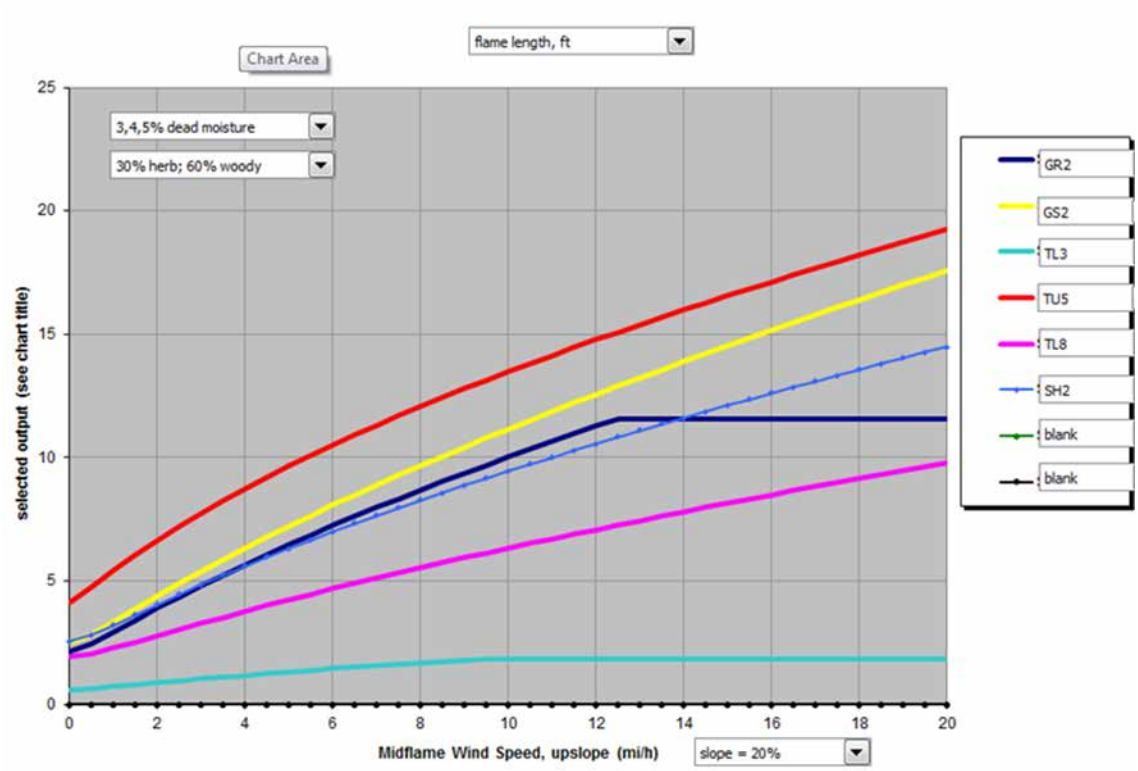

Figure 3-10: Flame Lengths for Primary Fire Behavior Fuel Models in Westside Project. GR2: Lowload, dry climate grass; GS2: Moderate Load, Dry Climate grass-shrub; TL3: Moderate load, conifer litter; TU5: Very high load, dry climate, timber-shrub; SH2: Moderate Load Dry Shrub

Bitterroot National Forest and Region1 fire data base records indicate large, severe fires have occurred in the area since the 1890s. The largest recorded fires in the analysis area occurred in 1915, 1931, 1988, and 2012 (Figure 3-11).

Fire growth in the Bitterroot area is typically from the west, southwest, following the prevailing winds. Therefore, fires that start in the Bitterroot Mountains west of the project area have the potential to move into the project area and east toward private land. Northwest winds have also led to large fire growth in the area. Fuel quantity, continuity, and arrangement across the landscape, are important factors in fire growth along with wind and moisture (i.e. drought). As

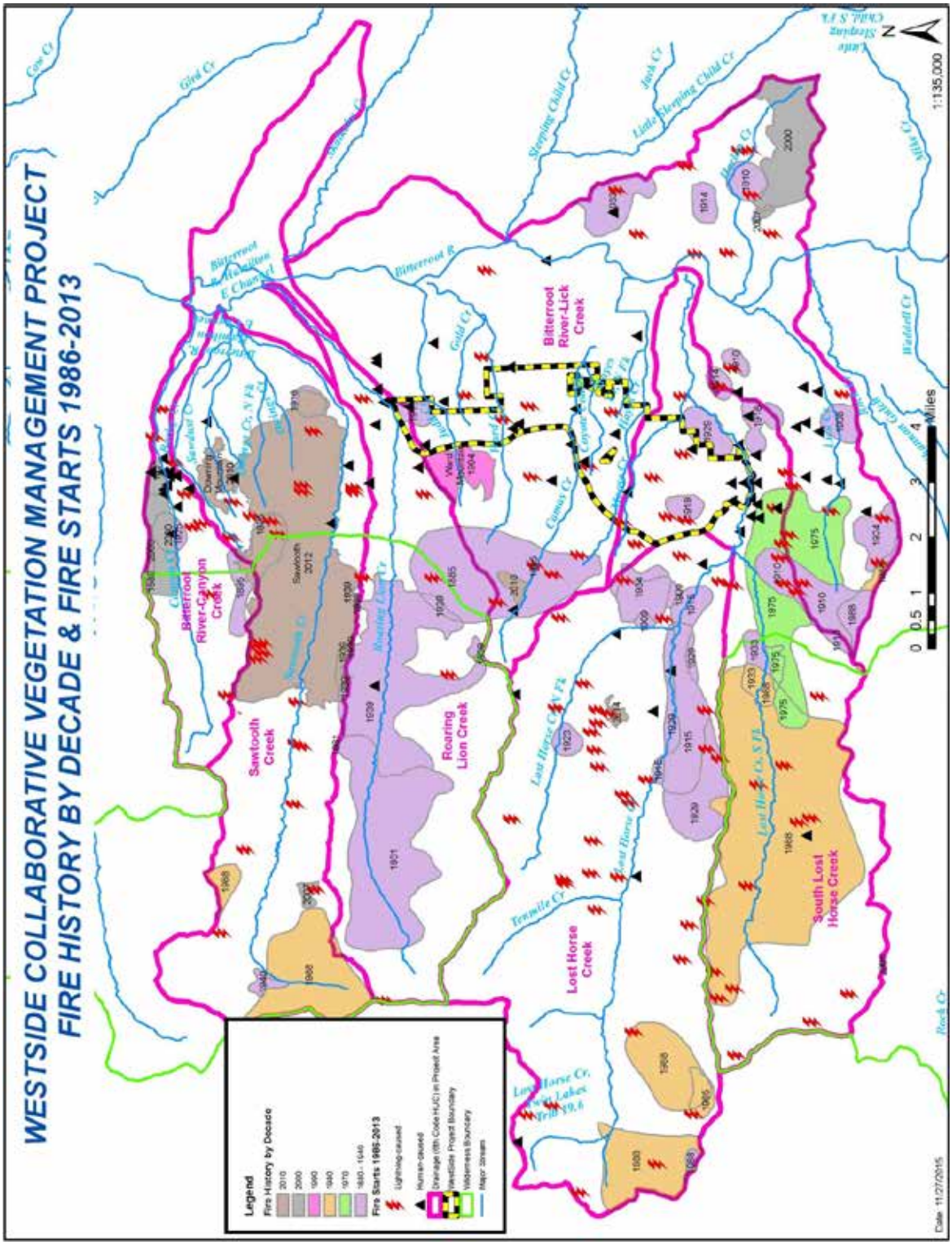

Figure 3-11 : Fire History by Decade and Fire Starts 1986-2013 in the Westside Project Area and 6th Order Hydrologic Units.

evidenced by nearby fires in 2012 (Sawtooth Fire), 2010 Downing Mountain, 2009 Kootenai, 1994 Ward Mountain, 2007 Tin Cup stand-replacing fires can negatively affect forest resources and private properties.

Past Management

Research indicates that past forest management practices, including successful fire suppression, have increase the amount of surface and canopy fuels in some western United States ecosystems. These high fuel loads increase the potential for severe fires (Brown and Arno, 1991; Mutch et al., 1993; Kolb et al., 1998; Keane et al., 2002; Stephens and Ruth, 2005). Because productivity exceeds decomposition in most of the West, surface fuels tend to increase in the absence of disturbance. In most coniferous forests, canopy fuels also increase and become more available without disturbance as more shade-tolerant trees become established in the understory and overstory (Keane et al. 2002).

Community Fuels Reduction Accomplishments (Private Land)

The Bitterroot Resource Conservation District (RC&D) has managed a fuels reduction grant program in Ravalli County since 2003. 1,048 acres of private lands near the project area have been treated (Table 3-7, PF-Fire-003).

Table 3-7: Bitterroot Resource Conservation District funded fuels treatments on private lands adjacent to the Westside project area.

TYPE CODE	STATUS	ACRES
0	Ongoing	38
1	Completed	770
2	Dropped	97
3	Treated w/o Grant:	240
TOTAL:		**1,048**

Environmental Consequences

Vegetation treatments can reduce the crown and surface fuels by thinning trees and burning, removing, or chipping surface fuels. Table 3-8 describes the effects of some fuel treatment principles.

Table 3-8: Fuel Treatment Principles[1]

PRINCIPLE	EFFECT	ADVANTAGE
Reduce Surface Fuels	Reduces potential flame length	Improves control, reduces torching
Increase Canopy Base Height	Requires longer flame length to start torching	Reduces torching
Decrease Crown Density	Makes tree-to-tree crown fire less likely	Reduces potential for active crown fire
Retains and Grows Larger Trees Favoring Fire Tolerant Species	Increases proportion of trees with thicker bark, taller crowns	Increases tree survival

[1] Adapted from Agee, J. K. 2002. Fire behavior and fire-resilient forests. In: Fitzgerald, S. A., ed. Fire in Oregon's forests: risks, effects, and treatment options. Portland, OR: Oregon Forest Resources Institute: 119.126.

The vegetation treatments propose reducing fuel loads by removing trees and reducing slash and surface fuel loads through timber harvest, understory thinning, and prescribed fire. Harvesting trees from the overstory reduces crown density. Thinning understory trees raises canopy base height and makes it more difficult for surface fire to reach the overstory and initiate a passive crown fire. The focus of thinning is to remove the smaller trees and species less resistant to fire and retain the larger, fire resistant trees for the habitat type. The proposed surface fuel treatment would reduce the amount of surface fuels to lower potential flame lengths. These treatments would improve the ability of the project area to withstand the adverse effects of future fires (Reinhardt (2008).

Methodology

Analysis Boundary

The fire history analysis is based on the 6th Code HUC (Hydrologic Unit) of 127,391 acres. Fires on the Bitterroot face tend to burn west to east and will impact the Westside project area.

Field Measurement

Westside project proposed treatment units were assessed by walk though field reconnaissance, Browns Transects for coarse woody debris plots (Project File PF-FIRE-001, 002), LANDFIRE data, and GIS data analyses. Field reconnaissance to determine representative stands for stand level modeling was conducted in 2015. All treatment units were visited. Fuel models (Anderson 1982), 40 Fuel Models (Scott/Burgan) photo fuel guides (Fischer 1981), and LANDFIRE data were used to estimate fuel model conditions throughout the treatment units. Method of assessment was based on fire groups (Fischer & Bradley 1987) and the FlamMap model. Fire Groups characterize the forest by vegetation and structure, fuel types and fuel structures, fire frequencies, and forest succession.

FlamMap (Version 5.0) is a spatial fire behavior mapping and analysis program that requires a landscape file, and fuel moisture and weather data. The basic fire behavior calculations in FlamMap characterize fuel hazard in fire management planning. FlamMap makes independent fire behavior calculations (for example, fireline intensity, and flame length) for each location of the raster landscape (cell), independent of one another. There is no predictor of fire movement across the landscape, and weather and wind information are held constant. FlamMap outputs are useful for comparing pre- and post-treatment effectiveness and identifying hazardous fuel and topographic combinations, thus aiding in prioritization and assessment (Stratton 2004). Landfire data was used for all required spatial inputs in the FlamMap analysis. More in-depth descriptions of the FlamMap model, assumptions, and limitations are in the project file (PF-FIRE-012) and previous analyses such as Como Forest Health project (2015).

Anticipated Consequences of Limitations

The limitations of the FlamMap analysis do not have substantial consequences on the comparative analysis of the alternatives. These analysis tools are sufficient to compare relative changes in fireline intensity, fire type, and arrival time to gauge the effectiveness of treatments in changing fire behavior.

Fire type is used to describe current fire behavior conditions in the Westside analysis area. One weather scenario was used in all fire behavior modeling to simulate "Extreme" fire danger conditions that typically occur during the peak fire season on the Bitterroot National Forest.

Modeling inputs included a maximum temperature of 85 degrees Fahrenheit, a 10-hour fuel moisture of 4%, and live fuel moisture of 70%, with three wind directions from the south, southwest and west at 25 miles per hour (20ft wind-speed). All weather and fuel moisture inputs are detailed in the project file.

Spatial and Temporal Context for Effects Analysis

Spatial Bounds: The direct and indirect effects analysis focus primarily within the project area boundary. The cumulative effects area boundary extends approximately one-half mile beyond the perimeter of the project boundary and 6th code HUC of 127,391 acres. This is considered adequate in size from which treatments could influence fire behavior on a landscape level and to address the issue of wildland fire and proposed treatment effectiveness in reducing home losses within and adjacent to the project area.

Temporal Bounds: The timeframe considered is approximately 10 years after treatments are implemented.

Alternative 1 – No Action

Direct and Indirect Effects & Cumulative Effects

There would be no vegetation treatment under Alternative 1, except those approved in previous NEPA decisions that are still currently active (Hayes Creek timber sale or timber stand improvement projects). Timber harvest in Hayes Creek timber sale has been completed but not the prescribed fire treatments. Without treatment, fuel conditions would persist and fuel loads would increase. In Alternative 1, stand conditions would continue to trend towards active crown fire initiation in moderate fire severity conditions (Alternative 2 – Proposed Action

Direct and Indirect Effects

Fire behavior was modeled based on surface fuels, stand composition, and structure to evaluate potential fire type, fireline intensity, and rate of spread for the project analysis area.

Proposed treatments are expected to reduce surface, ladder, and crown fuels and change the fuel model profile in all the proposed treatment areas once they are complete (Table 3-9).

Changes in the overall fuel profile reduces flame lengths, rate of spread, and the potential for passive and active crown fires (Fig. 3-13). This reduction in potential fire behavior improves fire management options to protect forest resources and adjoining properties. Treating the Westside project area will:

- make the forest more resilient to fire in lower elevation pine stands
- allow the use of prescribed fire to maintain natural fire regimes
- improve the ability of firefighters to manage fires safely

This alternative would contribute to the project's purpose and need, the desired condition, Forest Plan direction, Bitterroot Community Wildfire Protection Plan, and respond to the National Fire Plan goals of reducing hazardous fuels to modify current fire behavior.

Table 3-9, Fig. 3-12). Fire Regime Condition class would continue to depart from historic conditions. Under these conditions, fires would continue to be suppressed because of the potential fire severity and the resources at risk: people, property, high use, dispersed recreation, timber, and wildlife.

Alternative 2 – Proposed Action

Direct and Indirect Effects

Fire behavior was modeled based on surface fuels, stand composition, and structure to evaluate potential fire type, fireline intensity, and rate of spread for the project analysis area.

Proposed treatments are expected to reduce surface, ladder, and crown fuels and change the fuel model profile in all the proposed treatment areas once they are complete (Table 3-9).

Changes in the overall fuel profile reduces flame lengths, rate of spread, and the potential for passive and active crown fires (Fig. 3-13). This reduction in potential fire behavior improves fire management options to protect forest resources and adjoining properties. Treating the Westside project area will:

- make the forest more resilient to fire in lower elevation pine stands
- allow the use of prescribed fire to maintain natural fire regimes
- improve the ability of firefighters to manage fires safely

This alternative would contribute to the project's purpose and need, the desired condition, Forest Plan direction, Bitterroot Community Wildfire Protection Plan, and respond to the National Fire Plan goals of reducing hazardous fuels to modify current fire behavior.

Table 3-9: Alternative comparison of potential fire behavior at 90th percentile weather characteristics expected in the project area.

Potential Fire Behavior Characteristic	No Action		Proposed Action		Difference	
	Acres	Percent	Acres	Percent	Acres	Percent
Flame Length (feet)						
Non-Veg	25	0.4	25	0.4	0	0
0−4	1741	31	2983	52	+1242	+21
4.1−8	1571	28	1433	25	-138	- 3
8.1−11	412	7	169	3	-243	-4
11+	1949	34	1089	19	-860	-15
Fire Type						
Non-Veg	25	0.4	25	0.4	0	0
Surface fire	2454	43	3742	66	+1288	+23
Passive crown fire	3124	55	1925	34	-1188	-21
Active crown fire	95	2	6	0.1	-89	-2
Rate of Spread (chains per hour)[1]						
Non-Veg	25	0.4	25	0.4	0	0
0-5	1557	27	1800	32	+243	+4
5.1−10	322	6	1313	23	+991	+17
10.1−20	1035	18	1068	19	+33	+0.5
20.1−40	1374	24	612	11	-762	-13
40+	1385	24	879	15	-506	-9

[1]1 chain = 66 feet

The proposed action would improve potential fire behavior characteristics by increasing the areas with flame lengths of less than 4 feet on 21 percent of the project area (Table 3-9). Most of the reduction in flame lengths came from the 11-foot or greater category, generally adjacent

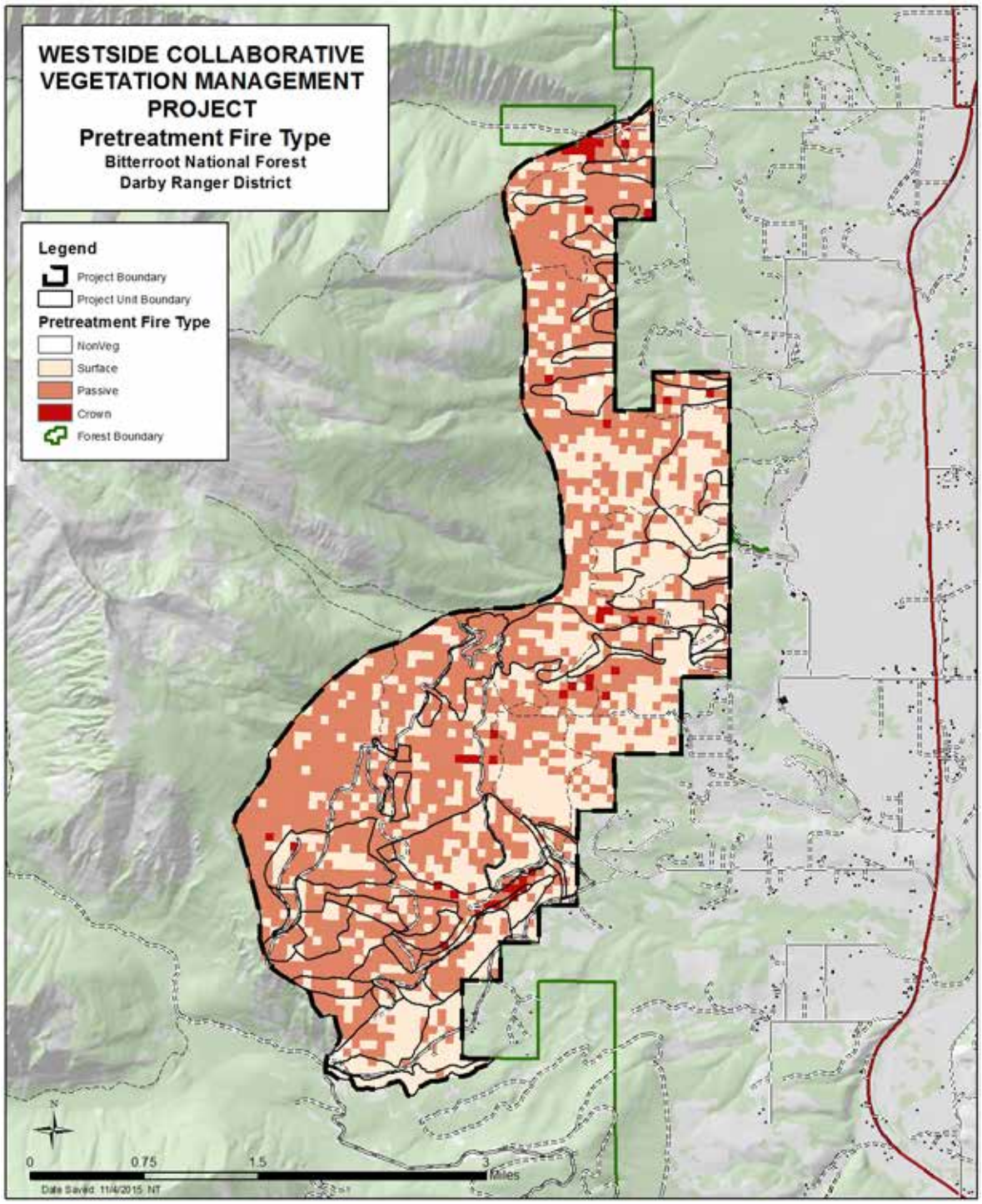

Figure 3-12: Fire Type under Alternative 1: No Action.

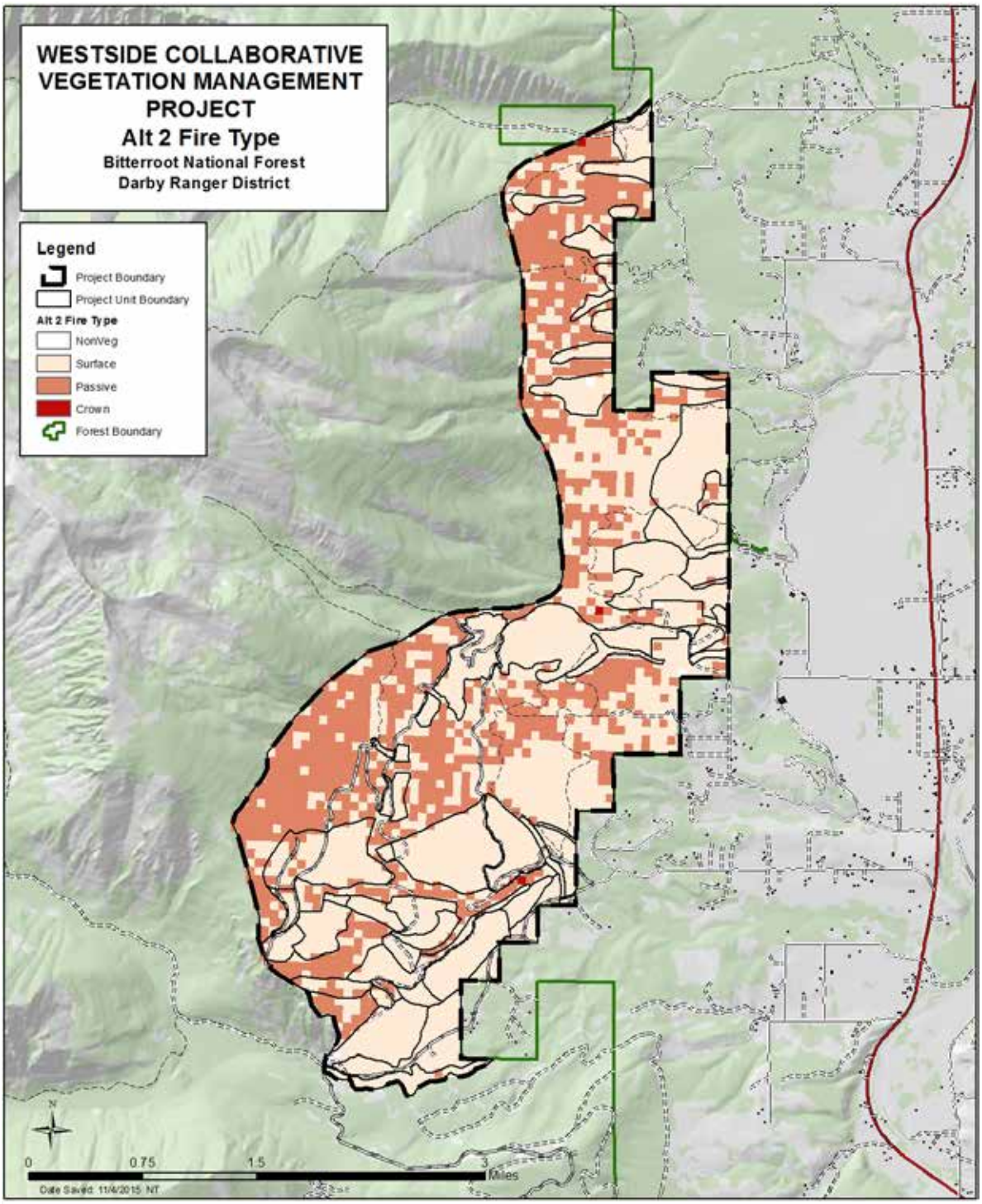

Figure 3-13: Fire Type under Alternative 2: Proposed Action

to the national forest boundary (PF-FIRE-012). The potential for surface fires increases by 23 percent and potential passive crown fire is reduced by about as much; active crown fire potential is almost non-existent. Areas with fire rates of spread less than 10 chains per hour increase on about 22 percent of the project area.

Scientific findings indicate the most appropriate fuel treatment strategy is often thinning (removing ladder fuels and decreasing crown density) followed by prescribed fire, piling and burning fuels, and mechanical treatments. Research shows that areas treated before a fire begins can decrease severity (Strom and Fule 2007; Peterson et al. 2005; Omi and Martinson 2004; Agee and Skinner 2005; Graham 2004; Pollet and Omi 2002; Fule et al. 2001). However, in extreme weather conditions, such as drought and high winds, fuel treatments may do little to mitigate fire spread or severity (Pollet and Omi 2002).

Treatments on national forest land would reduce fire intensity and passive and active crown fire potential, but may not directly protect all homes. Studies indicate that wildfire mitigation focused on structures and their immediate surroundings is the most effective at reducing structure ignitions (Cohen 1999, 2000, 2002; Scott 2003). Proposed treatments under this alternative would complement treatments being proposed on and currently occurring on private lands. While individual home-by-home treatments can help reduce the risk of loss of individual homes, relying solely on such treatments would forego strategic opportunities for managing fires in the wildland urban interface area. Although homes in the path of a wildfire are perhaps the most immediately recognized value at risk, research has determined that treatments need to go beyond the home ignition zone for other resource values (Graham 2004).

Cumulative Effects

Alternative 2 would complement other Forest Service treatments (Hayes Creek, TSI Thinning, Lost Moose Fuel Reduction), as well as complement the fuels reduction work on private land. Collectively, these projects would reduce surface, ladder, and crown fuels. National Forest and adjacent private lands would benefit from the maintenance of more natural fire regimes.

The selection of this alternative combined with past fuel management activities would modify fire behavior on the landscape by contributing to the overall reduction of surface, ladder, and crown fuels to reduce fire severity and passive and active crown fire.

Transportation

The transportation analysis reviews the National Forest System road (NFSR) locations and management to determine the suitability of the road system to meet current and foreseeable future management needs.

Affected Environment

The Civilian Conservation Corps constructed the Lost Horse Road (NFSR 429) between 1934 and. Many of the roads in the Hayes Creek drainage were constructed in the 1950s for timber harvest and removal.

The main collector roads in this project area (NFSR 429 and 496) get considerable motorized use during the year. Road 429 provides access into Lost Horse Canyon, Schumaker Campground, Twin Lakes, Bear Creek Pass Campground and Trailhead, as well as, trails in South Lost Horse, North Lost Horse, Bailey Lake, and the Selway-Bitterroot Wilderness. The Lost Horse drainage also has abundant rock climbing and bouldering opportunities. Recreational use in this area is expected to continue. Road 496 provides access to Lost Horse Observation Point, Coyote Coulee trailhead, and Camas Creek trailhead. These are very popular recreation destinations for hiking, and mountain bike and horseback riding.

The project area is relatively low elevation and accessible much earlier in the spring than other road systems on the forest. Recreational driving with four-wheel drive vehicles, as well as all-

terrain vehicles (ATVs), has increased in the last decade and loop roads are very popular. National Forest System roads 496 and 5620 create a loop road that is used throughout the year. A surge in motorized use occurs during the hunting season on NFSR 429, 496, and 5620, as well as non-motorized use on the closed roads. We expect motorized and non-motorized uses of these roads will continue and possibly increase. Timber harvest and the need for a road system to transport logs from the forest will also continue in the project area.

The primary destinations of road system users is access to the Lost Horse Corridor, wilderness trailheads, system trails, campgrounds, and other recreational opportunities in the project area. The open and seasonally open roads are used mainly for general forest access, recreation area access, timber harvest, fire suppression, land management, hunting access, and recreational driving. The roads closed yearlong to motorized use are used for administrative access, including timber harvest, forest monitoring, and non-motorized recreational uses, such as horseback riding, mountain bike riding, and berry picking. Many of these roads are not accessible to motorized traffic due to existing vegetative cover.

Project Area Road System

The Bitterroot National Forest completed a Forest Scale Roads Analysis (Subpart A) in the fall of 2015. This analysis identifies roads likely needed or not needed for future management at the Forest scale. The Subpart A analysis does not include site-specific information in its determinations. It is intended to inform planning while allowing ID Teams to determine the roads needed based on site-specific information. In the Westside project analysis, the ID Team identifies the minimum transportation system needed for future forest management in the project area. The ID Team identified an additional road (NFSR 62960) during field visits that would be needed in the future.

The Westside ID Team identified many of the same roads as not needed for future management as were identified in the Subpart A analysis and proposes these roads for decommissioning (PF-Transport-002).

The main access from US Hwy 93 to the Westside project area are County Roads 7400 (Hayes Creek Road) and 7600 (Lost Horse Road). Lost Horse County Road connects with NFSR 429. Within the project area, there are 9.4 miles of County road and 3.9 miles of undetermined roads (Table 3-10). The Bitter Root Irrigation District (BRID) accesses the Lost Horse Diversion structure from NFSR 429.

Existing undetermined roads in the project area were verified and field reviewed. Some of the undetermined roads have been waterbarred and have trees up to 9” DBH growing in the road prism. Other undetermined roads have bermed entrances and intact road prisms but require extensive work to be serviceable for timber harvest and removal. Undetermined road 62960 is needed for future forest management. It is intact and stable and provides access to Units 3e, 9b, 9c, and 9d. Alternative 2 proposes to place road 62960 on the National Forest System of Roads, as a ML 1 road. ML 1 roads are closed to motorized travel yearlong. The road has two stream crossings that have been removed. The Westside project would use both ends of the road so the crossings would not need to be re-established. The undetermined roads not needed for future management would be decommissioned and treated as needed to return them to the productive land base (Chapter 2, pg. 8, Table 2-3).

Table 3-10: Miles of Road by System in Alternatives 1 and 2 in the Westside Project Area

EXISTING SYSTEM	ALTS 1 (MILES)	ALTS 2 (MILES)	NOTES
National Forest System Roads (NFSR)	21.6	24.6	Constructed and maintained by the Bitterroot National Forest
Undetermined Roads	5.1	0.0	All of these roads are on National Forest System Lands
Ravalli County	9.4	9.4	Ravalli County jurisdiction and maintenance
Proposed New Construction National Forest System Roads	0.0	3.8	Constructed for Timber management
Undetermined road added to NFSR system	0.0	1.3	Road number 62960, connecting roads 62953 and 496B
Decommission – return to productive land base	0.0	5.9	Includes 3.9 miles Undetermined Roads and 2.0 miles of National Forest System Road

Operational Maintenance Levels

Operational Maintenance levels are assigned to roads considering resource needs, road condition, budgets, and environmental concerns. Table 3-11 shows current road mileage by maintenance level and the changes proposed in Alternative 2. All road mileage in Table 3-11 is National Forest System Road, or located on National Forest. The description of the maintenance level is taken from the Travel Routes Data Dictionary 3.1.

Table 3-11: Operational Maintenance Levels For Alternatives 1 and 2 in the Westside Collaborative Vegetation Management Project Area

MAINTENANCE LEVEL (ML)	ALT 1 (MILES)	ALT 2 (MILES)	OPERATIONAL MAINTENANCE LEVEL DESCRIPTION
ML 1	0.3	3.1	Roads placed in storage (> one year) between intermittent uses. Receive basic custodial maintenance and are closed to vehicular traffic. All miles are National Forest System roads (NFSR), includes 1.6 miles new construction, and 1.3 miles of previously undetermined road.
ML 2	7.8	8.5	Roads open for use by high clearance vehicles. All miles are NFSR, 1.3 to be decommissioned, and 1.9 miles new construction
ML 3	12.1	11.7	Roads are open to and maintained for travel by a prudent driver in a standard passenger car.
ML 4	1.4	1.4	Roads maintained for a moderate degree of user comfort
ML NA Undetermined	5.1	0.0	Undermined roads; future management needs not known; road prism exists
ML NA Not Needed	0.0	5.9	Previously undermined roads and NFSR roads no longer needed for future management. Decommission and return to the productive land base

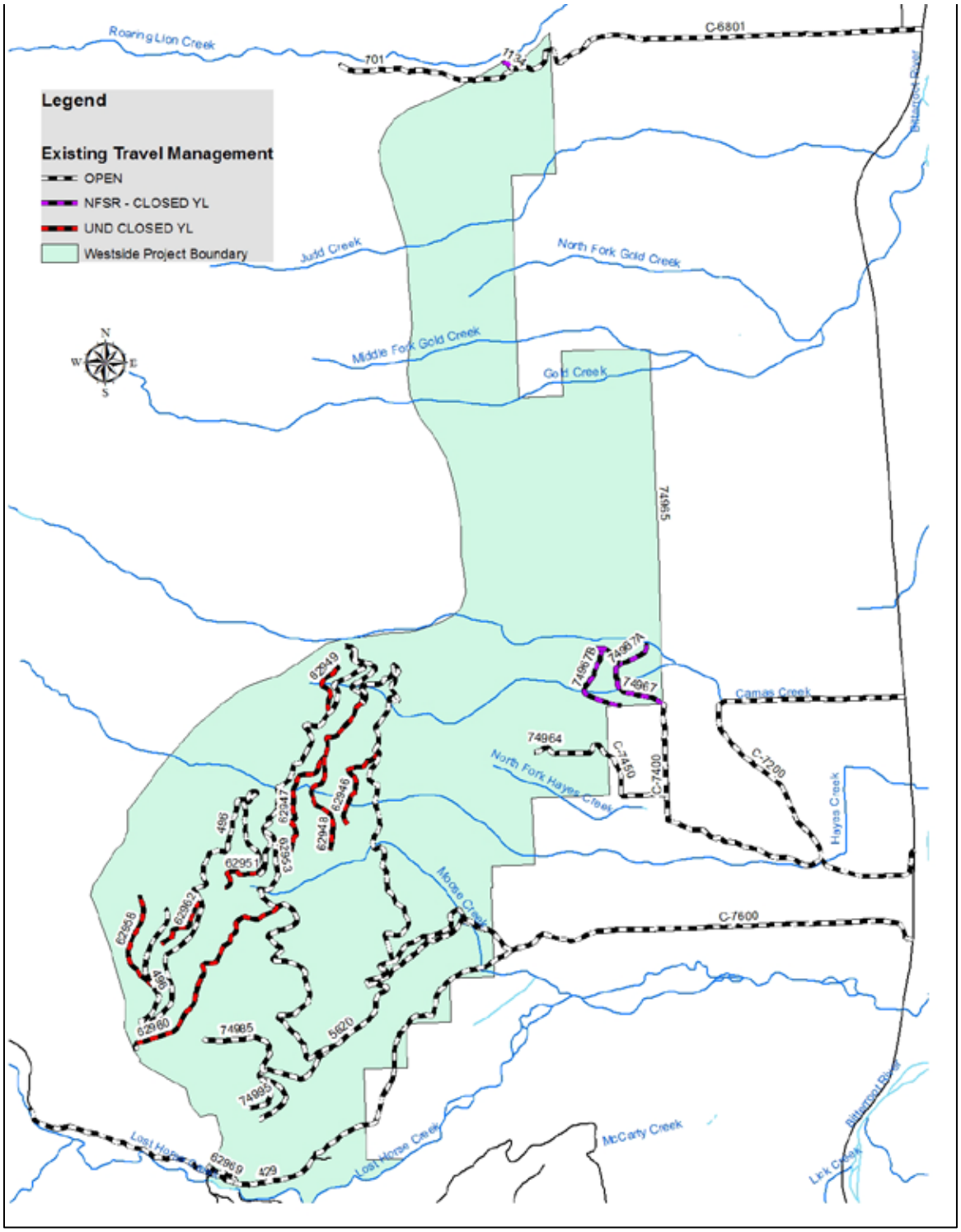

Figure 3-14: National Forest Service Transportation System in the Westside Project Area. The map shows the existing (Alternative 1) road system access travel.

Existing Access Travel Management

Existing access travel management in the project area ranges from 'open yearlong to street legal motorized vehicles' to 'closed yearlong to all motorized uses' (Figure 3-14). Current travel management under the alternatives in the Westside project area is shown in Table 3-12.

Desired Condition of the Transportation System

The desired condition in the Westside project is to identify the National Forest System of Roads needed for the current and future management of this part of the National Forest. Recommendations about the future need of undetermined and National Forest System Roads are included in Alternative 2 (Table 3-12).

Table 3-12: Travel Management in the Westside Project Area.

CURRENT TRAVEL MANAGEMENT	ALT 1 (MILES)	ALT 2 (MILES)	NOTES
No Restriction, Open Yearlong to street legal motorized	19.9	18.7	Reduction in Alt 2 due to decommissioning of 7485, 74995, 74967B, and portion of 5620
Closed yearlong, Undetermined roads*	5.1	0.0	*These roads are not accessible to full size motorized travel, a portion of road 62960 is currently being used by trail vehicles
R-1: Closed yearlong to all motorized (NFSR)	1.7	6.0	includes all new road construction in Alt 2, and 62960, previously undetermined road
Decommissioned, no motorized travel	0.0	5.9	Included all undermined roads, and NFSR 5620, 74967B

*There are 5.1 miles of undetermined roads in the project area. Most of the road mileage is currently unavailable to motorized traffic due to vegetative growth in the road prism. The exception is undetermined NFRS 62960 that is currently used by ATVs and motorcycles.

Environmental Consequences

Disposition of Roads

The ID Team reviewed the National Forest road system and undetermined roads and their utility for managing the resources in the project area (PF-TRANSPORT-019). They considered Goal 11 under Forest Management in the Bitterroot Valley Natural Resource Use Policy approved by the Ravalli County Commission, November 21, 2012. The ID Team considered the need for motorized access to economically and ecologically sustain forest health and fire hazard management and provide public access. They considered beneficial road uses such as, whether the roads were important for fuels management, summer, fall, or winter recreation, vegetation management, fire suppression access, access for state or private lands, and commercial access. They weighed these benefits against negative effects (risks) the roads might have on visuals, elk security, soils and water, and threatened and endangered species or their habitats. Most of the roads proposed for decommissioning in Alternative 2 are redundant to NFSR 496 and have low values for commercial and recreation access (PF-Transport-019). A few of the roads are eroding and contributing sediment to a tributary of Moose Creek. The roads are not needed for efficient forest management or fire protection. Trees and shrubs are currently growing on most of the roads proposed for decommissioning and the roads show no evidence of recreation or motorized use.

The ID Team recommended decommissioning 3.9 miles of undetermined roads system and two miles of National Forest System roads, returning these areas to the productive land base. The other 1.3 miles of undetermined roads would be added to the National Forest System of Roads. Treatments associated with decommissioning roads are described in Chapter 2, Table 2-3.

The Bitterroot Valley Natural Resource Use Policy has an objective of "no net loss of Forest Service roads and trails. Though the analysis shows a small net loss of roads (0.8mile) on the inventory (Table 2-7), there is no actual reduction in currently used roads or change in vehicle access. The roads proposed for decommissioning have grown in or are re-routed to avoid detrimental watershed effects.

Road Maintenance

NFSR 429 and NFSR 496 are high priority roads for maintenance because they receive high levels of use. The Westside project area is a popular recreation location due to its proximity to towns, existing trail system, low elevation, and ease of access. Forest road crews blade and shape roads for drainage, clean ditch-lines and culverts, replace or install culverts, fix cut and fill slope failures, clear roads of blowdown, place improved aggregate surfacing, and perform other work as needed.

Proposed Access Travel Management

Proposed access travel management in the project area range from open year-long to street legal motorized, to closed year-long to all motorized uses. Table 3-12 illustrates the proposed travel management of existing project roads in the Alternative 2. About 4.8 miles of road added onto the road system would be stored and closed yearlong to public motorized travel (Figure 3-15). About 1.9 of those miles would be available for Bitterroot National Forest administrative motorized use.

Travel management in the Westside project area does not change access on roads 429, 496, or 5620. It does however decommission system roads 74985, 74995, and a portion of 5620 (MP 0.00 to MP 0.7). Those roads to be decommissioned will no longer be available to motorized travel. To maintain access, a newly design road prism would be constructed to connect roads 496, and 5620. Changes in mileages by travel management category reflect the addition of roads to the National Forest road system. Roads added to the system and closed yearlong are currently accessed from road systems that are open yearlong to street legal motorized vehicles. Undetermined roads proposed for decommissioning are grown in with vegetation, and show no signs of recent use except for a portion of road 62960, currently receiving some trail vehicle use.

Project Design Features for Roads

NFSR 62953, Hayes Creek – Moose Creek Road, will be improved with aggregate surfacing at two crossings. In addition, ditches or culverts that have the potential to contribute sediment to Moose Creek or its tributaries will be cleaned.

Alternative 1 – No Action

Direct Effects and Indirect Effects

Alternative 1 does not identify the minimum transportation system needed for current or future management of National Forest System lands in the project area. There would be no change to the transportation system under Alternative 1 (Existing Condition).

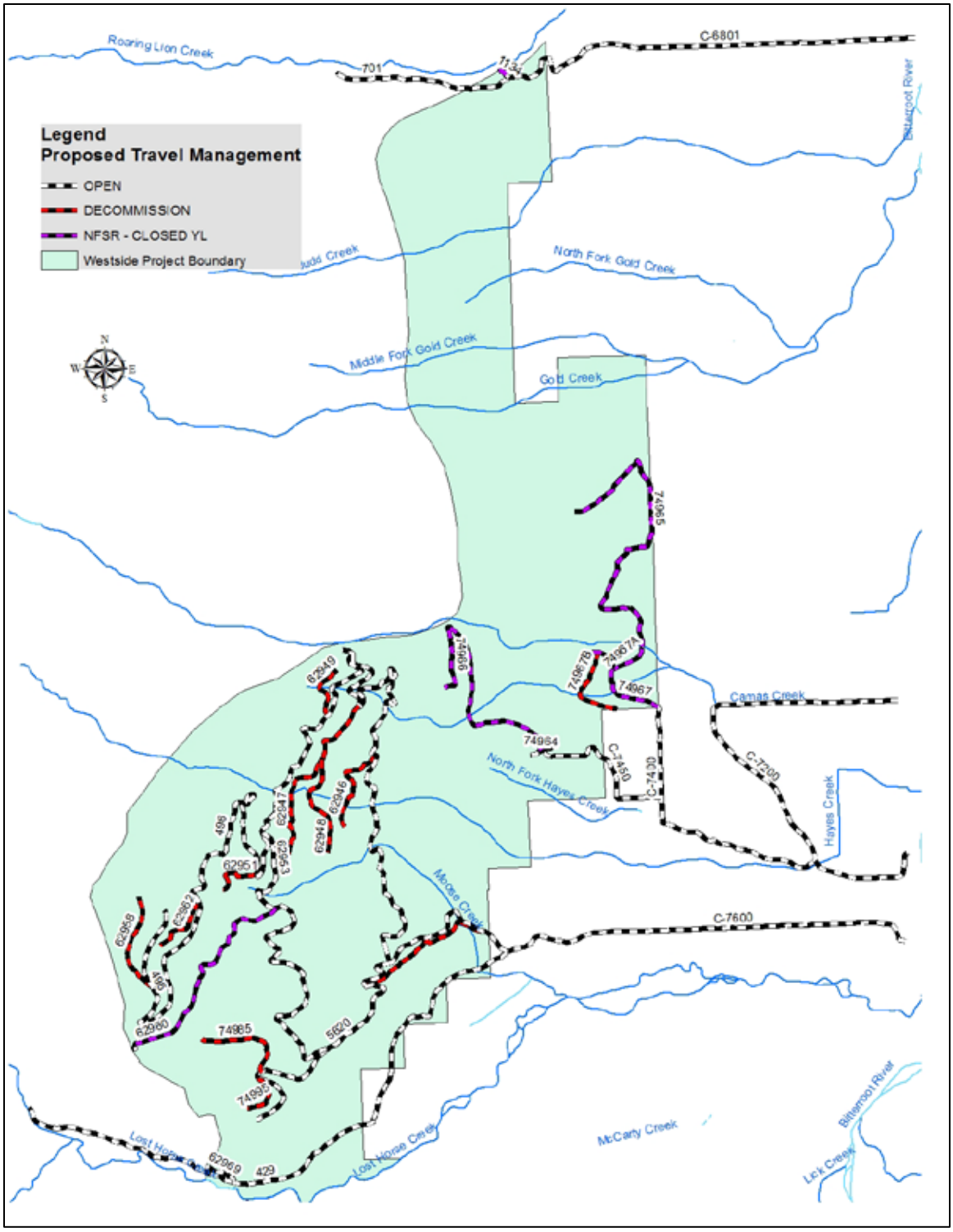

Figure 3-15: National Forest Service Transportation System in Alternative 2 in the Westside Project Area. The map shows the proposed travel management of the road system.

Alternative 2 – Proposed Action

Direct and Indirect Effects

Most of the roads added to the system would be ML-1. The maintenance cost of these roads would be minimal to non-existent once the roads are stored due to improved hydrologic function of road prism after road storage treatments and the yearlong restriction on motorized use. The road into Units 2a and 2b would be ML 2 to accommodate Forest Service administrative motorized use but closed to public motorized use (Figure 3-15). This road would remain intact with appropriate road surface drainage and culverts left in drainages at the end of the project.

ML 1 roads, when needed for administrative use such as a timber sale, receive a higher degree of maintenance, depending on the condition of each individual road. This work may include surface grading, slump removal, brushing, clearing, drainage improvement, culvert installation, and spot surfacing. The maintenance level may be increased during administrative use. The costs associated with the higher degree of maintenance are absorbed by the timber sale and not the annual road maintenance budget. Once the administrative activities are accomplished, these roads would return to ML 1.

Illegal motorized use on ML-1 roads may increase following project implementation. However, the appearance of the roads would be minimized (Table 2-4).

Economics

This section describes the economic impact area, analysis methods, and economic effects of the Westside project. Analysis of the economic effects includes sale feasibility, financial efficiency, and economic impacts. The affected environment section presents a variety of demographic, social, and economic variables that describe the current state of the social-economic environment. Sale feasibility and financial efficiency are used to evaluate the costs and revenues of implementing the project. Economic impacts indicate the project effects on the local economy.

Affected Environment

Economic Impact Area

The affected environment for the economic analysis is synonymous with the economic impact area. The economic impact area for the Westside project is Ravalli and Missoula Counties of Montana. This area was selected because:

- The project is located in Ravalli County
- The primary wood product would most likely be transported to Missoula County for processing
- Contractors and sub-contractors performing the work will likely be residents of Missoula and Ravalli Counties. (FSH 1909.17(24))

Selection of this area as the economic impact area followed guidance in FSH 1909.17(24).

Environmental Consequences

Methodology

The economic measures used for this report are sale feasibility, financial efficiency, and economic impacts.

Sale feasibility is used to determine if a timber sale is likely to attract bids, given current market conditions. The determination of feasibility relies on a residual value appraisal. The residual value is calculated as the revenue – based on local delivered log prices – minus the costs of logging and required rehabilitative work. The appraised value of a timber sale is referred to as stumpage. The appraised stumpage rate from this analysis is compared to the base rate (a legally required minimum stumpage rate considered essential to cover required reforestation plus minimum payment to the Federal treasury). The sale is considered feasible if the appraised stumpage rate exceeds the base rate. If the stumpage rate is less than the base rate, it does not mean that the timber sale cannot occur; it means there is a higher risk that the project would not attract bids or would need supplemental funding to be implemented.

The volume of timber harvested is a critical component of sale feasibility and is measured in this analysis as one hundred cubic feet (CCF). Costs or values associated with the timber harvest are expressed in terms of dollars per CCF of sawtimber ($/CCF).

The analyst used the Forest Service Region 1 Alternative Feasibility tool to determine feasibility. The Alternative Feasibility tool is a spreadsheet that compiles and processes all the information necessary to determine sale feasibility.

The logging costs used in the feasibility tool are developed through ongoing research conducted by the University of Montana's Bureau of Business and Economic Research. Other cost estimates were developed through comparison of recent timber sale appraisals and professional estimates.

Financial efficiency provides information relevant to the future financial position of the program if the project is implemented. Financial efficiency considers anticipated costs and revenues that are part of Forest Service monetary transactions. Present net value (PNV) is the measure of financial efficiency. The analyst used the Project Economic Analysis Tool (PEAT) to calculate PNV. PNV combines benefits and costs that occur at different times and discounts them into an amount that is equivalent to all economic activity in a single year. A positive PNV indicates that the alternative is financially efficient.

The PNV analysis is not intended to be comprehensive, incorporating a monetary expression of all known market and non-market benefits and costs, because economic efficiency is not the sole 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 this report.

Management of the forest is expected to yield positive benefits, but not necessarily financial benefits. Costs for restoration activities are based on recent experienced costs and professional estimates. Non-harvest related costs are included in the PNV analysis, but they are not included in appraised timber value.

Economic impacts are the potential direct, indirect, and cumulative effects on the economy. Economic impacts are estimated using input-output analysis. Input-output analysis is a means of examining relationships within an economy, both between businesses and between businesses and final consumers. It captures all monetary market transactions for consumption in a given time period. The resulting mathematical representation allows one to examine the effect of a change in one or several economic activities on an entire economy, all else constant. This examination is called impact analysis. The IMPLAN modeling system (Minnesota IMPLAN Group 2003) allows the user to build regional economic models of one or more counties for a particular year. The model for this analysis used the 2009 IMPLAN data. IMPLAN translates changes in

final demand for goods and services into resulting changes in economic effects, such as labor, income, and employment of the affected area's economy.

The economically affected area is referred to in this report as the economic impact area. The Forest Service Economic and Social Analysis Handbook states that an economic impact area "should be defined as (1) a functional economic unit of a size appropriate to the [project] and (2) an area that includes most of economic factors that are most directly affected by the [project]." It goes on to state that "a practical limitation is that economic impact areas must be some combination of individual counties."

The economic effects are measured by estimating the direct jobs and labor income generated by

- the processing of the timber volume from the project
- the dollars resulting from any restoration activities of the project into the impact area.

The direct employment and labor income benefit employees and their families and, therefore, directly affect the local economy. Additional indirect and induced multiplier effects (ripple effects) are generated by the direct activities. Together the direct and indirect effects comprise the total economic impacts to the local economy.

The data used to estimate the direct effects from the timber harvest and processing were provided by the University of Montana's Bureau of Business and Economic Research (BBER). This national data is broken into multi-state regions and is considered more accurate than that which is available from IMPLAN. The Northern Rockies BBER region (Montana and Idaho) is used for this analysis. The BBER data represents the results of mill censuses that correlate production, employment, and labor income. The indirect and induced multiplier effects were estimated using the IMPLAN model for the economic impact area. For restoration and reforestation activities, the direct, indirect, and induced effects were derived using IMPLAN.

Potential limitations of these estimates are the time lag in IMPLAN data and the data intensive input-output model. Significant changes in economic sectors since the latest data for IMPLAN have been adjusted using information from the University of Montana's Bureau of Business and Economic Research.

Alternative 1 – No Action

The no-action alternative would not harvest timber, implement BMPs on haul routes, or take any restorative actions and, therefore, incurs no financial costs. It would also produce no revenue, jobs, or income.

Alternative 2 – Proposed Action

Timber Sale Feasibility

As described in the methodology section, the timber sale is feasible if the estimated stumpage rate is greater than the base rate of $4.00/CCF.

The volume of timber harvested is directly related to the number of acres harvested and the treatments proposed in each cutting unit. This sale would harvest approximately 13,022 CCF of saw timber.

The stumpage rate reflects a wide array of costs associated with the timber sale. These can be categorized as (1) stump-to-mill costs and (2) other logging costs.

Stump-to-mill costs include the direct cost of cutting, skidding, processing, loading, and hauling the logs to the mill. The stump-to-mill costs are most affected by the type of logging system

(ground-based or skyline) required to cut and skid the trees, the size of the trees, the volume per acre, the skidding distance, and the haul distance from the cutting unit to the sawmill. The logging and hauling costs are summarized in Table 3-13 and based on detailed information in the project file (PF-ECON-026).

Table 3-13: Stump-to-mill Costs in the Westside Project

APPRAISAL ITEM	TOTAL COST ($)	UNIT COST ($/ TOTAL CCF OF SAWTIMBER)
Ground-based logging	848,030	65.12
Ground Lead Logging (winching or bull-line)	31,132	2.39
Skyline Logging	219,934	16.89
Log Hauling	737,800	56.66
Total	**1,836,897**	**140.06**

In addition to the stump-to-mill costs, road maintenance, temporary road, specified road, and environmental costs are required in the timber sale contract. Road maintenance costs include the necessary work to support vehicle operations and implement Best Management Practices (BMPs). Environmental costs include slash disposal, erosion control, and other cleanup work. Temporary road costs include construction, maintenance, and rehabilitation of temporary roads. Rehabilitation of temporary roads include recontouring and erosion control work. Erosion control consists of applying seed and fertilizer to soil disturbed by harvesting activities. Specified road costs include survey, design, construction, and reconstruction of Forest Service system roads. Costs associated with bridge construction are included under specified roads.

Table 3-14 shows other logging costs for the proposed action. These costs are included in the stumpage rate calculation because they are required under the timber sale contract and included in the appraisal. Essentially, the stump-to-mill and other logging costs are covered by the value of the timber harvested.

Table 3-14: Other Logging Costs in the Westside Project

APPRAISAL ITEM	TOTAL COST ($)	UNIT COST ($/ TOTAL CCF OF SAWTIMBER)
Road Maintenance	26,044	2.00
Environmental	97,216	7.47
Temporary Roads	42,553	3.27
Specified Roads	254,500	19.54
Total	**420,313**	**32.28**

The calculation of the stumpage rate is shown in Table 3-15. The table shows the estimated delivered log value, followed by the appraisal costs. The result is the stumpage rate of $11.87/CCF. Because the stumpage rate is greater than the base rate, the timber sale is considered feasible.

Table 3-15: Stumpage Rate Calculation for the Westside Project

	TOTAL VALUE ($)	UNIT VALUE ($/ TOTAL CCF OF SAWTIMBER)
Delivered Log Value	2,386,347	183.25
Stump-to-Mill Cost	-1,836,897	-141.06
Other Logging Costs	-420,313	-32.28
Stumpage Rate	**129,178**	**9.92**
Base Rate	NA	4.00

Financial Efficiency

The financial efficiency analysis is specific to the timber harvest and ecosystem management activities associated with the project (FSM 2400–Timber Management and FSH 2409.18). Costs for sale preparation, sale administration, and ecosystem restoration are included. All costs, timing, and amounts were developed by the specialists on the Westside project ID Team.

The expected revenue for Alternative 2 is the predicted high bid from the sale feasibility analysis multiplied by the volume of sawtimber harvested. The predicted high bid is used for the expected revenue (rather than the appraised stumpage rate) since the predicted high bid is the best estimate of the high bid resulting from the timber sale auction. The actual timber value will depend on the market when the timber is sold and may be higher or lower than the predicted high bid. The predicted high bid is the expected revenue from both sawtimber and non-sawtimber products.

Two versions of PNV are calculated because not all project costs are associated with the timber harvest. The first PNV reflects sale preparation and administration costs, including the required design criteria. The total PNV of all proposed expenditures includes sale preparation, sale administration, and the costs of the restoration activities (Table 3-16). Present Net Value is calculated using a four percent discount rate. Cost estimates are described in the resource sections and the economics project file.

The PNV for timber sale-related expenditures and for all expenditures are $-120,896 and $-828,604, respectively.

Economic Impact

Jobs and Income Contributed

The economic effects of the Westside project are measured by the jobs and labor income contributed to the economic impact area (Missoula and Ravalli Counties) over the life of the project. Direct jobs and labor income result from timber harvest and total jobs and labor income include both timber harvest and restoration activities (Table 3-17). These jobs or income are not new to the economic impact area but are jobs and income attributed to this project. Estimates for these activities were developed by the resource specialists based on similar projects occurring on the Bitterroot National Forest (PF-ECON-026).

The analysis assumes the timber volume would be processed within the designated impact area. However, if some of it were processed outside the region, then a portion of the jobs and income would be lost from this economic impact area.

Table 3-16: Present Net Values of the Westside Timber Sale showing direct timber sale costs and costs associated with all associated forest management projects.

TIMBER SALE EXPENDITURES	VALUE ($)	ALL PROPOSED EXPENDITURES	VALUE ($)
PREDICTED HIGH BID	**379,331**		
Sale Preparation	-204,706	Sale Preparation	-204,706
Sale Administration	-275,285	Sale Administration	-275,285
		Non-Commercial Thinning	-122,192
		Prescribed Fire	-654,911
		Road Decommissioning	-17,750
		Relocation of Forest Road 5620	-5,800
		Noxious Weed Treatment	-40,700
Total Timber Sale Expenditures	-479,991	Total Additional Expenditures	-1,321,344
PRESENT NET VALUE OF TIMBER SALE EXPENDITURES (USING A 4% DISCOUNT RATE)	**-120,896**	**PRESENT NET VALUE OF ALL EXPENDITURES (USING A 4% DISCOUNT RATE)**	**-828,604**

Table 3-17: Jobs and Labor Income over the Project Time Span, includes timber sale and restoration work.

	ALTERNATIVE 2
Direct Jobs	44
Total Jobs	77
Direct Labor Income ($)	2,039,000
Total Labor Income ($)	3,309,000

Impact to Tourism and Agriculture

Some public comments expressed concern over potential impacts to the tourism and agricultural economies. As previously stated, this economic analysis is not intended to be a comprehensive analysis of all market benefits and costs. It would be very difficult to quantify such effects at either the local or regional level. A qualitative analysis indicates there will be little to no economic effect on either the tourism or the agriculture industries (Recreation and Hydrology effects analysis). There may be a temporary effect, during implementation of the project, to tourism businesses adjacent to the project area, due to closures in the project area.

Road, trail, and area closures implemented during harvesting activities would temporarily affect public use. It is unlikely that any given closure would last longer than several months and each closure would be site-specific; that is to say, the entire project area would not be closed for the duration of the timber sale. Closures would inconvenience people recreating in the area, particularly those who use it regularly. But, because the Bitterroot National Forest is home to dozens of other recreational opportunities similar to those offered in the project area, the opportunity to recreate on the forest will not be diminished.

Also, there is no evidence that selective timber harvest will have a long-term effect on recreational use of the area. The Bitterroot National Forest has completed similar timber sales with ground-based skidding and selective treatments at more than 10 other recreation sites since 2010. These include two of the most popular recreation areas on the forest: the Bass

Creek Recreation Area (Larry Bass Stewardship Project) and the Lake Como Recreation Area (Como Campground Timber Sale). Aside from temporary closures during the timber sale, there has been no observable decrease in recreational use following completion of timber harvest.

Comments about potential impacts to the agriculture economy cite sedimentation of and physical impacts to irrigation ditches. Sedimentation from soil disturbed through harvesting operations is mitigated through planning, harvest unit design, and standard procedures in the timber sale contract. All of these forestry practices minimize the area disturbed during operations. It is standard procedure for the Forest Service timber sale contract to display irrigation ditch locations and require the timber sale purchaser to address how they will be protected during operations.

Recreation and Trails

The Westside Project area includes several trails within its boundary that are semi improved or developed and provide a full complement of recreation opportunities. The area receives an estimated 10,000 users annually. Recreation opportunities on the trail systems include: hiking, backpacking, horseback riding, mountain biking, motorcycling, and all-terrain vehicle riding. Trails in the project area offer access to the Selway-Bitterroot Wilderness. Other popular recreation activities include student educational field trips, rock climbing, viewing scenery, and hunting, and in winter, snowshoeing, and cross-country skiing.

The recreation and trails analysis focuses on public health and safety, maintaining multiple use recreation opportunities, maintaining the visual integrity, esthetics, and natural beauty of the area while achieving project objectives. The analysis identifies the existing recreation opportunities and discloses the potential effects on recreation and trails from the proposed management.

Affected Environment

Recreation

The National Visitor Use Monitoring survey (NVUM) data reveal that most visitors to the Bitterroot National Forest are local and recreate within 50 miles of their home. The most common activities that visitors come to the Bitterroot National Forest for are hiking, walking, and hunting. Driving for pleasure is also a popular recreation activity. According to the 2006 NVUM survey, approximately 58% of visitors participated in viewing wildlife, birds, fish, etc. and approximately 74% participated in viewing natural features (scenery).

There are no developed recreation sites within the project area. Most of the recreational uses in the Westside project area are dispersed uses such as recreational driving, hunting, hiking, berry picking, firewood gathering, viewing scenery and wildlife, horseback riding, mountain bike riding, ATV riding, snowmobile riding, rock climbing, cross-country skiing, shooting firearms, and camping in dispersed campsites. Twenty-three dispersed campsites are in the project area and receive moderate to high use during the summer and moderate use in the fall. The dispersed campsites provide an alternative camping area and most are located along the Lost Horse road on the southern border of the project area. They are primitive sites and do not contain any developed facilities (such as picnic tables or fire rings, etc.).

The Lost Horse rock quarry is a popular rock climbing area in the project area. The area to the north of Lost Horse Road is a popular place for bouldering. Bitterroot Climbing is authorized under a special use permit to host the annual Boulder Bash. The Lost Horse portal station is a

development along the Lost Horse road that provides a 3-panel information board, a new outhouse, and trash can.

Lost Horse Observation Point is a popular destination that provides a vista overlooking Lost Horse Canyon.

During the winter, snowmobilers park at the Coyote Coulee trailhead and ride snowmobiles up NFSR 496, beyond Lost Horse Observation Point. They ride up NFSR 62958 to access the terrain above Kidney and Camas Lakes. This is a popular area for moderate-advanced snowmobilers. The Lost Horse road (at the southern project area boundary), is open to snowmobiles and receives moderate use in the winter. The Bitterroot Ridgerunners Snowmobile Club is authorized to groom the Lost Horse road from the junction with NFSR 5621, west to the Lost Horse Guard Station. The 2014 winter season was the first season that the club groomed the road. Winter recreationists park along the lower stretches of the Lost Horse road by the junction with NFSR 5621.

Trails

Trails in the project area provide a wide range of recreational opportunities. The area receives high use from May through September, and moderate use from October through April. Factors that contribute to the high use are paved yearlong access, low elevation, variety of loop routes with varying degrees of difficulty, proximity to large population bases, and the variety of recreation opportunities. Day use is the largest single recreational use in the area.

This area includes trailheads, trails, and day use areas. Table 3-18 lists the trails in the project area, the design purpose, trail class, permitted uses, and amount of use.

Table 3-18: Trails and Their Uses in the Westside Project Area.

Trail #	Trail Name	Design	Trail Class	Uses	Amount of use
123	Sawtooth Creek	Pack & Saddle	2	Horseback riding, hiking, bicycle Cross-country ski, snowshoe	moderate
124	Roaring Lion Creek	Pack & Saddle	2	Horseback riding, hiking, bicycle Cross-country ski, snowshoe	moderate
125	Camas Creek	Pack & Saddle	2	Horseback riding, hiking, bicycle Cross-country ski, snowshoe, motorcycle	moderate
127	Coyote Coulee	Pack & Saddle	3	Horseback riding, hiking, bicycle Cross-country ski, snowshoe	high
208	Ward Mountain	Pack & Saddle	2	Horseback riding, hiking, bicycle Cross-country ski, snowshoe, motorcycle	high
511	North Fork Hayes Creek	ATV	3	ATV, horseback riding, hiking, bicycle Cross-country ski, snowshoe, motorcycle	moderate

Recreation Opportunity Spectrum

The ROS for the project area is roaded natural and semi-primitive motorized. Roaded Natural ROS provides opportunities to associate with other users in developed sites but with some chance for privacy. The area is mostly natural appearing environment as viewed from sensitive roads and trails. Vegetation changes maintain desired visual and recreational characteristics.

Semi-primitive non-motorized ROS classes are characterized by predominantly natural or natural-appearing landscapes.

The existing condition in the Westside project area meets Forest Plan standards, and provides the desired distribution of recreation opportunities relative to the purpose and need for this project.

Environmental Consequences

Alternative 1

Direct and Indirect Effects

There would be no direct effects on the recreational uses, trails, and access under this alternative because no additional management activities are proposed.

The severity of fire in the project area would be moderate to high, depending on burning conditions in the event of fire (Figure 3-12). Fire could cause temporary forest road closures and jeopardize public health and safety. The loss of tree cover and shade would reduce the recreation quality of the area and the recreationists' experience.

Cumulative Effects

In the event of a fire, the need to remove hazard trees would change the scenic quality of the project area and detract from the recreation experience until new ponderosa pine and Douglas fir regenerated and reached comparable diameters as currently present. Depending on the extent of the fire in the area, costs to maintain the area would increase and some areas may need to be closed until they could be made safe for public use.

Alternative 2

Direct and Indirect Effects

The proposed project would disrupt recreation use for about three years. Temporary roads, excavated skid trails, slash or slash piles, and follow up burning activities would be visible to the recreationist for 3 – 5 years. All temporary roads, skid trails, and landings would be rehabilitated before the close of the timber sale contract. All designated trails in the Westside project area used as roads or skid trails will be restored to the standards for the trail class. Project activities near developed high use recreation sites would be staged to have the least impact on the users (Table 2-4). Other developed sites or trails may have short-term closures during project activities. Equipment operating in the project area would be seen and heard for the duration of the project. Recreationists using roads could experience dust or smoke and meet equipment or log hauling trucks during operations. Some short-term delays would be expected by the public on roads in the project area.

Commercial and non-commercial treatments would reduce visual screening to the recreation user, except in the riparian areas. Impacts from equipment use and motorized vehicles would include removal of vegetation, brushing, and limbing along portions of the trails for wider vehicle passage, skid trails, and vehicle tracks. These effects would be partially mitigated by consideration of routes but would be obvious to visitors in the short-term as more than typical trail maintenance. These wider sections of trail could invite unauthorized use if they are mistaken for temporary roads. Thinning in the project creates opportunities to obliterate unauthorized user-created trails.

Fire is a natural process and common on the Bitterroot National Forest. Blackened trees from prescribed burning would be noticeable in the short-term, though there would be little evidence

that the fires were initiated by management or natural ignition. In the areas that burn at low severity, visitors would see charred duff, scorched underbrush, and possibly scorched lower branches of the forest. The areas of moderate severity fire would have these same characteristics with the addition of individual and small groups of burned trees and areas of scorched ground. Small diameter stumps from hand thinning may remain visible for several seasons following the prescribed fire. The hand lines and escape routes may invite unauthorized motorized use until they are rehabilitated after treatments. Slash piles would be noticeable to visitors until the piles were burned, which is variable due to the weather window.

Trails

The Ward Mountain and Sawtooth Creek trails have a common trailhead that provides parking for both trails. The trailhead would be used as a landing for harvest in Unit 1 and would be closed to the public for a few weeks during harvest and hauling operations. The public wanting to use these trails during harvest operations would need to find other locations to park on NFSR 1134. People using a truck and trailer would have to find other turn around locations.

Coyote Coulee trail and North Fork Hayes Creek trail are the most developed trails and have the highest potential for damage to the trail. Landings and equipment use may block access to Roaring Lion and Camas Creek trails. Travel restrictions may need to be designated so that traffic can pass safely.

The permanent road to Unit 2c would be a stored, ML 1 road. It would be re-contoured where it crosses the trail system, scarified, and seeded. The permanent road accessing Units 2a, and 2b would be maintained for administrative access and closed yearlong to public motorized use. Non-motorized use, such as walking, horseback riding, and bicycling would be permitted on the roads. Some forest visitors may feel the construction of these roads reduces their recreational experience by making non-motorized access easier in an area where it once was not.

Recreation use of the Westside project area may decline during project implementation because some people may be unwilling to recreate in an active timber harvest operation.

Trail features would be located on the sale area map to protect, repair, or replace them if they are damaged during timber sale implementation. Some of the features that have potential to be damaged during project implementation are jackleg fence, waterbars, drain dips, foot log bridges with handrail, culverts, turnpikes, puncheon, signs on trees and posts.

Landings and equipment use may block access to Roaring Lion and Camas Creek trails. Travel restrictions may need to be designated so that traffic can pass safely.

The permanent road to Unit 2c would be a stored, ML 1 road. It would be re-contoured where it crosses the trail system, scarified, and seeded. The permanent road accessing Units 2a, and 2b would be maintained for administrative access and closed yearlong to public motorized use. Non-motorized use, such as walking, horseback riding, and bicycling would be permitted on the roads. Some forest visitors may feel the construction of these roads reduces their recreational experience by making non-motorized access easier in an area where it once was not.

Recreation use of the Westside project area may decline during project implementation because some people may be unwilling to recreate in an active timber harvest operation.

Table 3-19: Trails and Trail Length in the Westside Project Units

UNIT #	TRAIL	MILES OF TRAIL IN UNIT	UNIT TREATMENT
1	Ward Mountain	0.2	Commercial-Tractor
2a	Coyote Coulee	0.7	Commercial-Tractor
2b	Coyote Coulee	0.6	Commercial-Tractor
2c	Coyote Coulee	0.5	Commercial-Tractor
10	Coyote Coulee	0.4	Commercial-Tractor
23	Coyote Coulee	0.1	Habitat Enhancement
36	Coyote Coulee	0.1	Aspen Enhancement
TOTAL MILES OF TRAIL IN TREATMENT UNITS		**2.6**	

Cumulative Effects

No other projects are occurring in the Westside project area that would affect recreation or trails. Therefore, there would be no cumulative effects attributable to this project.

Roadless Areas and Unroaded Areas

This analysis focuses on the direct, indirect, and cumulative effects of activities proposed in the Westside project on roadless area values, including unroaded areas. The assessment of existing condition and potential effects are based on the wilderness attributes defined in FSH 1909.12, Chapter 70. The combination of the Selway-Bitterroot Inventoried Roadless Area (IRA) and adjacent unroaded areas make up the roadless expanse (Figure 3-16).

Affected Environment

Portions of the Selway-Bitterroot Wilderness (1,340,000 acres), the Selway-Bitterroot IRA - #01067 (115,625 acres) and unroaded lands (2310 acres) are either in close proximity to or adjoin the Westside project area. The Westside project overlaps approximately 939 acres of the Selway-Bitterroot IRA (Figure 3-16).

The Selway-Bitterroot IRA was inventoried by the Forest Service for possible inclusion in the wilderness preservation system in the 1970 Roadless Area Review and Evaluation process. A portion of the Selway-Bitterroot Roadless Expanse was recommended for inclusion as wilderness in the Forest Plan but none of this area is in the Westside project area. Unroaded areas in the Westside project area are less than 5,000 acres but adjacent and contiguous to the Selway-Bitterroot IRA. The Selway-Bitterroot IRA is contiguous to the designated Wilderness (Figure 3-16).

The original inventory of roadless lands took place through the Roadless Area Review and Evaluation (RARE I) process, and then again in the late 1970s during RARE II. The RARE process was intended to evaluate the potential for such roadless areas to be included in the wilderness preservation system. Roadless areas outside of Idaho and Colorado are those areas designated as Inventoried Roadless Areas pursuant to 36 CFR Subpart B. This includes areas identified in a set of inventoried roadless area maps, contained in the Forest Service Roadless Area Conservation, Final Environmental Impact Statement, Volume 2, dated November 2000. Effective March of 2001, 36 CFR Part 294 Special Areas; Roadless Area Conservation; Final Rule

was adopted to provide lasting protection for IRAs in the National Forest System in the context of multiple-use management.

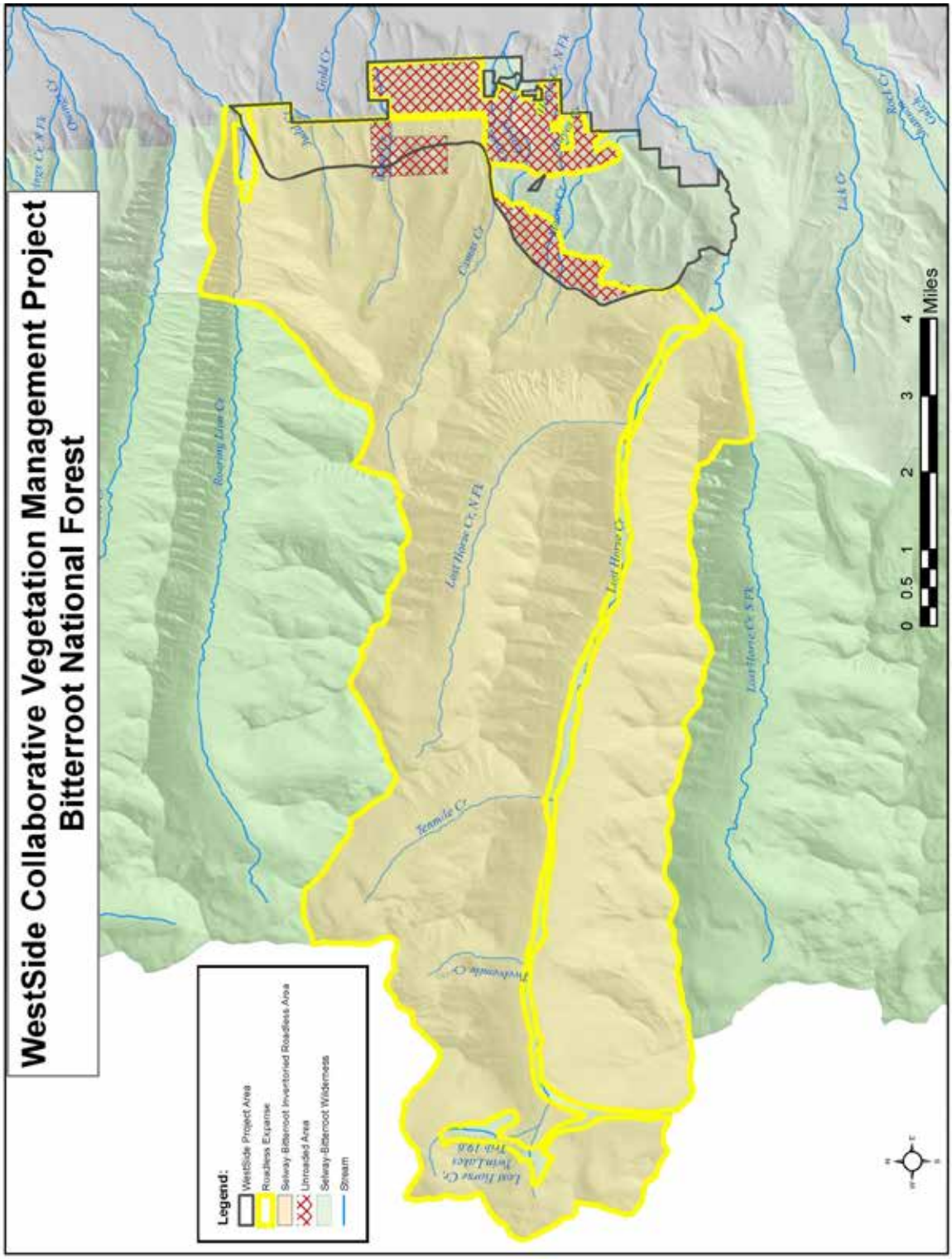

Figure 3-16: Roadless Expanse Associated with the Westside Collaborative Vegetation Management Project

The Selway-Bitterroot IRA holds special values for many individuals. This large expanse of wild land is home to wildlife, clean water, native fisheries, outstanding primitive recreation opportunities, beautiful scenery, and unique geologic, historic, and cultural features. This combination of attributes and "undeveloped" spaces create a rare and unique setting in a world where ever-increasing urbanization, population increases, and modification of the natural environment are more the norm. Many people have expressed their feelings that maintaining the integrity of these wild lands is important to them, though they may never have an opportunity to experience them first hand.

No activities are proposed in the Selway-Bitterroot Wilderness or in the Westside project area within or directly adjacent to the Wilderness boundary. The project area overlaps into the Selway-Bitterroot IRA and the rest of the project area is adjacent to the IRA boundary.

The Forest Service proposes timber harvest and thinning, and low to moderate severity prescribed fire in the Selway Bitterroot IRA. It proposes these same activities and road construction in unroaded areas adjacent to the roadless area. The unroaded areas do not have a special designation; the Forest Plan and Management Area designations guide management. Timber has been harvested from the unroaded areas since the early 1900s.

Roadless Expanse

About 35,838 acres of the 115,625-acre Selway-Bitterroot IRA (about 31%) is adjacent to the project area. In addition, 2,310 acres of unroaded lands are within the project area. The Selway-Bitterroot IRA and adjacent unroaded lands form the roadless expanse. They are discussed as such in the affected environment and environmental consequences.

This roadless expanse is described by the following characteristics:

Natural Integrity

Lost Horse canyon bottom contains most of the pre-1985 impacts of human activity in the roadless expanse. The Coyote Coulee trail system and North Fork Hayes Creek trail are entirely within the project area as are portions of Ward Mountain and Camas Creek trails. The Trailhead for the Ward Mountain trail is located on the northern Westside project area boundary. Portions of Roaring Lion Creek trail, Sawtooth Creek trail, North Fork Lost Horse Creek trail #59, and Bailey Lake #293 trails are within the roadless expanse. Trail bridges and corduroy sections across boggy sections of trail, and isolated pockets of heavy recreation use along the trail moderately reduce the natural integrity. Non-native plants encroach into the roadless area, and livestock use is evident in streams and open areas.

At lower elevations, fire suppression currently alters the natural integrity of the roadless expanse. Fire is a natural condition on the landscape and was typically of high frequency and low severity, which maintained open ponderosa pine stands. The ponderosa pine, lodgepole pine, and Douglas-fir stands have higher tree stocking and fewer open grasslands than might be expected. Non-native, invasive plants are present in the area. These conditions create the potential for more severe fires.

Roads within the project area are apparent, timber harvest or thinning has occurred in portions of these lands, since the late 1800s and early 1900s.

Human activities outside of the project area but within the roadless expanse affect the "natural integrity" of the roadless expanse. These activities include:

- an old jeep trail in the South of Lost Horse

- reservoir drawdown on Como and Twin Lakes,
- South Fork of Lost Horse Creek Trail #128
- Lost Horse Road (NFSR 429)
- Two small abandoned irrigation dams at Kidney and Lower Camas Lakes

Apparent Naturalness

Apparent naturalness measures visitor perceptions of human impacts on the area. Human impacts are widely dispersed in the Westside project area but evident to most visitors. However, because of the type of human impacts, the area has a high rating for natural appearance. Evidence of human activities near the roadless expanse limits this area's apparent naturalness, though at the site level, much of this area appears natural to the visitor.

The roadless expanse retains its apparent naturalness though timber harvest has occurred since the early 1900s. Most recent timber harvests were a combination of non-commercial thin or sanitation cuts that have left most of the forest intact. However, a visitor may notice cut stumps and overgrown skid trails and roadbeds. Roads adjacent to the roadless expanse compromise the apparent naturalness because of their existence and the proximity to the sights and sounds of the human uses occurring on them.

The two abandoned irrigation dams at Kidney Lake and Camas Lakes detract from the apparent naturalness of the area.

Opportunity for Solitude

Common indicators of solitude are numbers of individuals or parties one may expect to encounter in an area during a day, or the number of parties camped within sight and sound of other visitors.

Human activity is moderate to high in portions of the roadless expanse. The Coyote Coulee trail system in the project area gets moderate to high use throughout the year due to its low elevation and close proximity to town for hikers, horseback riders, and mountain bike riders. The opportunity for solitude would increase on some of the trails in the roadless expanse as you continue up the canyon and into the Selway Bitterroot Wilderness. The opportunity for solitude diminishes along the Lost Horse Road due to a higher presence of visitors.

Much of the terrain in the canyons and ridges in this area are rocky and steep. Ridges and slope breaks obscure the view and sounds from surrounding roads and on-going management. Opportunities for solitude are high, especially when one is away from the trails and areas beyond the sights and sounds of the valley floor. Knowing that over a million acres of wilderness lie to the west and observing the precipitous, glacially carved terrain enhances the feeling of solitude.

Remoteness

The physical factors that can create "remote" settings include topography, vegetative screening, distance from human impacts such as roads and logging operations (sight and sound).

Civilization appears near when looking eastward towards the Bitterroot valley. The Bitterroot valley is visible from various viewpoints in the roadless expanse. Lost Horse drainage is a very popular recreation area on the forest consisting of a developed campground, trailheads and many dispersed sites. Vegetative and topographic screens enhance the user's sense of remoteness in some areas.

The proximity of roads and management activities on adjacent National Forest diminish the perception of remoteness and seclusion.

Unique Features and Special Places

This rugged and scenic landscape of the roadless expanse has changed little since the ice age. This landscape gives one a feeling of serenity and spaciousness. Elk and deer summer on the more gentle sites. Falcons nest in some of these canyons. Magnificent views of past glaciation exist throughout this area.

Big game hunting, fishing, horseback riding, use of dispersed sites, hiking the Coyote Coulee trail system, or continuing into the Selway-Bitterroot Wilderness to Fish or Bailey Elk Lakes, or driving to Lost Horse Overlook makes up most of the human use in this area.

Manageability (Boundaries)

Changes in the shape of an area influence how it can be managed. The locations of projects proposed outside the area also need to be considered. Boundary management effects relate to such factors as the need to provide access to the area and to match boundaries to terrain features that can be easily located. Manageability or boundaries was not a wilderness quality factor in RARE II, but is a factor considered since the mid-1990s to evaluate effects on roadless areas (FSH 1909.12 72.1(5)).

The roadless expanse abuts the Selway-Bitterroot Wilderness on the north and south. The eastern boundary traverses mid-slope above roads and timber harvest units. The roadless expanse, excluding the unroaded area of 2,310 acres, contains good topographic features that facilitate identification of the Wilderness boundary and as such have the potential to be managed as Wilderness.

Environmental Consequences

Methodology

The 1964 Wilderness Act identified attributes of natural integrity, apparent naturalness, opportunities for solitude, and opportunities for a primitive recreation experience to determine the wilderness qualities of an area. Forest Service Handbook (FSH) 1909.12, 72.1 discusses the attributes of wilderness, and additional attributes considered when evaluating potential wilderness areas (roadless characteristics). A cross walk between wilderness attributes and roadless characteristics is presented in Table 3-20. These attributes are used to compare existing and desired conditions and the effects of project activities on wilderness quality of the roadless expanse.

The Westside project effects on wilderness attributes and roadless area characteristics are analyzed at two levels:

- the Selway-Bitterroot Wilderness
- the roadless expanse, which includes 35,838 acres of the Selway Bitterroot Roadless area and 2,310 acres of unroaded areas within the project area.

Table 3-20: Attributes of Wilderness and Roadless Characteristics defined in FSH 1909.12, 72.1, 36 CFR 294.11

WILDERNESS ATTRIBUTES	ROADLESS CHARACTERISTICS
Natural Integrity: The extent to which long-term ecological processes are intact and operating.	High quality or undisturbed soil, water, and air. Source of public drinking water. Diversity of plant and animal communities. Habitat for threatened, endangered, candidate, proposed, and sensitive species dependent on large areas.
Apparent Naturalness: Environment looks natural to most people.	Natural appearing landscapes with high scenic quality. Reference landscapes
Solitude and Primitive Recreation: Personal subjective value defined as the isolation from the sights, sounds, and presence of others and the developments of man.	Primitive, semi-primitive non-motorized, semi-primitive motorized ROS classes of dispersed recreation.
Remoteness: Perceived condition of being secluded, inaccessible, and out of the way.	
Unique Features: Unique and/or special geological, biological, ecological, cultural, or scenic features.	Other locally identified unique characteristics. Traditional cultural properties and sacred sites.
Manageability/boundaries: Ability to manage a roadless area to meet the minimum size criteria (5,000 acres) for wilderness.	No criteria.

Effects Common to Both Alternatives

Selway-Bitterroot Wilderness

There will be no direct effects on wilderness attributes in the Selway-Bitterroot Wilderness from the Westside project because no activities are proposed within Wilderness and the roadless expanse separates the project area from the Wilderness. Indirect effects may include sights and sounds of commercial and small tree thinning activities on non-wilderness lands. The sights and sounds of the work crews and their equipment might affect solitude and primitive recreation in some parts of the Wilderness, although proposed activities are downstream and more than one air mile from wilderness boundaries. The distance from proposed activities to the wilderness and intervening landforms would mitigate noise and smoke from proposed activities. Noise would be at levels below ambient wilderness sounds.

Roadless Expanse

For most of the roadless expanse, the project area is out of sight and sound distance and would have little impact on remoteness. The proposed activities would not markedly diminish the natural appearing nature of the area. Effects on the components of the roadless expanse vary based on their proximity to the proposed activities. Effects specific to the roadless expanse are described for each alternative.

Alternative 1

Direct and Indirect Effects

There are no direct effects of the no action alternative on wilderness attributes or the roadless characteristics of the roadless expanse. There would be no change to the existing recreational opportunities or travel access since no new management activities would occur.

The severity of fire in the project area would be moderate to high, depending on burning conditions in the event of fire (Figure 3-12). Fire could cause temporary forest road closures and jeopardize public health and safety.

Cumulative Effects

Since there are no direct effects on the wilderness attributes or roadless characteristics, there would be no cumulative effects.

Alternative 2

Direct and Indirect Effects

Under Alternative 2, commercial and non-commercial harvest, and prescribed fire is proposed on 878 acres (2.0%) of the roadless expanse in the project area (Table 3-21, Figure 3-17).

Alternative 2 proposes to treat approximately 163 of IRA between Gold Creek and Roaring Lion Creek. The treatment area would be 0.14 percent of the 115,625- Selway–Bitterroot IRA. The treatments include about 141 acres of non-commercial thinning and 22 acres of commercial harvest. The slash would be piled and burned followed with a low intensity underburn.

None of the roadwork proposed in this alternative would occur in the IRA. Commercial harvest, in and adjacent to the roadless expanse would require the construction of 3.5 miles of new system road. The permanent roads in Unit 2a and 2b will be maintained for administrative use and closed year-long to public motorized access. The permanent road in Unit 2c will be a stored road maintained as Maintenance Level 1. It will be re-contoured, scarified, and seeded where it crosses the trail system. About 2.4 miles of temporary road segments will be created in Alternative 2 to access timber within the roadless expanse. Temporary roads would be rehabilitated following completion of timber harvest and associated activities (Table 2-4). The six miles of decommissioned roads are not in the roadless expanse.

Table 3-21: Proposed Treatments in the Roadless Expanse

TREATMENTS IN ROADLESS EXPANSE[1]	ALT. 2	TREATMENTS IN ROADLESS EXPANSE	ALT. 2
Total Area in Roadless Expanse(acres)	38,148	Aspen Enhancement with Prescribed Fire	71
Commercial (Improvement- Tractor)	55[2]	Habitat Enhancement with Prescribed Fire	33
Commercial (Improvement- Skyline)	0	New NFSR Roads (mile)	3.3
Commercial (Irregular –Tractor)	499	Temporary Roads (mile)	2.4
Commercial (Irregular – Skyline)	0	Decommission roads	0
Non-commercial Thin with Prescribed Fire	220		
TOTAL TREATMENT		**878 ACRES AND 5.7 MILES**	

[1] Roadless expanse is the combined Selway-Bitterroot Roadless Area and adjacent unroaded areas.
[2]Commercial harvest is proposed on 22 acres of Unit 1 though the total area of Unit 1 is 55 acres.

Effects of the use of motorized equipment and vehicles would be obvious in the short-term (about 3-5 years) and would include removal of vegetation for passage, skid trails, tracks of egress and ingress, and brushing and limbing on the trails in the project area to allow wider vehicle passage. Short-term effects, though mitigated by careful consideration of routes, would be obvious to visitors as more than typical trail maintenance. The more obvious routes could facilitate unauthorized motorized use of these routes and create the appearance of temporary roads. Temporary roads would detract from apparent naturalness during project

implementation until they are rehabilitated and ground cover is re-established. Effects would be commensurate with the success of rehabilitation efforts. The new system roads would continue to detract from apparent naturalness after the project is completed.

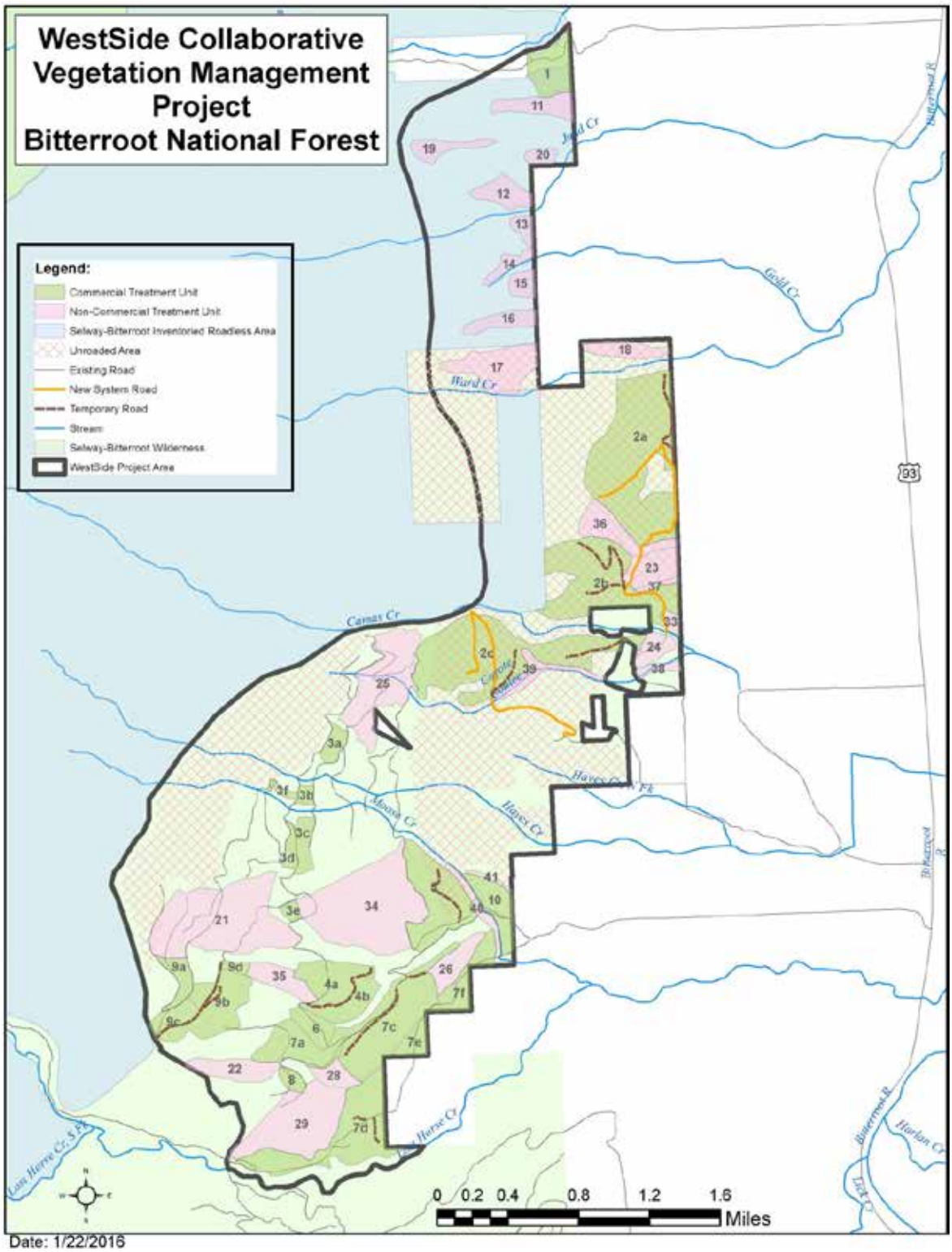

Figure 3- 17: Alternative 2 Treatment Units in the Roadless Expanse of the Westside Project.

Prescribed fire treatments in the roadless expanse would not greatly affect the roadless characteristics because low and moderate intensity fires are typical of the forest ecosystems in the area and influence the development of the forest communities. Prescribed fire is a form of "modern human control or manipulation" and affects the natural character of the roadless area. Though the appearance of the vegetation would change, it would be within the parameters of natural integrity and apparent naturalness. Low and moderate severity burning would mimic wildfire within its natural regime and thereby enhance or maintain the natural appearing landscape. In contrast, the untreated areas could appear unnatural to visitors when compared to treated areas.

Short-term direct impacts would be expected from fire treatment, though there would be little evidence that the fires were initiated by management or natural ignition. The fire lines would create a linear disturbance within the roadless expanse. In the areas that burn at low severity, visitors would see charred duff, scorched underbrush, and possibly scorched lower branches of the forest. The areas of moderate severity fire would have these same characteristics with the addition of individual and small groups of burned trees and areas of scorched ground. Stumps from the hand slashing of small diameter trees may remain visible for several seasons following the prescribed fire. They may detract from the undeveloped character for visitors traveling the area. The hand lines and escape routes may invite unauthorized motorized use until they revegetate. Blackened trees from the prescribed burn would be noticeable but would not affect roadless integrity because fire is a natural occurrence on the landscape. Visitors would notice slash piles until they are burned, generally within three years of creation depending on the burning window. Fire line construction and the number of personnel on site to manage the fire would compromise the attributes of remoteness and solitude during prescribed fire operations.

Other short-term indirect effects on the undeveloped attribute include smells of the fire and smoke, which could persist for a few days after ignition. Dust from machinery could also be present while operations are occurring. These effects would not cause lasting impacts on the undeveloped attribute.

Project implementation activities would reduce the attributes of remoteness and solitude by the presence of workers, vehicles, and the sound of equipment until all the proposed activities are complete and ground cover has re-grown. However, these attributes are already low because units border roaded areas that provide direct views to the sights and sounds of traffic and management activities on adjoining National Forest.

Effects on primitive and dispersed recreation would be minor and limited to those periods when activities are taking place. People could be displaced from favorite areas while project implementation occurs, particularly on the Coyote Coulee trail system. An indirect effect of the fire management activities could be displacement of visitors to unburned areas, both because of visuals and downfall from burned trees.

In the long term, the proposed action would enhance or maintain the roadless resource including high quality soil, water, air, diversity of plant and animal communities, and habitat for those species dependent on large, undisturbed areas of land. The system road into Unit 2C would not detract from roadless area values because there would be 20-30 year intervals between its uses for forest management. It would not increase the potential for incursions into the IRA because it would be stored between administrative uses and the terrain and Camas Creek create natural barriers from the proposed road location closest to the IRA boundary.

These activities are consistent with the 2001 Roadless Area Conservation rule (Roadless Rule), as they would maintain or restore the characteristics of ecosystem composition and structure, such as to reduce the risk of uncharacteristic wildfire effects (36 CFR 294.13(b)(1)(ii))). Generally, small diameter timber would be cut (Ch. 3 pg. 23, 25, 71) and one or more roadless characteristics (36 CFR 294.11) would be maintained or improved as described above.

Cumulative Effects

The past, present, and reasonably foreseeable actions will have minimal cumulative effects on the wilderness attributes and roadless characteristics of the roadless expanse in the project area. The areas with the highest wilderness and roadless attributes would remain unchanged in the long term.

Road construction and timber harvest do not affect wilderness attributes because they do not occur in the wilderness and the wilderness is buffered from the proposed activities by the roadless expanse. They have had minor effects on roadless characteristics in the roadless expanse as described in the existing condition and Forest Plan monitoring reports (PF-Monitor-003).

Unroaded areas closest to the roaded areas are most affected by past, present, and proposed management activities. Unroaded areas closest to the roaded areas also have the lowest roadless characteristics and wilderness attributes. Past timber harvest has occurred on 671 acres of the roadless expanse in the project area (PF-Roadless-005).

Roadless Expanse

The roadless expanse consists of 38,148 acres, 35,838 acres of Selway Bitterroot IRA and 2,310 acres of unroaded area in the Westside project area. All proposed treatments in the Westside project area would affect 2.3% of the roadless expanse in Alternative 2.

Under the 2004 Weed EIS, the Forest Service can treat weed infestations in specific locations of the roadless expanse. The 2009 Selway-Bitterroot Weeds EIS extended this management option into the Wilderness. Weed treatments benefit wilderness and roadless areas by eliminating invasive plants and potential sources of weed spread. Weed suppression in the project area would not have adverse cumulative effects on roadless attributes because suppressing invasive plants favors recovery and spread of native plant species.

Annual trail maintenance will be ongoing in the roadless expanse. This work involves clearing the trail of fallen logs, cleaning waterbars, and brushing. During this time, workers may be visible in the roadless expanse. The activity will be temporary and restricted in area. The potential cumulative effect of this disturbance and the actions in Alternatives 2 on solitude would be restricted to a small part of the roadless expanse.

Temporary roads in the unroaded areas would detract from apparent naturalness during project implementation until they are rehabilitated and ground cover is re-established. Effects would be commensurate with the success of rehabilitation efforts. The roads would continue to detract from apparent naturalness after the project is completed. The new system roads into Units 2a and 2b will be closed but maintained for administrative use. The drainage structures would remain in place and the roadbed would show intermittent signs of motorized use. The new system road into Unit 2c would be less apparent because it would be stored with the drainage structures removed and the roadbed seeded. Segments of this road ascend higher on the slope so it may be apparent from a distance until it revegetates.

Wildlife

This section discloses the effects of the alternatives on endangered, threatened, and sensitive wildlife species, as well as management indicator species identified in the Bitterroot National Forest Plan. General habitat characteristics considered in the analysis are summarized in this environmental assessment and more detailed information is in the project file (PF-WILD-053). Wildlife species with similar habitats and affected similarly are combined in one discussion.

The wildlife effects are analyzed on National Forest in the Westside project area unless otherwise noted. Exceptions are explained in the affected environment description and may be because of species or habitat distribution, home range size, linkages between suitable habitats, or modeling methods. The cumulative effects analysis area is defined for each species with an explanation why it is an appropriate area for that resource.

The potential effects on a particular species determine the level of analysis. The level of analysis depends on the intensity and magnitude of the potential effects on habitat conditions or wildlife populations. The wildlife biologist reviewed regional and national wildlife assessments and conservation strategies, and the Integrated Scientific Assessment for Ecosystem Management in the Interior Columbia River Basin as the starting point for the analysis. He reviewed the Forest Plan and monitoring reports, Montana Natural Heritage Program, and Forest and district wildlife databases and survey records to determine the potential for threatened, endangered, sensitive, and management indicator species occurring in the project area. A species was selected for detailed analysis if the species was present within the affected area or known habitats for the species would potentially be affected by the proposed actions. Old growth habitat is not analyzed because no treatments are proposed in old growth forest. Snag habitat is analyzed because this habitat component is crucial to several species and it might be affected by the proposed actions. Canada lynx (*Lynx canadensis*), yellow-billed cuckoo (*Coccyzus americanus*), bald eagle (*Haliaeetus leucocephalus*), Coeur d'Alene salamander (*Plethodon idahoensis*), northern bog lemming (*Synaptomys borealis*), northern leopard frog (*Rana pipiens*), Rocky Mountain bighorn sheep (*Ovis canadensis canadensis*), and wolverine (*Gulo gulo*) are not analyzed because proposed activities would not occur in their suitable habitats or they or their habitats are not known to occur in the project area (PF-WILD-053). Wildlife species that are analyzed in detail are summarized in Table 3-22.

Field surveys, satellite imagery, and vegetative and occurrence databases provided most of the information for detailed effects assessments. Stand level vegetative data relevant to wildlife habitat information was collected using Common Stand Exam protocols and is contained in the FSVeg database. The wildlife biologist and technician supplemented the data with information gathered during unit-level walk-through exams (PF-WILD-003; PF-WILD-004). The wildlife biologist reviewed, interpreted, and validated the stand level data used for the Westside project analysis of wildlife resources. The wildlife biologist knows the Westside project area through multiple field reviews of this project area and the surrounding area. Vegetation stand data derived from the R1 VMap dataset was used in the analysis of mid-level habitat for some wildlife species. Vegetation data collected through the Forest Inventory and Analysis program was used in a Regional wildlife habitat modeling effort to derive statistically reliable habitat estimates for a broad-scale habitat analysis for many wildlife species and habitat components such as snags (Samson 2005, Samson 2006).

Table 3-22: Habitat Characteristics of Wildlife Species with the Potential to Inhabit the Westside Project and analyzed in detail.

SPECIES	HABITAT PREFERENCE	SPECIES OCCURRENCE IN ANALYSIS AREA	SPECIES IMPACTED BY ALTERNATIVES/ SUMMARY DETERMINATION [1]
American Peregrine Falcon (*Sensitive*)	Cliff nesting (ledges); aerial foraging over open areas for small to medium-sized bird species prey. Eyrie located in Bass Canyon.	Numerous breeding territories known in Bitterroot Mountains. Potential nesting cliffs adjacent to project area.	Possible/MIIH
Black-backed Woodpecker (*Sensitive*)	Burned or insect-killed snag concentrations, limited to 5 or 6 years following mortality. Individuals may occur in green forests with scattered insect-killed snags.	Possible, although no primary habitat from recent burns or insect mortality in project area.	Y/ MIIH
Fisher (*Sensitive*)	Moist coniferous forested types (including mature and old growth spruce/fir), riparian/forest ecotones. Suitable habitat predominantly along larger tributary streams in Bitterroot Mountains.	Possible, although no occurrence records in project area.	Y/ MIIH
Flammulated Owl (*Sensitive)*	Mature and old growth ponderosa pine with snags and open understory, with abundant moth species prey. Secondary cavity nester.	Possible, although no occurrence records in project area.	Y/MIIH
Gray Wolf (*Sensitive*)	Habitat generalists. Abundant prey availability (primarily large ungulates) and lack of human disturbance (corresponding to low road densities) preferred.	Y	Y/MIIH
Long-eared Myotis (*Sensitive*)	Mostly forested areas or nearby openings. Often associated with old growth forests. Roosts in buildings, caves, mines, hollow trees. Nursery sites in buildings, caves, mines, rock crevices. Most probably migrate to warmer areas for winter.	Possible, although no occurrence records in project area.	Y/MIIH
Long-legged Myotis (*Sensitive*)	Montane coniferous forests, often at higher elevations. Roosts in buildings, under bark, rock crevices. Nursery sites in hollow trees, buildings, rock crevices. Hibernates in caves and mines, but most probably migrate.	Possible, although no occurrence records in project area.	Y/MIIH
Townsend's (Western) Big-Eared Bat (*Sensitive*)	Roosts in caves, mines, rocks and buildings. Forages over tree canopy, over riparian areas or water. Hibernates in caves or mines. Temporarily roosts in large snags.	Possible, although no occurrence records in project area.	Y/MIIH

SPECIES	HABITAT PREFERENCE	SPECIES OCCURRENCE IN ANALYSIS AREA	SPECIES IMPACTED BY ALTERNATIVES/ SUMMARY DETERMINATION [1]
Western (Boreal) Toad (*Sensitive*)	Terrestrial habitat generalist; breeds in ponds, slow streams	Y	Y/MIIH
American Marten (*MIS*)	Mature and older lodgepole, subalpine fir and spruce forests with abundant down logs.	Y	Y
Pileated Woodpecker (*MIS*)	Mature and older lower to mid-elevation conifer forests or cottonwood gallery forests with large snags and down logs.	Y	Y
Rocky Mountain Elk (*MIS*)	Habitat generalist. Winter range in lower elevation conifer/shrub/grasslands.	Y	Y
Northern Goshawk (*Species of Interest*)	Nest in mature or older conifer stands with closed canopies and open understories. Forage in a wide variety of habitats.	Y	Y

[1] Definitions of Summary Determination Abbreviations: For T&E species: NE = No effect, NJ = Not jeopardize, NLAA = Not likely to adversely affect, LAA = Likely to adversely affect, BE = Beneficial effect. For Sensitive Species: NI = no impact; MIIH = may impact individuals or habitat, but will not likely result in a trend toward federal listing or reduced viability for the population or species; WIVH = will impact individuals or habitat with a consequence that the action may contribute towards federal listing or result in reduced viability for the population of species; or BI = beneficial impact. MIS = Management Indicator Species identified in the Forest Plan (USDA Forest Service 1987).

To meet the requirements of the National Forest Management Act (NFMA) and its implementing regulations, the Forest Service analyzes the effects of the alternatives on management indicator species (MIS), and threatened, endangered, and sensitive (TES) wildlife species and their habitats at the project level. Effects determinations for TES wildlife species come from the Biological Assessment/Biological Evaluation Summary Conclusion of Effects (PF-WILD-055). The effects are also assessed in the Forest or Regional context to determine potential effects to species viability. This approach is consistent with recommendations in Ruggiero et al. (1994) and Marcot and Murphy (1992) that analysis areas larger than the project area are appropriate for assessing population viability for highly mobile or wide-ranging species like peregrine falcons and marten.

Snags

Affected Environment

Currently, there are few high quality snags in the Westside project area. Much of the area was clearcut around 1900, which eliminated most of the large trees and potential snags. More recent timber harvest that occurred in portions of the project area in the early 1970s and in 2006 further reduced snag numbers. Some of the best large snags available for wildlife are cottonwoods along several of the streams in the project area.

The only recent fire of any size in the project area was the Saloon fire that burned about 100 acres in the southwest corner of the project area in July 2000. This fire affected parts of Units 8, 29 and the corner of Unit 7d and created fire-hardened snags that are still standing. The snags provide wildlife nesting and denning habitat. Recent prescribed burns in portions of the project area may have created small numbers of new snags.

Mountain pine beetles and other bark beetles have been active in parts of the Westside project area over the past five years. A wave of successful beetle attacks created thousands of new lodgepole pine snags around 2010 in the upper elevations in the project area. Subsequent bark beetle attacks have been more sporadic, but have killed scattered individual and small groups of ponderosa pine across the project area. Attacks seem to have tapered off, but are still occurring. Some snags created by bark beetles are large enough to provide woodpecker nesting habitat but most of them are too small. However, this pulse of snags provides abundant woodpecker foraging habitat. Other agents such as root disease, comandra blister rust, and lightening have created scattered snags throughout the project area.

Twenty four large snags and 86 live trees across the project area were signed as wildlife trees in the project area. Most of the live trees signed as wildlife trees have fire scars, lightening scars, dead or broken tops, woodpecker foraging or nesting excavations or other indications of internal decay such as conks. These trees and snags either currently provide valuable nesting habitat for woodpeckers, or will likely provide such habitat in the future.

The numbers of existing snags have not been systematically counted throughout the project area. However, snags over 5” dbh were tallied during stand exams in potential old growth stands in 2014. Plots were installed in 15 different stands that totaled about 558 acres. Table 3-23 shows the number of snags per acre as estimated from the plots, as well as the estimated total number of snags within those stands. Table 3-23 also displays an estimate of the number of snags that may occur throughout the rest of the project area based on the assumption that the measured stands were representative of the entire area (PF-WILD-005).

Table 3-23: Measured and Estimated Snags by Size Class in the Westside Project Area

SNAG SIZE CLASS	5”-10.1” DBH	10.2” – 12.1” DBH	12.2” – 20.1” DBH	20.1”+ DBH	TOTAL SNAGS >10”
SNAGS ESTIMATED FROM PLOTS (558 AC.)					
# Snags	7,169	1,170	1,896	290	3,356
Snags/acre	12.9	2.1	3.4	0.5	6.0
SNAGS ESTIMATED BY EXTRAPOLATION OVER THE PROJECT AREA (5,698 AC.)					
# Snags	73,501	11,968	19,379	2,861	34,208
Snags/acre	12.9	2.1	3.4	0.5	6.0

Snags less than 10 inches DBH are too small for woodpecker nesting habitat. Snags greater than 20 inches DBH are large enough for pileated woodpeckers nests. The lack of snags in the large diameter classes reflects the relatively small average tree size in the project area resulting from harvest in the early part of the last century. The number of snags over 10” DBH in these stands is on the low end of recommended snag numbers in the VRUs and fire groups within the project area (PF-WILD-053).

Environmental Consequences

Methodology

The effects analysis of snag habitat in the Westside project area focuses on the availability of snags across the project area, and in specific treatment units. The effects of the project on particular species associated with or dependent on snag habitat are described under the species heading i.e. black-backed woodpecker, fisher, American marten, and pileated woodpecker.

The ID Team determined the minimum number of snags to retain in the treatment units by reviewing the scientific literature about snag densities in the Northern Rocky mountains. We reviewed:

- Northern Region Protocol for Snag Management (USDA Forest Service 2000a)
- Abundance and Characteristics of Snags in Western Montana Forests (Harris 1999)
- Old-Growth Forest Types of the Northern Region (Green et al. 1992, errata 2005)
- Requirements for Snags and Downed Wood appendix from the Interior Columbia Basin Ecosystem Management Project FEIS (USDA Forest Service 2000b)

The recommendations in the literature were applied to the VRUs in the project area with consideration of fuel management objectives and OSHA safety regulations (PF-WILD-053). The minimum numbers of snags left in treatment units are as follows:

- VRU 1: 2-5 snags/acre
- VRU 2: 4-12 snags/acre
- VRU 3, 4, 7, 9: 10-15 snags/acre

Snags, or standing dead trees, are an essential component in forests, and have long been recognized by the scientific community for their role as critical habitat for numerous wildlife species (McClelland 1977; Thomas et al. 1979). Several factors or combinations of factors can be responsible for tree mortality, including insect outbreaks, diseases, fire, drought, and flooding. The events and decay processes that create snags also maintain the snag resource through time. Snags occur on the landscape as individual trees, patches, or entire stands after disturbance processes move through the local ecosystem. Snag-associated wildlife in the Northern Rockies have evolved to use these structures. How a snag is used depends on how the tree died, its species, size, and longevity (Bull et al. 1997).

The Occupational Safety and Health Administration (OSHA) requires felling danger trees (often defined as snags) that pose risks to woods workers (OSHA 29 CFR 1910.266. Logging Operations. Amended by 60 Federal Register 47035, Sept. 8, 1995). The Forest Service Manual also directs the removal of hazardous trees at developed recreation sites (FSM 2332.11).

Direct and Indirect Effects

Alternative 1 (No Action Alternative)

This alternative would not reduce the number of existing snags in the project area because it does not include any vegetative treatments. In the short term, snag numbers would continue to increase as trees die from insect and disease activity. At the same time, some existing snags would fall because of decay progression in their roots and stems, strong winds, and snow loads. Snags near open roads, along trails, and around developed recreation areas would continue to be removed for safety purposes and firewood cutting. Overall, the number and distribution of snags would probably continue to increase from the existing condition. In the long term, the existing dense canopies and high fuel loads that are common in the project area would continue to increase the risk of a severe fire that could kill most or all of the trees over a portion of the

project area. If such a fire occurred, it would dramatically increase the number of snags and provide a large pulse of snags for snag-dependent wildlife habitat.

Alternative 2

This alternative would retain all existing snags on about 3,373 acres, or about 59% of the project area, because no treatments are proposed for this area. Some snags would be felled and removed from up to 1,305 acres of commercial harvest units, or about 23%, of the project area. Prescribed burning following harvest or in the non-commercial thinning units could reduce snag numbers by igniting existing snags, which often burn until they fall. Prescribed burning could also create new snags by killing some live trees, but these are likely to be smaller than the snags lost to burning, and thus less valuable for wildlife habitat.

Guidelines for snag and woody debris retention specified in Chapter 2 of this document would be followed during harvest operations. These guidelines are designed to assure that the number, size and species of snags that are left on site are within the historic ranges for a given habitat type, if such snags are currently available within the unit. Ponderosa pine and Douglas-fir snags would be retained at levels listed above unless they were deemed to be a safety hazard, in which case they would be felled and removed. Larger snags would generally be favored over smaller snags for retention if a choice is necessary. All snags containing excavated cavities should be retained unless they conflict with the silvicultural prescription or pose a safety hazard. Cavities indicate that the snag contains heart decay, and has little value for timber, but high value for wildlife. All trees and snags marked with wildlife tree signs should be retained. Monitoring of recent vegetation management activities on the Bitterroot National Forest indicates that snag retention guidelines have consistently been met or exceeded (PF-WILD-006; PF-WILD-007).

The project area that is not harvested contains snag numbers within the historic range for the VRU. The number of snags in the project area would be within the historic snag level range because snags would be retained at this level in treated units and no snags would be felled outside of the units. Leaving historic levels of snags for a given habitat type provides adequate snag habitat to sustain the snag-dependent or associated wildlife in those habitat types.

Prescribed fire would follow commercial and non-commercial treatments. The effects of prescribed fire would be similar to a low severity fire and reduce fuels while preserving most of the live trees, shrubs, and other forest vegetation. Some existing snags would burn and fall during prescribed burning, but low numbers of new snags would most likely be recruited.

The overall effects of the proposed treatments would be to restore fire behavior to levels characteristic of the VRU. In addition, spacing would be increased between trees to improve growth rates and stand structures. Improving growth rates would increase the transition of trees into the larger diameter classes that would eventually create larger snags. Maintaining characteristic fire behavior would increase the probability that snags would be retained through fires.

Cumulative Effects

Geographic and Temporal Boundaries

The defined cumulative effects area for snags is the Westside project area. The project area is appropriate to analyze the incremental effects on snags from this project added to those of past, present, ongoing, and reasonably foreseeable actions because management activities will neither create nor remove any dead trees outside of this boundary. An assessment of information available at the Forest level is also considered to provide additional context.

The effects of any reduction of snags in Alternative 2 would continue until other trees die. Given current mortality rates due to insects, disease, and fire across the Region, it is likely that snag recruitment will continue to provide adequate snag numbers into the future.

Activities within the Cumulative Effects Area

The existing condition represents the sum of past activities. The effects of previous thinning and timber harvest within the project area have created the scarcity of large snag habitat in the project area. Recent bark beetle outbreaks have killed lodgepole pine and ponderosa pine, creating a large pulse of snags throughout the project area. Bark beetle activity will continue to create new snags though more slowly as the populations decline. There are no reasonably foreseeable activities that would affect snags. Though individual snags may be felled in harvest units, enough snags would be retained within the range of historic snag levels in the treated units. In addition, all snags would be retained in untreated portions of the project area. Since there would be no direct or indirect effects on snag density in the project area, there would be no cumulative effect.

Trends and Broader Context

Snags are probably more abundant now on the Bitterroot National Forest than at any time since the Forest was created. The fires of 2000 burned across approximately 307,000 acres of the forest and created millions of snags. About 46 percent of this area burned with moderate or high severity converting most of the trees to snags. In over half of the area that burned at low severity, up to 40 percent of the trees were killed as either individuals or small groups. The fires created a large pulse of snags similar to pulses created by fires prior to fire suppression. While the fires of 2000 may have been characteristic for some areas across the landscape, other areas across the landscape had higher levels of stand replacing fires (in warm dry habitat types) than would have been expected historically. This resulted in a higher mortality in large ponderosa pine – generally a fire resistant species – than is characteristic for that fire regime.

Fires since 2000 have continued to create huge numbers of snags on the Bitterroot National Forest. The Forest has a large fire event every two or three years, with numerous smaller fires almost every year. Fires burned 248,900 acres on the Bitterroot National Forest between 2003 and 2013 (Table 3-24). Most of the burned areas will never be harvested because they are in wilderness or roadless areas, or are otherwise difficult to access. Therefore, snags in these areas will be left on the landscape until they naturally fall and become downed woody material.

Table 3-24: Burned Area on the Bitterroot National Forest since 2003, Creation of Snag Habitat

YEAR	BURNED AREA (ACRES)	YEAR	BURNED AREA (ACRES)
2003	19,700	2009	2,200
2005	22,600	2010	1,300
2006	8,000	2011	18,000
2007	29,000	2012	100,000
2008	8,100	2013	40,000
Total			**248,900**

In the last decade, the Forest has salvaged dead and dying trees from very few burned areas. Monitoring areas that were salvaged after the fires in 2000 indicates that numbers of snags

remaining after harvest averaged much higher than the snag retention guidelines (PF-WILD-005; PF-WILD-006). On the landscape, the Forest is allowing natural disturbance processes to shape the ecosystem by retaining most of the biological diversity created by fires.

A second major source of current snags on the Bitterroot National Forest is the Douglas-fir bark beetle epidemic, which started before the fires of 2000. In 2002, Douglas-fir bark beetle populations soared to the highest infestation level ever recorded on the Bitterroot National Forest with approximately 29,000 acres infested on the southern half of the Forest. The epidemic continued through 2006 and has created large Douglas-fir snag habitat on over 30,000 acres of the Forest outside Wilderness, and about 20,000 acres of Wilderness. Douglas-fir beetle activity has tapered off, and aerial detection flights estimate 134 acres on the Bitterroot National Forest were infested in 2013 (PF-WILD-009).

In 2010, mountain pine beetle activity increased exponentially across the Forest, affecting about 70,600 acres (PF-WILD-008). Mountain pine beetle was detected in many areas where it was not observed in 2009. Most of the trees killed by mountain pine beetle were in the southern half of the Forest. Mountain pine beetle activity affected about 98,300 acres on the Bitterroot National Forest in 2014, but the intensity of the activity decreased from previous years (PF-WILD-009).

Continued firewood cutting removes snags along open National Forest System roads. Firewood cutting reduces the number of potential nesting trees for cavity nesters as well as potential roosting and foraging habitat. However, the loss of snag habitat is negligible because of the abundance of snags across the Forest and the small portion of the Forest available to firewood cutting. Management areas 1, 2, 3a, and 3c (the “roaded” portion of the Forest) comprise about 484,000 acres of National Forest. About 334,600 acres (70%) of this area is more than 100 meters from a road, regardless of road travel status. Nearly 80 percent of the Forest outside of Wilderness and Roadless areas is beyond 100 meters from a road that is open yearlong or seasonally.

FIA data indicate snags are abundant and well distributed across the Forest (Table 3-25, PF-WILD-010). Czaplewski (2004) summarized use of FIA data to estimate old growth and snag densities, including assumptions and limitations. Estimates of snag numbers are conservative, because they exclude data from plots where fire or harvest activities have occurred since the plots were last inventoried. These estimates also may not reflect the large number of snags created by insect outbreaks since the time of the last inventory.

Table 3-25: FIA Estimates of Snag Density on the Bitterroot National Forest

Area	90% CI[1] Lower Bound	Snags 10”+ (snags/ac)	90% CI Upper Bound	90% CI Lower Bound	Snags 15”+ (snags/ac)	90% CI Upper Bound	90% CI Lower Bound	Snags 20”+ (snags/ac)	90% CI Upper Bound
Entire BNF	7.9	10.0	12.3	2.3	3.1	4.0	0.6	0.9	1.3
MA1	1.1	3.3	6.1	0.0	0.4	1.0	0.0	0.3	0.8
MA2	0.4	2.4	5.1	0.2	1.5	3.1	0.1	1.3	2.9
MA3	2.3	7.2	13.9	0.3	2.0	4.5	0.1	0.7	1.4
MA5	8.3	15.4	23.7	2.2	4.6	7.4	0.2	0.6	1.2

With the abundance of snags available now and snag management guidelines in place to assure a continuing supply, snag numbers on the Forest will continue to meet the habitat needs of snag dependent wildlife species and sufficient snag habitat will exist to maintain species viability on

the Forest. Therefore, the relatively minor effect of this proposal on snags would not be measurable at the Forest scale.

Black-Backed Woodpecker (*Picoides arcticus*) (Sensitive)

Affected Environment

No large fires have burned within the Westside project area or the adjacent larger cumulative effects area during the past 10 years, so there are no recent post-fire areas to provide primary habitat for black-backed woodpeckers.

Insect and disease aerial surveys indicate that large portions of the project area have been infested with mountain pine beetles in the past 10 years (EA pg. 3-16). Most of the bark beetle infestations in and near the project area have occurred in the past six years. Adjacent areas to the south and west have also experienced similar levels of mountain pine beetle-caused tree mortality in the same period. This recent outbreak has created new lodgepole pine and ponderosa pine snags across the Bitterroot National Forest. Mountain pine beetle larvae are generally only present in trees for a year after the initial beetle attack, but the ongoing nature of the bark beetle outbreak could continue to provide woodpecker foraging opportunities for several years.

Forest personnel detected pileated woodpeckers, hairy woodpeckers, and three-toed woodpeckers, and to a lesser extent red-naped sapsuckers foraging on trees killed by bark beetles in the project area but they did not observe black-backed woodpeckers. However, it is possible that some black-backed woodpeckers occur in the project area.

Environmental Consequences

Methodology

The analysis for black-backed woodpecker for the Westside project focuses on two evaluation criteria:

- Impacts to snags in high quality, primary habitat (moderate or severe fire areas burned within the last six years)
- Impacts to snags in secondary habitat (patches of insect and disease infestations).

The Westside analysis includes both post-fire snag habitat (primary habitat) and insect and disease snag habitat (secondary habitat) in the analysis of potential effects of proposed activities to black-backed woodpeckers (PF-WILD-053).

Direct and Indirect Effects

Alternative 1 (No Action Alternative)

This alternative would not reduce existing snag numbers, and would therefore not directly affect the amount of habitat available for black-backed woodpeckers in the short term. Existing population levels of black-backed woodpeckers would eventually decline in the project area as the number of trees killed by bark beetles decreases. As stand density and fuel loads increase, the probability of bark beetle infestations and severe fire increase. In these events, abundant black-backed woodpecker habitat would be created and support black-backed woodpeckers for several years.

Alternative 2

This alternative would not affect primary habitat for black-backed woodpeckers because there have been no recent moderate or high severity fires in the project area. Commercial harvest treatments in this alternative would reduce the habitat quality of marginally suitable secondary

habitat by falling some snags on about 1,305 acres where some trees have been killed by insects or diseases over the past several years. These treatments would also reduce stocking rates of live trees in stands that are overstocked and vulnerable to future beetle attacks, thereby reducing the amount of secondary habitat that would potentially be available in the next five years as beetle populations moved through the stands. Black-backed woodpeckers prefer high snag densities and they are rarely found in partially salvaged burned areas (Hejl and McFadzen 2000). It is also likely that black-backed woodpeckers are rarely found in areas of insect outbreaks that have been partially salvaged.

Prescribed fire would follow commercial harvest and non-commercial thinning and would have effects similar to a low severity fire. Low severity fire reduces fuels while preserving most of the live trees, shrubs, and other forest vegetation. Prescribed burning has the potential to create small areas of primary habitat for black-backed woodpeckers; however the objectives for burning do not include creating the density of snags on the landscape that is preferred by this species.

Overall, this alternative could cause minor reductions in the number of black-backed woodpeckers the project area is capable of supporting in the short term. Over the long-term, this alternative would reduce the risk of a large, high-to-moderate severity fire and intense beetle outbreaks, thereby reducing the availability of a large amount of suitable habitat (snags) that would potentially attract and support large numbers of black-backed woodpeckers for several years.

Cumulative Effects

Geographic Boundaries

The defined cumulative effects area for black-backed woodpeckers is the Westside project area and the portions of the Bitterroot National Forest west of the project area. The cumulative effects analysis area includes all of the Moose Creek, Hayes Creek, Camas Creek, Gold Creek and Judd Creek drainages, and a small portion of the adjacent Lost Horse and Roaring Lion Creek drainages outside of the canyons. The analysis area totals about 12,600 acres of mostly forested habitat and provides adequate area to assess effects assuming the estimated territory size in secondary habitat is 1000 acres. Incremental effects of the proposed project activities on nesting territories outside the analysis area would not be measurable. An assessment of the habitat and population viability at the Regional and Forest levels is considered to provide additional context. It is likely that most black-backed woodpeckers in this part of the Bitterroot Mountains currently occupy primary habitat in the area burned by the 2012 Sawtooth fire several miles north of the Westside project area.

Activities within the Cumulative Effects Area

The existing condition represents the sum of past activities. The effects of previous thinning and timber harvest in the project area created the scarcity of quality black-backed woodpecker habitat present in the area. The only recent fire in the vicinity of the cumulative effects area that created primary habitat for black-backed woodpeckers was the 2012 Sawtooth Fire. This fire created several thousand acres of primary habitat to the north of the cumulative effects area. No salvage harvest occurred on National Forest burned by the Sawtooth fire.

Trends and Broader Context

Successful fire suppression reduced the amount of primary black-backed woodpecker habitat available for woodpeckers over the past several decades (Caton 1996). Hillis et al. (2003) reported that the amount of black-backed woodpecker habitat created by fire across Region One in 2000 was 258% of the mean historic range of variability for six-year periods from 1940 to

1999. Samson (2006) reported that black-backed habitat (post-fire and insect outbreaks) has increased substantially across the Region in the last decade (from 278% on the Kootenai to over 300,000% on the Flathead). Samson (2006) also found that no gap between current post-burn or insect-infested (with no burn) areas has occurred that would limit black-backed woodpeckers from interacting Region wide. Hundreds of thousands of acres burned in Montana almost every year since 2006. Snags on a high percentage of these burned acres will never be harvested because they are in wilderness or roadless areas, or are otherwise difficult to access.

However, a recent Forest Service insect and disease condition report for Montana shows dramatic decreases in tree mortality due to non-fire causes from 2010 to 2014 (PF-WL-008; PF-WILD-009). Across all federal ownership in Montana, mountain pine beetle-caused tree mortality was evident on over 1,430,000 acres of lodgepole pine and 98,000 acres of ponderosa pine in 2010. In 2014, the area affected by mountain pine beetle mortality decreased to 239,000 acres of lodgepole pine and 44 acres of ponderosa pine. Across the same area, Douglas-fir beetle mortality in Douglas-fir stands declined somewhat from about 14,000 acres in 2010 to only 235 acres in 2014. Across much of Montana, these dramatic declines are at least partially due to a lack of suitable host trees resulting from previous mortality. Areas that contain relatively high densities of trees recently killed by bark beetles are declining rapidly. This means there is less area available as secondary habitat to support black-backed woodpecker populations. Given the recent climate trend towards warmer, drier weather, it is likely that fires and insect outbreaks will continue to create abundant habitat for black-backed woodpeckers.

Median dispersal distance for the black-backed woodpecker is estimated to be about 65 miles, although they are known to travel farther during irruptions. This dispersal distance indicates that black-backed woodpeckers across the entire Region belong to a single, well-connected population. Although no population estimates are available, the large amount of apparently suitable and well-distributed habitat across the Region combined with the interconnectedness of the population indicates the black-backed woodpecker population is viable in the short-term across the Region (Samson 2005).

Habitat models based on burned areas estimate that the Bitterroot National Forest contained sufficient post-fire habitat to support between 1,100 to 2,000 pairs of black-backed woodpeckers between 2000 to 2003 (Samson 2005), although the portion of this habitat that burned in 2000 has since lost its suitability. Areas of insect outbreaks offer additional potential habitat. This habitat and more recently created post-burn habitat is well-distributed across the Bitterroot National Forest as a result of more current fires (Table 3-24).

At a Forest-wide scale, Samson (2005, 2006) estimated that between 2000 and 2003, there were 373,600 acres of black-backed woodpecker habitat more than what is necessary to maintain a minimum viable population, which is estimated to be 330 individuals. In other words, the Bitterroot National Forest has about 1,370% of the habitat necessary to maintain a minimum viable population of black-backed woodpeckers. The recent trend towards a drier, warmer climate and the frequency of fires on the Bitterroot National Forest creates regular pulses of snags that provide suitable habitat for black-backed woodpeckers.

Determination

Alternative 1 (No Action Alternative

Implementation of this alternative would have **no impact** on black-backed woodpeckers or their habitat.

Alternative 2

Implementation of Alternative 2 **may impact individual black-backed woodpeckers or their habitat, but would not likely contribute to a trend towards Federal listing or loss of viability to population or species** (PF-WILD-055).

Fisher (*Pekania pennanti*) (Sensitive)

On January 12, 2016, USFWS published a 90-day finding on a new petition to list the Northern Rocky Mountain Distinct Population Segment (DPS) of the fisher as an endangered or threatened species under the Endangered Species Act (ESA) (USDI Fish and Wildlife Service 2016). Potential listing of the fisher as endangered or threatened would take a minimum of two years from the start of the status review. In the interim, the Northern Rocky Mountain DPS of the fisher is not protected under the ESA, but continues to be classified as a Sensitive species by the USDA National Forest Northern Region.

A previous status review of the Northern Rocky Mountain DPS (USFWS 2010a) determined that the fisher in this region did not warrant listing under the Endangered Species Act at that time (USDI Fish and Wildlife Service 2011).

Fishers are medium-sized members of the weasel family and are uncommon to rare on the Bitterroot National Forest. They appear to be well distributed in the Bitterroot Mountains, occupying habitat from Lookout Pass to Nez Perce Pass. Fisher habitat on the Bitterroot National Forest most likely occur near larger streams at lower elevations because fisher appear to prefer mature, moist, coniferous forests and areas with lower snow accumulation. The large canyons in the Bitterroot Range that lead into the Selway-Bitterroot Wilderness appear to provide the most fisher habitat on the Bitterroot National Forest.

Affected Environment

The Bitterroot National Forest does not have population estimates for fishers in the Westside project area. The wildlife biologist and wildlife technician conducted habitat assessments in potential fisher habitat but did not find fishers or fisher tracks. No fisher records have been definitely located in the project area. However, between 1977 and 2010, trapping records indicate that 13 fishers were trapped from townships that include portions of the project area. These records only specify location by township but it is likely that most or all of them were located outside of the project area in areas of higher quality fisher habitat along Rock Creek, Lost Horse Creek, Roaring Lion Creek, or Sawtooth Creek. In December 2014, one fisher was reported trapped along Roaring Lion Creek outside of the project area. In 2009, two fishers were documented in Lost Horse Creek about five miles west of the project area using non-lethal hair snare traps. In August 1998, a Bitterroot National Forest employee reported a fisher at Middle Camas Lake about 2 miles west of the project area. Given the distribution of these occurrences, it is possible that fisher populations in the adjacent canyons are connected through the project area and fishers occupy or travel through it.

The Forest established multi-carnivore bait stations during the winter of 2014-15 to document the presence of marten, fisher, wolverine, and lynx. Two of the bait stations were located on Camas and Hayes Creeks in the Westside project area and another was located near Camas Lake in the larger cumulative effects area. The bait stations at the Hayes Creek and Camas Lake documented the presence of marten but did not detect fisher, wolverine, or lynx.

About 4,164 acres (74% of the project area) of potentially suitable fisher habitat are identified in the Westside project area (PF-WILD-012; PF-WILD-013). This habitat may currently have the

components necessary to meet fisher denning and foraging needs. Predicted fisher habitat quality ratings are displayed in Table 3-26.

Table 3-26: Fisher Habitat Quality in the Westside Project Area, Existing Condition and Expected Changes from Alternative 2 Implementation

Fisher Habitat Class	Existing Fisher Habitat in Project Area Acres and (% of area)	Alternative 2 Fisher Habitat in Project Area Acres and (% of area)	Existing Fisher Habitat in Units Acres and (% of area)	Alternative 2 Fisher Habitat in Units, Acres and (% of area)
0 (Non-habitat)	1,459 (25.9%)	2,920 (51.9%)	569 (24.5%)	2,030 (87.3%)
1 (Low-quality Habitat)	3,426 (60.9%)	2,203 (39.2%)	1,519 (65.3%)	296 (12.7%)
2 (Moderate-quality Habitat)	735 (13.1%)	498 (8.9%)	238 (10.2%)	1 (0.4%)
3 (High-quality Habitat)	3 (0.1%)	2 (0.4%)	0.7 (.03%)	0 (0%)
Total Habitat	5,623 (100%)	5,623 (100%)	2,326 (100%)	2,326 (100%)

Average fisher habitat quality across the project area is low, with an overall habitat quality index of 0.22 on a scale of 0 to 1 (PF-WILD-013). The low habitat quality index is largely due to the amount of low elevation, xeric (dry), ponderosa pine forests and previous timber harvests across much of the area. These areas typically lack the high crown closure and down log components that fisher prefer. Fisher habitat quality within proposed treatment units is slightly lower, with an overall habitat quality index of 0.21. Predicted fisher habitat within the project area occurs in a band of mixed ponderosa pine and Douglas-fir forest that runs across the lower to mid-elevation, east-facing slopes. This band could potentially connect more extensive fisher habitat in Lost Horse and Roaring Lion Creek canyons. In addition, north aspects and riparian areas along streams such as Moose, Hayes, Camas, and Gold Creeks that bisect lower elevation areas provide stringers of suitable habitat that might facilitate east-west fisher travel. Higher elevations within the project area are not predicted to provide fisher habitat, presumably due to deeper snowpacks in those areas (PF-WILD-012).

Environmental Consequences

Methodology

The fisher analysis focuses on the suitable habitat in the Westside project area. Suitable habitat is defined as habitat that may currently have the components necessary to meet the needs of fisher. Fisher habitat components are lower elevation, mesic forests in older seral stages, and usually contain old growth and mature trees or multi-storied structures.

The wildlife biologist on the Westside project based the fisher analysis on updated fisher habitat estimates (Olson et al. (2014) but modified them based on extensive field verification (PF-WILD-003). Fisher habitat was classified and mapped on a Regional scale by Olson et al. (2014) using vegetation data provided by the LANDFIRE model and a number of physical and climatic parameters. Olson subsequently reran the model using vegetative data in the R1 VMap dataset, which includes tree species composition, size class, and canopy cover.

Direct and Indirect Effects

Alternative 1 (No Action Alternative)

The No Action Alternative would not directly change existing fisher habitat quality in forested uplands or riparian corridors because there would be no treatments. In the short term, habitat quality would continue to improve at lower elevations as forests dominated by Douglas-fir continue to mature, crown closures increase, and coarse woody debris accumulates.

Fisher habitat quality would eventually decline as tree mortality from bark beetles increases and canopy cover declines. Overall, the landscape pattern of fisher habitat would remain fragmented. In the longer term, increasing fuel loads as trees attacked by pine beetles die and fall would increase the probability of a severe fire. A large fire would create unsuitable habitat for fishers in areas that burned with moderate or high intensities.

This alternative would not change existing recreational access during the summer or winter, so would not affect the risk of disturbance or trapping mortality to fishers.

Alternative 2

Alternative 2 includes treatments in about 1,756 acres (42%) of the predicted fisher habitat in the project area (PF-WILD-013; PF-WILD-014). About 2,703 acres of predicted fisher habitat would remain in the project area following Alternative 2 implementation. The fisher habitat quality index across the project area would be reduced from 0.22 to 0.14 on a scale of 0 to 1 (PF-WILD-013), which indicates that average fisher habitat quality across the project area would be poor. The fisher habitat quality index within units would be .03, which indicates that most of the units would not qualify as fisher habitat following treatment (PF-WILD-013).

The treatments proposed in Alternative 2 would convert about 1,461 acres of currently predicted fisher habitat into unsuitable habitat for fishers (PF-WILD-013). This is primarily due to reductions in canopy cover and coarse woody debris. The resulting forest would have features that fishers tend to avoid – open canopies dominated by ponderosa pine. Most of this area currently provides low quality fisher habitat that likely supports only low levels of fisher activity. The pattern of fisher habitat and non-suitable openings that would result in the project area would increase the fragmented nature of the suitable fisher habitat at lower to mid-elevations between Gold and Lost Horse Creeks (PF-WILD-014). Fishers could still pass through this area in buffers between openings or along riparian corridors, but it is unlikely that resident fishers could defend a territory or reproduce in the fragmented area. The model predicts that most of the area to the west of the project area is not fisher habitat, presumably due to deep snow packs. The Westside project area may already be too fragmented to support a resident fisher population, so it is unlikely that implementation of Alternative 2 would reduce carrying capacity for fisher more than a minor degree.

Prescribed fire would follow commercial harvest and non-commercial thinning and would have effects similar to a low severity fire. Low severity reduces fuels while preserving most of the live trees, shrubs, and other forest vegetation. Components of the multi-storied forest structure would most likely be lost in portions of fisher habitat depending on fire behavior. In the long-term, this alternative would reduce the risk of severe fire. A severe fire would drastically reduce the amount of suitable fisher habitat in large portions of the project area. This alternative would help move treated stands towards old growth conditions in the long term by reducing high stocking densities improving growth rates on remaining trees.

Cumulative Effects

Geographic and Temporal Boundaries

The defined cumulative effects area for fisher is the Westside project area and the portions of the Bitterroot National Forest west of the project area. The cumulative effects analysis area includes all of the Moose Creek, Hayes Creek, Camas Creek, Gold Creek and Judd Creek drainages, and a small portion of the adjacent Lost Horse and Roaring Lion Creek drainages outside of the canyons. The analysis area totals about 12,600 acres of mostly forested habitat. In addition, the fisher cumulative effects area includes the Lost Horse and Roaring Lion Creek bottoms because both are directly connected to fisher habitat in the Westside area, and contain high-quality fisher habitat (Olson et al. 2014). The addition of these creek bottoms and the area between them increases the cumulative effects area to about 56,000 acres. This analysis area is appropriate to analyze the incremental effects of project activities on fishers in conjunction with past, present, ongoing and reasonably foreseeable actions because it incorporates nearby fisher habitat that is directly connected with fisher habitat in the project area. Incremental effects of proposed activities on fisher populations outside the cumulative effects area would not be measurable. An assessment of information available at the Forest and Regional levels is also considered to provide additional context.

Effects of the reduction in fisher habitat from Alternative 2 would last until canopy cover has re-grown to provide continuous cover and develop a multi-storied forest structure.

Activities within the Cumulative Effects Area

The existing condition represents the sum of past activities. Most of the project area was clearcut around 1900, which likely eliminated fisher habitat across the area and continues to limit the availability of important fisher habitat components such as mature or over-mature forests, large snags and downed logs. More recent regeneration timber harvest around 1970 and commercial thinning harvest in 2006 eliminated recovering fisher habitat within units and resulted in a highly fragmented landscape between Lost Horse and Camas Creeks. The existing fisher habitat index for the smaller of the cumulative effects area is 0.12 on a scale of 0 to 1 (PF-WILD-013). This is lower than the fisher habitat index within the project area because it includes a considerable amount of higher elevation terrain that Olson et al. (2014) classify as non-habitat for fishers, presumably due to deep snow packs. Fishers are associated most frequently with relatively unbroken, late-successional forest (Powell and Zielinski 1994). Hargis et al. (1999) found that highly fragmented landscapes supported few if any resident marten, even though forest connectivity was still present. Assuming that fisher numbers decline in fragmented landscapes similar to marten, fisher habitat in many drainages within the cumulative effects area may already be too fragmented to support a resident fisher population. The degree of forest fragmentation within the cumulative effects area implies that few resident fishers occupy the project area, although transient fishers could use forested areas between openings and along riparian zones to move through the area.

Successful fire suppression may have allowed many forested stands in the cumulative effects area to mature and become better fisher habitat than they might have under the influence of the historic fire regime, which would typically produce a mosaic of burned and unburned stands over time. However, the buildup of fuels allowed by fire suppression suggests that if a fire occurs in the area now it could be severe. If this occurred, it could eliminate large areas of fisher habitat for 50 or more years.

The road system built to access historic timber sale units on the face, especially the Lost Horse Creek road that goes all the way to the top of the Lost Horse Creek drainage, provides easier

access to fisher habitat for summer and winter recreational users, who may disturb or kill fishers. The road system also facilitates trapping access and fisher harvest, which would reduce the local fisher population. Lost Horse Creek is the likely source of many fisher trapping records in the Bitterroot, partly due to the ease of winter access on the existing road.

Trends & Broader Context

Fishers were apparently extirpated from Montana by 1930, and there are no records of their occurrence in the state from then until fishers from other areas were released at several sites in the early 1960s (Vinkey 2003; Vinkey et al. 2006). The Bitterroot Mountains possess the most verified records of fisher in the State, both before and after 1989, and appear to be the stronghold of fisher populations in Montana (Vinkey 2003). They may be a stronghold because of the release of 42 fishers from British Columbia in the Idaho side of the Bitterroot Mountains in 1962 and 1963 (Vinkey et al. 2006). However, recent genetic studies indicate that some native fishers may have survived in the Selway-Bitterroot region based on the presence of individuals that carry a haplotype unique to fishers native to the Northern Rocky Mountains (Vinkey 2003; Vinkey et al. 2006). Twelve fishers from British Columbia were released at Moose Lake on the eastern edge of the Sapphire Mountains in 1960 (Weckwerth and Wright 1968), and apparently became established in the Sapphires based on trapping records. One of these fishers was killed in a trap in the Skalkaho Creek drainage on the Bitterroot National Forest in 1965. There are no verified fisher locations in the northern Sapphire Range (Vinkey 2003).

The Bitterroot National Forest participated in a Regional pilot study designed to determine fisher presence within 25 square mile grids each year from 2007 through 2013 (Schwartz et al. 2006). Fishers were detected in Lost Horse drainage, Trapper Creek, Bear Creek, Tough Creek, and in the Burnt Fork drainage. Additionally, the Forest surveyed for multiple small carnivores using bait stations during the winters of 2012 –2014. These stations detected fishers in the White Cap drainage and along the Magruder Crossing road in the Selway-Bitterroot Wilderness in 2012 – 2013, but have not detected any fishers since then. Other recent fisher sightings have been confined to the Bitterroot Mountains.

Fishers are known to be highly vulnerable to trapping and susceptible to overharvest (Powell 1979). Montana is the only state in the western U.S. that still allows limited trapping of fishers. Montana Department of Fish, Wildlife, and Parks (MDFWP) trapping records indicate that since 1996 trapping success has been consistent with about 7 fishers trapped across the state, and generally 2-3 being trapped from Ravalli County (PF-WILD-017). These records indicate that fisher populations may be relatively stable.

FIA data estimates that there are 95,134 acres of summer habitat and 286,142 acres of winter fisher habitat on the Bitterroot National Forest. This amount of habitat is 95% of the habitat necessary to maintain a minimum viable population of fisher (Samson 2005, Samson 2006). The adjacent Lolo National Forest and Clearwater National Forest have an estimated 149% and 358% of the habitat necessary to maintain a minimum viable population, respectively (Samson 2005). This information indicates that the Bitterroot National Forest has generally marginal fisher habitat and linkages to better habitats on the Lolo and Clearwater National Forests need to be maintained.

Determination

Alternative 1 (No Action)

Implementation of this alternative would have **no impact** on fisher or their habitat.

Alternative 2

Implementation of Alternative 2 **may impact individual fisher or their habitat, but would not likely contribute to a trend towards Federal listing or loss of viability to population or species** (PF-WILD-055).

Flammulated Owl (*Psiloscops flammeolus*) (Sensitive)

In general, flammulated owls nest in relatively large trees in open forests. They are not typically associated with burned areas or extensive beetle-killed trees, probably due to the lack of physical and biological components needed to support both the owls and the insects they prey on. Flammulated owls primarily prey on noctuid (night flying) moths in the early spring, and crickets, grasshoppers, moths, and beetles in the summer (McCallum 1994). The openness of foraging stands provides space for hawking flying insects between crowns and for hover gleaning them from outer needle bunches (Reynolds and Linkhart 1987). Several studies have reported average territory size of around 15 hectares (37 acres), which decreases by half during the nestling and fledgling periods (McCallum 1994, Reynolds and Linkhart 1987).

Affected Environment

The Forest does not have population estimates for flammulated owls in the Westside project area. There are no records of flammulated owls in or near the project area. The wildlife technician surveyed for flammulated owls throughout the roaded portion of the project area between Lost Horse Creek and Camas Creek in June 2015, and in similar habitat along Rd. 5621 between Lost Horse Creek and Lake Como. No owls were detected (PF-WILD-018). The Avian Science Center conducted surveys for flammulated owls across the Bitterroot National Forest in 2005 and 2008, and did not detect any flammulated owls along several routes on faces between Camas Creek and Chaffin Creek (Cilimburg 2006; Smucker et al. 2008). Wright (1996) surveyed for flammulated owls along many routes in the Bitterroot and Sapphire Mountains in 1994 and 1995. In 1994 she surveyed three transects in the project area including the loop between Moose Creek and Camas Creek formed by roads 5620, 62953 and 496, lower Lost Horse Creek Road and the lower part of the Ward Mountain Trail. In 1995, she surveyed Road 496 up to the Lost Horse Observation Point. She did not detect any flammulated owls in the project area or on nearby slopes with similar habitat including Lick Creek, Tin Cup Creek, Goat Mountain, and Canyon Creek. Forest biologists surveyed many east-facing slopes of the Bitterroot Mountains in 1991 with habitat similar to the project area, including Lick Creek. Although they did not survey the project area, they did not detect flammulated owls in similar habitats (PF-WILD-019).

Approximately 733 acres (13%) of the Westside project area is predicted suitable flammulated owl habitat (PF-WILD-020; PF-WILD-021). This habitat may currently have the components necessary to meet the nesting and foraging needs of flammulated owls. The predicted flammulated owl habitat is scattered across the landscape, with no large concentration of predicted habitat. Much of the project area has potential as future flammulated owl habitat but currently lacks the large tree and large snag components preferred by this species.

Environmental Consequences

Methodology

The flammulated owl effects analysis focuses on suitable habitat in the Westside project area. The wildlife biologist classified and mapped flammulated owl habitat using the R1 VMap dataset. The dataset includes dominant tree species, size class, canopy cover, and aspect. These forest structural components identify stands that contain or are likely to meet the habitat needs of flammulated owls. Predicted flammulated owl habitat is generally open, mature to old growth

ponderosa pine and Douglas-fir forests on lower elevation, drier sites with well-developed grass and understory shrubs where frequent fires limit the colonization of shade-tolerant trees (McCallum 1994, Reynolds and Linkhart 1992). These habitats correspond very closely to VRUs 1, 2 and 3 on the Bitterroot National Forest based on current literature.

Direct and Indirect Effects

Alternative 1 (No Action Alternative)

The No Action Alternative would not change existing habitat quality for flammulated owls in the short term, because no treatments would occur in existing flammulated owl habitat. Over time, habitat quality for flammulated owls would gradually decline as Douglas-fir and sub-alpine fir continued to fill in the sub-canopy layer under mature and older ponderosa pine and Douglas-fir. The open stand structure that attracts flammulated owl prey species and allows the owls to forage would become less common. As forests continue to mature, snag numbers would increase and coarse woody debris would accumulate. In the longer term, increasing tree densities and fuel loads would increase the probability of severe fire. Severe fire would create marginal or unsuitable habitat for flammulated owls in areas that burned at moderate or high severity.

Alternative 2

This alternative would treat about 43% of the predicted flammulated owl habitat in the project area. About 199 acres of predicted owl habitat are in commercial harvest units, and 94 acres are in non-commercial thinning units, with minor amounts in the other treatment types (PF-WILD-022; PF-WILD-023). Both commercial harvest and non-commercial thinning units would reduce crown closures and increase the percentage of ponderosa pine in the overstory, which would improve flammulated owl habitat quality by improving foraging conditions. However, both treatments are likely to reduce the number of large snags that might provide suitable nesting habitat. In the short term, these treatments are likely to be slightly negative for flammulated owl habitat quality. In the longer term, these treatments would improve habitat quality for flammulated owls by increasing the ratio of ponderosa pine in the stands, accelerating growth rates of remaining trees, and moving the units towards the open stand structure that this species prefers. Treatments would be unlikely to have any short-term effects on flammulated owl populations because the younger stands that dominate the project area do not appear to be occupied.

Prescribed fire would follow commercial harvest and non-commercial thinning and would have effects similar to a low severity fire. Older snags would be vulnerable to igniting and burning unless protected from fire. New snags would most likely be recruited during prescribed burning, but these would likely be smaller than existing snags killed by fire, and would tend to be less valuable for flammulated owl nesting. Some thickets of Douglas-firs should be left in units to provide roosting areas for flammulated owls.

Cumulative Effects

Geographic and Temporal Boundaries

The defined cumulative effects analysis area for flammulated owl is the Westside project area and portions of the Bitterroot National Forest west of the project area. The cumulative effects analysis area includes all of the Moose Creek, Hayes Creek, Camas Creek, Gold Creek and Judd Creek drainages, and a small portion of the adjacent Lost Horse and Roaring Lion Creek drainages outside of the canyons. The cumulative effects analysis area is about 12,600 acres of mostly forested habitat. Incremental effects of proposed activities with past, present, and reasonably foreseeable activities on flammulated owl populations outside the cumulative effects

analysis area would not be measurable. An assessment of information available at the Forest and Regional levels is also considered to provide additional context.

The effects of snag reductions in Alternative 2 would continue until other trees die. Given current mortality rates due to insects, diseases, and fire across the Region, it is likely that snag recruitment will continue to provide adequate snag numbers.

Activities within the Cumulative Effects Area

The existing condition represents the sum of past activities. The forested landscape in this area was historically characterized by open stands of large ponderosa pines that likely provided flammulated owl habitat. Extensive clearcutting around 1900 removed most of the large ponderosa pines and large snags that existed in the area. Existing forest structure is composed mostly of second-growth mixed ponderosa pine and Douglas-fir. Large old trees and large snags are relatively rare components of this area. The habitat quality for flammulated owls throughout this area is generally poor, although there may be some patches that provide suitable nesting habitat and may be occupied by owls. The lack of high-quality habitat implies that flammulated owls do not currently occupy much of the project area. Lack of owl detections during repeated surveys supports this conclusion.

Flammulated owls may be vulnerable to continual fire suppression, which modifies forest structure and composition over time (Groves et al. 1997, Wright et al. 1997, Linkhart 2001, van Woudenberg 2003). Fire suppression in ponderosa pine-dominant forests has increased the presence of shade-tolerant tree species. In many lower to mid-elevation areas across the Forest, fire suppression has allowed succession of ponderosa pine forests to Douglas-fir (or grand fir in places). Forests are more dense with closed canopies and do not provide the habitat characteristics selected by flammulated owls (McCallum 1994). Understory development is reduced and the high stocking density can reduce or stagnate growth (Harrington and Sackett 1992). The structure of these stands and the high risk of tree mortality before they mature exacerbate the lack of nest-tree development.

Trends & Broader Context

At a Forest wide scale, habitat modeling based on FIA data estimates that the Bitterroot National Forest contains 11,144 acres of flammulated owl habitat more than the amount estimated as necessary to maintain a minimum viable population, which is estimated to be 340 individuals (Samson 2005, Samson 2006). Another way to say this is that we have an estimated 337% of the habitat necessary to maintain a minimum viable population of flammulated owls on the Forest.

The number of flammulated owl detections on the Bitterroot National Forest on unburned monitoring transects remained fairly consistent from 2000 to 2010. In high and mixed severity fires that burned through areas known to support concentrations of flammulated owls in 2000, about half the number of flammulated owls were detected in 2001. Flammulated owl detections on burned transects have continued to decline, and we found very few owls in burned areas in 2005 (PF-MONITOR-001).

A standardized Regional survey effort in 2005 found that flammulated owls were well-distributed in suitable habitat west of the Continental Divide, but were rather restricted in distribution east of the Divide. On the Bitterroot National Forest, flammulated owls were detected on 14 of the 30 completed transects, and on 42 of the 281 sample points (Cilimburg 2006). These surveys showed that flammulated owls are well distributed in suitable habitat on the southern half of the Forest, which was heavily sampled. They were only detected on a few transects on the north half of the Bitterroot National Forest, but this area was not heavily sampled. Wright (1996)

found a similar flammulated owl distribution pattern on the Forest during fieldwork in 1994 and 1995. The Region 1 Wildlife Ecologist reviewed flammulated owl viability in the Northern Region and determined the habitat is well distributed and abundant, and the species is viable in the short-term (Samson 2005).

Determination

Alternative 1 (No Action)

Implementation of this alternative would have **no impact** on flammulated owl or their habitat.

Alternative 2

Implementation of Alternative 2 **may impact individual flammulated owl or their habitat, but would not likely contribute to a trend towards Federal listing or loss of viability to population or species** (PF-WILD-055).

Gray Wolf (*Canis lupus*) (Sensitive)

Legal Status of Gray Wolf

The gray wolf was delisted as endangered by Federal legislation on May 5, 2011 (PF-WILD-025) and wolf management was returned to the state wildlife management agencies. Wolves were automatically added to the Regional Forester's Sensitive Species List at the time they were delisted. Montana and Idaho both held legal wolf hunting seasons beginning in 2011.

Affected Environment

The Westside project area is within the former territory of the Lake Como Pack. This pack was reported intermittently in both Montana and Idaho beginning in 2002. Its territory and numbers were never well-known because none of the wolves in the pack were collared. In 2011, the known pack consisted of three wolves (two adults and one sub-adult), all of which were lethally removed following a depredation incident on a local ranch. Currently, the Westside project area is not known to be within a wolf pack territory but is likely that transient individuals or adjacent packs use the area during exploration periods. Wolves are classified as a habitat generalist and the entire project area provides suitable habitat.

Environmental Consequences

Methodology

For each alternative the following evaluation criterion were used to predict impacts to gray wolf:

- Prey availability
- Human disturbance as predicted by open road density.

None of the activities proposed would make habitat unsuitable for wolves; therefore, habitat quality is not an evaluation criteria.

Direct and Indirect Effects

Alternative 1 (No Action Alternative)

The No Action alternative would not affect gray wolf habitat or populations in the short term. This alternative would not affect the availability of wolf prey because it would not change existing habitat conditions. It would not change the potential for human disturbance because it would not affect existing open road densities.

Alternative 2

Vegetation treatments proposed in this alternative would cause minor changes in deer and elk population numbers because they would increase forage production and reduced hiding cover.

Proposed reductions in open road densities would slightly reduce the potential for human disturbance on wolves and their prey in those areas. This would be offset to some extent by construction of new permanent roads that would facilitate non-motorized access to portions of the project area that are currently unroaded. The net effect from the combination of factors on local wolf populations would be negligible. Individual wolves might temporarily be displaced by human disturbance and move to another portion of their large territory.

Cumulative Effects

Geographic and Temporal Boundaries

The defined effects area for wolves is the Bitterroot Mountains, extending from Rock Creek to Blodgett Creek, which is the presumed territory of the Lake Como pack. This analysis area is appropriate to analyze any incremental effects from the actions of this project on wolves in conjunction with past, present, ongoing and reasonably foreseeable future actions because direct and indirect effects would be minor. Incremental effects of proposed activities of this project on wolf populations outside the cumulative effects area would not be measurable. An assessment of information available at the statewide level is also considered to provide additional context.

Activities within the Cumulative Effects Area

The existing condition represents the sum of past activities. Wolves were not present in the Bitterroot Mountains during previous periods of extensive road construction and timber harvest, so these activities had no direct or indirect effects on wolves. Clearcutting and improved hunting access to the area on the road system constructed for access to timber harvest units resulted in declines in elk populations documented in the elk section. However, elk populations had rebounded by the time wolves reoccupied the Bitterroots due to road closures and reforestation that increased hiding cover. The fact that wolves reoccupied the area within the past two decades indicates that the area is providing suitable habitat for wolves.

The effects of Alternative 2 would last while management activities were occurring. Given the large territories of wolves, their high mobility, and the high mobility their prey, cumulative effects would be minimal and temporary in nature.

Trends & Broader Context

At least 14 wolf packs were known or suspected to use portions of the Forest at the end of 2014. Eleven of these packs were classified as Montana packs, while three of them were classified as Idaho packs (USFWS et al. 2015). Montana Fish, Wildlife & Parks implemented wolf hunting seasons beginning in 2009, and added a wolf trapping season in 2012 in an effort to reduce wolf numbers in Montana. Seven wolves were legally harvested by hunters in Ravalli County in 2014 and three were killed through control efforts following livestock depredations.

Determination

Alternative 1 (No Action)

Implementation of this alternative would have **no impact** on wolves or their habitat.

Alternative 2

This alternative changes big game habitat, which could have minor effects on local deer and elk populations. Construction of new permanent roads could increase the risk of wolf disturbance or mortality from increased public access, though the roads would be closed to motorized use. During equipment operations, this alternative could disturb wolves in the vicinity of treatment units. This disturbance would be minor and temporary while equipment is operating. As a result, Alternative 2 **may impact individual wolves or their habitat, but would not likely**

contribute to a trend towards Federal listing or loss of viability to population or species (PF-WILD-055).

Long-eared Myotis (*Myotis evotis*), Long-legged Myotis (*Myotis volans*), and Townsend's Big-eared Bat (*Corynorhinus townsendii*) (Sensitive)

Long-eared myotis, long-legged myotis, and Townsend's big-eared bat and their associated habitats are described together because their habitats and the potential project effects are similar.

Affected Environment

Long-eared myotis, long-legged myotis, and Townsend's big-eared bats have been detected in the Bitterroot drainage but very little is known about their local abundance or distribution. Long-eared myotis occur singly or in small groups in many habitats where suitable roost sites exist. In forested habitats, they are often associated with mature or old growth forests (Foresman 2001). Long-eared myotis forage over water or among trees and shrubs by picking prey from the surface of foliage, bark, rocks, or the ground.

Long-legged myotis are found most often in montane coniferous forests, though they are also found in riparian cottonwood woodlots (Foresman 2001). Many Montana records come from elevations greater than 6,000 feet (Hoffmann et al. 1969). They feed primarily on moths, though they consume a variety of other insects. They chase prey for relatively long distances around, through, or over the forest canopy, forest clearings or water.

Townsend's big-eared bats are often associated with moist coniferous and deciduous forests, but occupy a wide variety of vegetation types, from juniper/pine to high elevation mixed conifer forests (Barbour and Davis 1969). They appear to avoid grasslands whenever possible (NatureServe 2012). Caves and abandoned mines are essential for maternity roosts and hibernacula (Foresman 2001). Females form maternity colonies in spring and summer, where they bear and raise young in colonies of 20 – 180 females (Pearson et al. 1952). Males are more solitary and may venture further into the forest to forage, and occasionally roost in tree cavities or behind loose bark. This species sometimes roosts in buildings or caves in late summer.

Both long-eared myotis and long-legged myotis roost in buildings, hollow trees, mines, caves, or rock fissures. Small maternity colonies of long-eared myotis have been found in buildings or in rock crevices (NatureServe 2012). Long-legged myotis nursery sites are often located in hollow trees, but buildings and rock crevices are also used (NatureServe 2012). Hibernacula are located in caves or mines.

No caves or tunnels are known to occur in the project area that would be suitable for a nursery or hibernating colony, though a few large snags contain cavities or hollows.

Long-eared myotis and long-legged myotis each have at least one record of overwintering in a Montana mine, but many individuals probably migrate (Foresman 2001). Townsend's big-eared bat may move some distance between hibernacula or roosts and foraging areas, but are not considered migratory.

Environmental Consequences

Methodology

Since there are no known primary roosting habitats (caves, mines, or buildings) for these bat species in the project area, potential effects on snags, which may be used as roosts, or nursery sites are assessed.

Direct and Indirect Effects

Alternative 1 (No Action Alternative)

This alternative would not affect long-eared myotis, long-logged myotis, or Townsend's big-eared bat populations or suitable habitat because it would not change existing habitats or motorized access.

Alternative 2

This alternative would not affect any mines, caves, or tunnels that could provide important maternal colony or hibernacula habitat for the three bat species because these structures do not exist in the project area. This alternative would reduce the existing snag densities on approximately 1,305 acres of commercial harvest units and 666 acres of non-commercial thinning.

Snag retention guidelines in the harvest units would assure that some snags would be retained in those units, including the large ponderosa pine and Douglas-fir snags that are more likely to provide the cavities or hollow areas that bats might use for roosting or maternal areas. The project area also contains moderate numbers of snags that are not within proposed units, all of which would be retained. Snags left inside and outside of proposed units would provide adequate roosting opportunities for individuals or small groups of bats.

The forest structure in the treatment units would be more open than it is currently, which may reduce prey or interfere with the feeding behavior of long-eared myotis. However, there is no information about the effects of forest structure changes on bat prey species or bat foraging opportunities.

Prescribed fire would follow commercial harvest and non-commercial thinning and would have effects similar to a low severity fire. Prescribed fire could reduce roosting or denning habitat quality for these three bat species by eliminating some of the large existing snags. These snags can catch fire even during low severity underburns, and will often burn through and fall. Prescribed fire can also create new snags if it generates sufficient heat around green trees, and some of these new snags may be large enough to provide bat roosting or denning habitat. Given the standard burning prescription in lower elevation stands, it is likely that the trend in the number of large snags in these units would be downward. Overall, the effects of prescribed fire on bat habitat would likely be neutral to negative in the short term.

Cumulative Effects

Geographic and Temporal Boundaries

The defined cumulative effects analysis area for these three bat species is the Westside project area. This analysis area is appropriate to analyze effects from the actions of this project on this species in conjunction with past, present, and reasonably foreseeable actions as incremental effects of proposed activities of this project on bats outside of the project area would not be measurable.

The effects of the reduction of snags in Alternative 2 would be in effect until other trees die. Given current mortality rates across the Region, it is likely that snag recruitment will continue to provide adequate snag numbers in the area.

Activities within the Cumulative Effects Area

The existing condition represents the sum of past activities. No known caves or mine adits exist within the cumulative effects area, so the impact of previous activities on bats is likely limited to timber harvest activities. Logging altered the forest structure to various degrees, which may have changed the abundance of available prey. Clearcuts could have created grassland-like habitats that Townsend's big-eared bats avoid. Felling snags in units may have eliminated some large snags that provided loose bark for roosting by individual bats.

Trends & Broader Context

Bat surveys on the MPG Ranch east of Florence have documented long-eared myotis and long-legged myotis at several different sites in 2014 and 2015 using both auditory bat detectors and mist-netting (K. Stone pers. comm.). Bat numbers seem to be highest at mid-elevation sites. Two automated bat monitoring sites on the southern half of the Bitterroot National Forest recorded numerous detections of all three species in 2013 and 2014, Townsend's big-eared bat was also recorded during late fall. A Bitterroot National Forest bat survey detected one long-legged myotis at one site along Meadow Creek and two long-eared myotis and two long-legged myotis at another site on the same creek on the Sula Ranger District in 2006. The same survey detected one long-legged myotis along Martin Creek near it's confluence with Bush Creek and a Townsend's big-eared bat near the confluence of Meadow Creek and the East Fork Bitterroot River. They also detected long-eared myotis along the East Fork Bitterroot River near the confluence of Meadow Creek, along Bush Creek, and along Balsam Creek using audio bat detectors. Specimens of long-eared myotis and long-legged myotis were collected from numerous locations around the Bitterroot Valley in the 1930s through the 1960s (PF-WILD-026).

A MDFWP biologist detected the vocalizations of a Townsend's big-eared bat at Lake Como in August, 2006 (K. DuBois, pers. comm.). Hoffman et al. (1969) reported specimens of the western big-eared bat collected northeast of Florence, at the Curlew Mine near Victor, in Hamilton, and at Lake Como. Others were collected near Victor and the mouth of Kootenai Creek (PF-WILD-026).

Determination

Alternative 1 (No Action)

Implementation of this alternative would have **no impact** on long-eared myotis, long-legged myotis, Townsend's big-eared bat or their habitat.

Alternative 2

Implementation of Alternative 2 **may impact individual long-eared myotis, long-legged myotis, Townsend's big-eared bat or their habitat, but would not likely contribute to a trend towards Federal listing or loss of viability to population or species** (PF-WILD-055).

Peregrine Falcon (*Falco peregrinus*) (Sensitive)

Affected Environment

Peregrine falcons occupy a wide variety of habitats, but need adequate cliff ledges or rock outcrops for nesting. Peregrines on the Bitterroot National Forest prefer to nest on dominant, high, open cliff faces near the mouths of many of the canyons in the Bitterroot Mountains. A peregrine aerie was discovered in the North Fork Lost Horse Creek drainage in 2001, and was

active most years until 2013. Forest biologists were unable to detect evidence that this territory was active in 2014 or 2015. In April 2015, the Forest documented potential courtship behavior between two peregrine falcons at cliffs directly above the Lost Horse Quarry, which is at the southwest corner of the Westside project area. Subsequent monitoring during the typical nestling and fledgling periods failed to detect peregrine activity at this site, indicating either that the site was not used for nesting, or the nesting attempt failed. The site is popular for rock climbing, and falcons can be sensitive to disturbance from rock climbing or other human activities.

Environmental Consequences

Methodology

Peregrine falcons can be sensitive to human disturbance at nesting sites during the nesting season. Therefore, disturbance impacts to potential nesting sites for peregrine falcons are evaluated for each alternative.

Direct and Indirect Effects

Alternative 1 (No Action Alternative)

This alternative would not increase disturbance near the cliffs above the Lost Horse quarry because no vegetation management activities would occur.

Alternative 2

This alternative would increase disturbance on potential falcon nesting in the cliffs above the Lost Horse quarry. Unit 29 actually includes the cliffs, and any slashing or prescribed burning activity in this unit during the nesting season (March 15 to August 30) could potentially disrupt a nesting attempt and cause a nest to fail. The western lobe of Unit 7d is just below and adjacent to the cliffs on the east. Harvest activity, or subsequent slash disposal activity in the western portion of this unit during the nesting season could also disturb nesting peregrines. Habitat changes resulting from implementation of either of these units outside of the nesting season would have negligible impacts to peregrine falcon use of these cliffs. In addition, the Lost Horse quarry would be the likely source of material needed for construction of the new roads proposed in this alternative. Quarrying or crushing rock at this site during the nesting season would disturb falcons nesting on the cliffs above. None of the activities required for implementation of Alternative 2 would disturb peregrine falcons nesting at the original site in the North Lost Horse Creek drainage.

If monitoring identifies an active peregrine falcon nest at the cliffs above the Lost Horse quarry, activities within ½ mile of the nesting cliffs would not occur during the nesting season (March 15 to August 30). This design feature would affect activities in Units 29 and the western lobe of Unit 7d and would ensure that project activities do not disturb nesting peregrines. This same seasonal restriction would apply to quarrying or rock crushing activities in the Lost Horse quarry.

Cumulative Effects

Geographic and Temporal Boundaries

The defined cumulative effects analysis area for peregrine falcons is the Lost Horse Creek drainage. This analysis area is appropriate to analyze effects of the actions of this project on this species in conjunction with past, present, and reasonably foreseeable actions as incremental effects of proposed activities of this project on falcons outside of the analysis area would not be measurable.

Activities within the Cumulative Effects Area

The existing condition represents the sum of past activities. For peregrines, past activities are largely confined to shooting and the use of DDT, which were directly responsible for dramatic declines in peregrine populations across the continent. Subsequent reintroduction of captive-bred peregrines to formerly occupied habitat allowed populations to rebound across the country and the species was removed from the Threatened and Endangered Species List in 2000. A more recent impact at some sites is disturbance of nesting peregrines caused by rock climbing on nesting cliffs. The cliffs above the Lost Horse quarry are popular for rock climbing, which could dissuade peregrines from nesting at this site, or cause a nesting attempt to fail. The Forest implemented a voluntary closure to rock climbing at these cliffs in the spring of 2015 when it appeared that falcons might be nesting at the site. Despite the closure, falcons appeared to have abandoned the site by the nesting and fledgling periods. It is unknown whether falcons were initiating nesting or scouting for an alternate nest site.

Trends & Broader Context

Peregrine falcon surveys on the Bitterroot National Forest have documented overall upward trends in numbers of occupied territories and numbers of young produced since wild peregrines were first documented on the Forest in 1992 (PF-MONITOR-001). In 2015, the Forest documented 13 active peregrine eyries in the Bitterroot drainage that fledged a minimum of 28 young. Since 1992, peregrine eyries have been documented in 18 different territories, many of which are occupied every year. We have documented 327 young peregrines fledged from Bitterroot territories since 1992. Actual numbers fledged are likely substantially higher.

Peregrine falcon numbers across the state have a similar strong upward trend. There were no known peregrine falcon aeries in Montana in the 1970s. Reintroduction efforts beginning in the late 1980s re-established peregrine populations in some areas of the state, including the Bitterroot Mountains. Falcon numbers have continued to climb as peregrines have recolonized suitable habitat. In 2015, peregrine surveys coordinated by the Montana Peregrine Institute documented at least 234 young peregrines fledged from about 100 active territories in Montana.

Determination

Alternative 1 (No Action)

Implementation of this alternative would have **no impact** on peregrine falcons or their habitat.

Alternative 2

Implementation of Alternative 2 **may impact individual peregrine falcons or their habitat, but would not likely contribute to a trend towards Federal listing or loss of viability to population or species** (PF-WILD-055).

Western Toad (Bufo boreas) (Sensitive)

Western toads are habitat generalists that are found in a variety of habitats from valley bottoms to high elevations. They breed in lakes, ponds, and slow streams with a preference for shallow areas with mud bottoms. Breeding season varies with elevation, but typically occurs soon after ice has left a particular site. Tadpoles are seen in ponds during the day. Breeding sites in lakes or ponds are obviously critical for western toads, but there is little indication in the literature that riparian habitats are particularly important for this species outside of the late spring/early summer breeding season.

Western toads appear to be attracted to recently disturbed areas and may benefit from fuel reduction projects. Toads colonized and bred in dozens of shallow ponds in burned forests in Glacier National Park, but not in adjacent, unburned areas (Pilliod et al. 2006). Diet samples

from western toads in burned subalpine fir and lodgepole pine forests in northeast Oregon contained higher numbers of prey than samples obtained from toads in unburned forests, although the numbers were not statistically different (Bull 2006).

Individual western toads may be injured or killed by vehicles when crossing roads or trails, or by logging equipment operating in harvest units. The potential for direct toad mortality from motor vehicles is related to the number of miles of roads and trails that are open to motorized use, since toads are largely terrestrial and use a variety of habitats that are often a considerable distance from water. Therefore, the number of miles of roads and trails open to motorized use should be an index of the risk for toad mortality from motorized use.

Affected Environment

The entire project area provides suitable western toad habitat given their use of a variety of habitats, although use may be limited in many of the denser stands on north-facing slopes (Bull 2006). There are several small permanent ponds within the analysis area and other small ephemeral ponds, but western toad breeding was not documented at any of these sites. Very small ponds may occur in association with shallow areas of some of the creeks or old roads, and if present, could provide suitable breeding sites for toads.

Environmental Consequences

Methodology

Western Toads are also commonly known as boreal toads. The analysis for western toads will focus on:

- Riparian habitat, and
- Mortality – activities that could cause direct or indirect mortality in terrestrial habitats.

Direct and Indirect Effects

Alternative 1 (No Action Alternative)

This alternative would not affect western toad populations or suitable habitat. Since it does not treat vegetation, existing habitat conditions would not change in the short-term. Current levels of motorized vehicle use on roads would likely remain unchanged, which would continue to pose some risk of toad mortality as they cross or rest on roads. In the short-term, continued tree mortality from the mountain pine beetle infestations would reduce canopy cover in some stands, which would improve toad habitat quality. In lower elevation stands, forest succession would tend to decrease the quality of toad habitat as mid-story canopies became denser, shading out understory plants that provide habitat for toads' insect prey (Bull 2006). The risk of severe fire or insect outbreaks would increase as canopies become denser. A severe fire might kill some toads, and would create unsuitable habitat for a short period, but toads would re-colonize burned areas when understory vegetation and associated insects returned.

Alternative 2

Riparian buffers along all known streams and riparian areas would protect toad breeding habitat that might occur in the project area from vegetation treatments.

This alternative would not change the amount of suitable habitat for western toads in the project area, but it would change habitat quality in some suitable habitat. It would improve habitat for toads by opening up the forest canopy and creating small openings that toads apparently select (Bull 2006) on about 1,305 acres of commercial harvest units and 666 acres of non-commercial thinning.

Mechanized activities in proposed harvest units could cause toad mortality if equipment runs over toads. This would be most likely in harvest units with ground based yarding systems. The construction of 3.5 miles of permanent road and 4.7 miles of temporary road needed to access treatment areas poses an additional risk to toads. Tree felling could kill toads in any of the harvest units.

Toads crossing or resting on roads would also be at risk during timber hauling. This is especially likely at night during the summer, when toads congregate on roads. Logging trucks and crew rigs often use these roads during the early morning hours so crews can get an early start and avoid working in the heat of the day. Driving these roads in the dark would increase the potential of running over toads.

Prescribed fire would follow commercial harvest and non-commercial thinning and would have effects similar to a low severity fire. Low severity reduces fuels while preserving most of the live trees, shrubs, and other forest vegetation. Toad habitat would improve in the units with prescribed burning, which would open the canopy to some extent and simulate some of the burned conditions that toads seem to do well in (Pilliod et al. 2006).

Cumulative Effects

Geographic and Temporal Boundaries

The defined cumulative effects analysis area for the western toad is the Westside project area. This is a reasonable size to analyze effects because western toad movements and home ranges for adult toads range from approximately 400 meters to more than 1,600 meters from breeding sites (PF-WILD-028). Incremental effects of proposed activities of this project on toads outside of the analysis area would not be measurable. A regional assessment of population trends is also considered to provide additional context.

The effects of the actions in Alternative 2 would only be in effect while the management activities were occurring. Once equipment operations cease, the risk of toad mortality would return to current levels. Treatments would improve habitat quality and protect potential breeding habitat until the density of mid-story canopies increases and shades understory plants that provide habitat for toads' insect prey.

Activities within the Cumulative Effects Area

The existing condition represents the sum of past activities. Toad habitat would be improved by timber harvest though toads may be at higher risk for direct mortality during harvest operations.

Continued high recreation levels in portions of the Westside project area also increases the risk of direct toad mortality from being run over by vehicles, mountain bikes, and horses.

Trends & Broader Context

Past timber harvest, road construction and maintenance, roadside herbicide spraying, grazing, and fire suppression have affected western toad habitat in the Westside area, but the extent of these habitat impacts on local toad populations is not known. Western toad populations appear to be declining regionally. Maxell (2004, p. 7) reported that western toads are still widespread in the region (detected in 50% of watersheds and breeding detected in 17% of watersheds). Of the lentic (still water) sites surveyed, western toads were detected at 5.5% of wet lentic sites and were breeding at 2.8% of the wet lentic sites (Maxell 2004).

Surveys of more than 2000 water bodies in western Montana since 1997 found breeding populations at less than 5% of the sites (PF-WILD-030). According to historic accounts, the western toad was once considered common or abundant. Since 1939, there has been evidence

of breeding reported at 16 lentic sites. Monitoring of water bodies at and near these localities was initiated in 2001. Thirteen of these localities had breeding activity in 2001-2003, one site was destroyed, and two seemed unlikely to have ever supported breeding activity. Several of the 13 localities with breeding activity are in close proximity to one another. Thus, only eight clusters of breeding activity are currently known on the Bitterroot National Forest. None of these sites occur in the Westside project area, though one site is located several miles south of the Westside area near Lake Como.

Recent evidence from Glacier National Park has linked western toads with wildfire. Some researchers are investigating whether forest encroachment into meadows, facilitated by fire suppression and cessation of cattle grazing, reduced the suitability of former breeding sites of a species of frog (PF-WILD-030). The relationship between forest structure and western toad habitat is not understood well enough to predict how changes in forest structure, mimicking historic densities and species composition, influence western toad populations.

Determination

Alternative 1 (No Action)

Implementation of this alternative would have **no impact** on western toads or their habitat.

Alternative 2

Implementation of Alternative 2 **may impact individual western toads or their habitat, but would not likely contribute to a trend towards Federal listing or loss of viability to population or species** (PF-WILD-055).

American Marten (*Martes americana*)

(Management Indicator Species for old growth forest)

Affected Environment

The Forest does not have population estimates for marten in the Westside project area, but marten are known to occur. The wildlife biologist surveyed potential marten habitat but did not find any marten or their tracks, though one marten was sighted along a tributary of Moose Creek while driving through the area. The Forest established two multi-carnivore bait stations in the Westside project area on Camas and Hayes Creeks during the winter of 2014-15 to document the presence of marten, fisher, wolverine, and lynx. A third bait station was set up outside the project area but within the larger cumulative effects area near Camas Lake. Marten were documented at Hayes Creek and Camas Lake bait stations. There are multiple records of marten in Lost Horse Creek canyon upstream of the project area, including numerous trapping records and records from furbearer surveys. There are also trapping records of marten from Roaring Lion Creek. Given the distribution of these occurrences, it is possible that marten populations in these canyons are connected through the project area and marten occupy or travel through it.

About 4,760 acres (85% of the project area) of suitable marten habitat are in the Westside project area (PF-WILD-031; PF-WILD-032) (Table 3-27). This habitat currently has the structural components needed for marten denning and foraging.

Average marten habitat quality across the project area is low, with an overall habitat quality index of 0.28 on a scale of 0 to 1 (PF-WILD-032). This low habitat quality index is largely due to the prevalence of low elevation, xeric (dry) forests dominated by ponderosa pine, and previous harvests that occurred across much of the area. These areas typically lack the high crown closure and coarse wood that marten prefer. Marten habitat quality in proposed treatment units is even lower, with an overall habitat quality index of 0.23. The best marten habitat in the

project area is along streams and north aspects, and at higher elevations. Most treatment units do not include these areas of higher quality marten habitat, so average habitat quality within the units is lower than average habitat quality across the entire area. Areas of good marten habitat along streams and at upper elevations could serve as linkages zones that allow marten to move through areas of low quality habitat.

Environmental Consequences

Methodology

The analysis for American marten focuses on the suitable habitat in the Westside project area. Suitable habitat is defined as habitat that may currently have the habitat components necessary to meet the needs of marten. Suitable habitat typically includes mesic forests in older seral stages, and usually contains old growth and mature trees or multi-storied structures.

The wildlife biologist classified and mapped marten habitat through a query of the R1 VMap dataset. The marten query was based on a combination of tree species dominance type, size class, and canopy cover that identifies stands that contain forest structural components that are likely to meet marten habitat needs. Ratings of marten habitat quality were highest in areas that had tree species adapted to moist sites, larger diameter trees, and higher crown closures. The project biologist modified the VMap habitat classifications based on extensive field verification (PF-WILD-003; PF-WILD-004).

Habitats with resting and denning sites are used as evaluation criteria because the types of forests that contain these sites may be more limiting in the project area.

Direct and Indirect Effects

Alternative 1 (No Action Alternative)

The No Action Alternative would not directly change existing habitat quality for martens in forested uplands or in riparian corridors because it would not implement any vegetative treatments. In the short term, habitat quality would continue to improve at lower elevations as forests dominated by Douglas-fir continue to mature, crown closures increase, and coarse woody debris accumulates.

Marten habitat quality would eventually decline as bark beetle-caused tree mortality increases and canopy cover declines. Overall, the landscape pattern of marten habitat would remain fragmented. In the longer term, increasing fuel loads would increase the probability of severe fire. A severe fire would create unsuitable marten habitat in areas that burned with moderate or high severity.

This alternative would not change existing recreational access during the summer or winter, so would not change the risk of marten disturbance or trapping mortality.

Alternative 2

Alternative 2 treats about 1,800 acres (38%) of marten habitat in the project area (PF-WILD-033; PF-WILD-032). About 3,312 acres of existing marten habitat would still qualify as marten habitat following implementation of Alternative 2 (Table 3-27). The marten habitat quality index across the project area would decline from 0.28 to 0.20 on a scale of 0 to 1 (PF-WILD-032), which indicates that average marten habitat quality would be poor. Most of the units would not qualify as marten habitat after treatment (habitat quality index 0.04).

Table 3-27: Marten Habitat Quality in the Westside Project Area, Existing Condition and Expected Changes from Alternative 2 Implementation

MARTEN HABITAT CLASS	EXISTING MARTEN HABITAT IN PROJECT AREA	ALTERNATIVE 2 MARTEN HABITAT IN PROJECT AREA	EXISTING MARTEN HABITAT IN UNITS	ALTERNATIVE 2 MARTEN HABITAT IN UNITS
	ACRES (% OF AREA)	ACRES (% OF AREA)	ACRES (% OF AREA)	ACRES (% OF AREA)
0 (Non-habitat)	861 (15%)	2,311 (41%)	523 (22%)	1,973 (85%)
1 (Low-quality Habitat)	3,490 (62%)	2,311 (41%)	1,506 (65%)	328 (14%)
2 (Moderate-quality Habitat)	1,089 (19%)	873 (15%)	240 (10%)	24 (1%)
3 (High-quality Habitat)	182 (0.3%)	128 (0.2%)	55 (2%)	0 (0%)
Total Habitat	5,622 (100%)	5,622 (100%)	2,324 (100%)	2,324 (100%)

The treatment proposed in Alternative 2 would convert about 1,450 acres of currently identified marten habitat into unsuitable habitat (Table 3-27). This is primarily due to reductions in canopy cover and coarse woody debris from harvest, thinning, and burning. Forest canopy closures would be too open to qualify as marten habitat. Most of the treated units currently provide low quality marten habitat which likely support low levels of marten activity. The pattern of marten habitat and non-suitable openings created by the treatments would increase the fragmented nature of the suitable marten habitat at lower to mid-elevations between Camas Creek and Lost Horse Creek. Marten could still pass through this area in buffers between openings or along riparian corridors, but it is unlikely that resident marten could defend a territory or reproduce in the fragmented area. Higher elevation marten habitat, west of the project area and between Roaring Lion and Lost Horse Creeks, would be much less fragmented and would continue to support resident marten. The Westside project area may already be too fragmented to support a resident marten population so it is unlikely that implementation of Alternative 2 would reduce carrying capacity for marten more than a minor degree.

Prescribed fire would follow commercial harvest and non-commercial thinning and would have effects similar to a low severity fire. Components of the multi-storied forest structure would most likely be lost in areas of marten habitat depending on the fire behavior. In the long term, this alternative would reduce the risk of a severe fire that could drastically reduce the amount of suitable marten habitat in large portions of the project area. This alternative would help move treated stands towards old growth conditions in the long term by reducing high stocking densities and improving-growth rates on the remaining trees.

Cumulative Effects

Geographic and Temporal Boundaries

The defined cumulative effects analysis area for marten is the Westside project area and portions of the Bitterroot National Forest west of the project area. The cumulative effects analysis area includes all of the Moose Creek, Hayes Creek, Camas Creek, Gold Creek and Judd Creek drainages, and a small portion of the adjacent Lost Horse and Roaring Lion Creek drainages outside of the canyons. The analysis area totals about 12,600 acres of mostly forested habitat. Assuming that the average marten home range size in the project area is similar to the

Montana average of about 716 acres for males and 173 acres for females (Burnett 1981), the size of the analysis area is appropriate to assess cumulative effects. Incremental effects of proposed activities added to the effects of past, present, and reasonably foreseeable actions on marten populations outside the cumulative effects area would not be measurable. An assessment of information available at the Forest and Regional levels is also considered to provide additional context (Samson 2006).

Effects of the reduction in marten habitat from Alternative 2 would last until canopy cover has re-grown to form a continuous canopy with multi-storied forest structure.

Activities within the Cumulative Effects Area

The existing condition represents the sum of past activities. Most of the project area was clearcut around 1900, which likely eliminated most of the marten habitat across the lower portion of the cumulative effects analysis area. Mature or over-mature forests, large snags, and coarse woody debris have not fully recovered from this early harvest. Regeneration timber harvest in the 1970s and commercial thinning in 2006 eliminated recovering marten habitat within units and resulted in a highly fragmented landscape for marten habitat between Lost Horse and Camas Creeks. Marten habitat at higher elevations above the project area was generally not harvested, but portions have burned over the past century. Most recently, the Ward Mountain fire in 1994 converted several hundred acres of mature and old growth mixed conifer forest to young age classes that marten tend to avoid. The existing marten habitat index for the cumulative effects area is 0.26 on a scale of 0 to 1 (PF-WILD-032). This is similar to the marten habitat index in the project area. Martens are associated most frequently with relatively unbroken, late-successional forest (Powell and Zielinski 1994). Hargis et al. (1999) found that highly fragmented landscapes supported few if any resident marten, even though forest connectivity was still present. If this is true in western Montana, marten habitat in the lower portions of many drainages within the cumulative effects area may be too fragmented to support a resident marten population; though transient martens could use forested areas along riparian zones to move through the area. The road system built to access historic timber sale units provides easier access to the area for summer and winter recreational users, who may disturb or kill marten. The road system also facilitates winter trapping access and the local marten population may be reduced by marten harvest.

Successful fire suppression may have accelerated forest succession into better marten habitat than would be expected under the historic fire regime. The historic fire regime would have maintained open ponderosa pine stands at the lower elevations and produced mosaics of burned and unburned forests at higher elevations. However, the buildup of fuels created through fire suppression indicates that fire will become increasingly severe. A severe fire would eliminate marten habitat for 50 or more years.

Trends & Broader Context

At a Forest-wide scale, we estimate that there are approximately 393,400 acres of marten habitat than is necessary to maintain a minimum viable population (Samson 2006). Another way to say this is that we have about 2,374% of the habitat necessary to maintain a minimum viable population of marten on the Forest. Alternative 2 would potentially reduce the amount of suitable marten habitat by about 1,450 acres. This reduction would amount to about 0.4% of the 410,700 acres of predicted habitat on the Forest.

Forest biologists have rated the suitability of the marten habitat across the Forest. Considering all the area rated, the Habitat Suitability Index for marten was calculated at 0.32. This index means that on average, marten habitat on the Bitterroot National Forest (at least the 190,000

acres rated for suitability) is about 1/3 as good as the best marten habitat. This implies that marten are likely to occur in low densities in suitable habitat throughout the Forest. However, marten populations are likely to be robust in the corridors of high quality habitat that exist along many of the larger streams draining the Bitterroot Mountains. Lacy and Clark (1993) used computer simulations to show that marten populations are sustainable over time if a small number of migrants into the breeding pool maintained genetic variation, even in the face of trapping and logging.

The Bitterroot National Forest has been monitoring marten populations by searching transects for marten tracks since 1988. The Forest surveyed nearly 750 miles of transects between 1988 and 1996. In that period, an average of one marten track every 6.7 miles was observed. Variation between transects was high, ranging from one track every four miles to one track every eleven miles. Nine marten transects were completed in 2004. A lot more marten tracks were seen in 2004 than in previous years. This apparent increase could mean that marten numbers have increased or that other sampling or environmental variables modified the results. One such variable could be the effect of pelt price on trapping activity. During years of abundant food supply, population densities of marten increase, which could be another factor (USDA Forest Service 1990, p. 34). American marten population density and trend information is reported in the current Forest Plan Monitoring Report (PF-MONITOR-001). The information is not sufficient to ascertain population densities or trends, but American marten tracks have been detected on all the established monitoring routes indicating American marten are well distributed across the forest. This distribution of habitat should allow individual martens to interchange between areas of habitat (USDA Forest Service 1990, p. 34).

Forest Service personnel surveyed marten between 2007 and 2010. They confirmed marten presence in riparian corridors along the Burnt Fork, Daly Creek, Skalkaho Creek, Nez Perce Creek, Soda Springs Creek, Mine Creek, Lost Horse Creek, Roaring Lion Creek, and Tin Cup Creek. Additionally, the Forest performed multiple-carnivore surveys using bait stations and motion-activated cameras during the winters of 2012 –2014. These stations detected marten at many locations across the Forest (PF-WILD-034).

Marten are known to be highly vulnerable to trapping and susceptible to overharvest (Powell 1979). MDFWP trapping records indicate that between 1996 and 2003, the average number of marten taken by trappers annually was 76 in Ravalli County (PF-WILD-015). From 2004 through 2010, the average number of marten taken by trappers annually was 181 in Ravalli County (PF-WILD-016). Harvest numbers appear to be higher in Ravalli County recently, indicating that marten continue to be relatively common in the Bitterroot drainage and surrounding areas (PF-WILD-017).

Conclusion

Alternative 1 (No Action)

Implementation of this alternative would not change marten populations or habitat quality in the short term within the analysis area or at larger scales. Marten habitat would continue to be at increased risk of a severe fire due to heavy fuel loads.

Alternative 2

Implementation of Alternative 2 would have minor short term negative impacts to marten habitat, and could slightly reduce marten carrying capacity in the project area. Treatments within marten habitat would reduce marten habitat quality by reducing overhead canopy, and by reducing the amount of potential down woody debris. However, treatments would also reduce the risk of severe fire, and would improve stand composition and structure in the long-term.

The changes in stand structure would improve marten habitat quality. Though marten numbers in the analysis area might be reduced somewhat in the short-term, the species would likely continue to occupy portions of the area, and transient individuals would be able to move through the area and connect populations to the north and south. Proposed treatments would help improve marten habitat and populations in the long-term at both the local and Forest scales.

Elk (Cervus elaphus) *(Management Indicator Species)*

Affected Environment

Population

The Forest Plan objective is to provide sufficient habitat to maintain the current (as of 1987) level of big-game hunting … opportunities (FP II-5, II-7).

Table 3-28 displays MDFWP elk numbers observed in the spring for the only elk trend count area wholly or partially included in the Westside project area (PF-WILD-035). Data from 1987 is displayed to provide a comparison with the Forest Plan objective.

The number of elk counted in the elk trend count area has exceeded the 1987 level for many years. Elk numbers in this area therefore meet the Forest Plan objective of maintaining the 1987 level of big game hunting opportunities.

Table 3-28: Montana Dept. of Fish, Wildlife, and Parks Elk Trend Count for the Westside Area

	1987	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	AVG.
Roaring Lion-Lost Horse	26	89	70	32	104	98	102	76	56	38	74	74

Elk numbers in the Roaring Lion – Lost Horse elk trend count unit increased from 26 in 1965 to a high of 104 in 2009. The tally has declined since then, but is still at the high end of the average range prior to 2009 (PF-WILD-035). Elk numbers counted in the Roaring Lion – Lost Horse and Lost Horse – Tin Cup trend count areas generally increased around 2007 or 2008, at the same time that elk numbers declined dramatically in the Blodgett – Roaring Lion trend count area. This may indicate a shift in elk distribution south from the Blodgett – Roaring Lion area, since total elk numbers in the combined area have remained consistent throughout the period. This larger area was affected to some extent by the general decline in elk numbers across the Bitterroot drainage between 2005 and 2008. A MDFWP study attributed much of the decline in elk numbers throughout the Bitterroot drainage to increased antlerless harvests to achieve a planned management reduction (Hamlin and Cunningham 2009). Predation and poor nutrition may also be factors.

Calf/cow and bull/cow ratios (PF-WILD-035) for the Roaring Lion – Lost Horse elk trend count area that includes the Westside area are shown in Table 3-29.

Calf/cow ratios have increased in the Roaring Lion – Lost Horse elk trend count area in recent years, as they have throughout the Bitterroot drainage. These calf/cow ratios indicate healthy herd dynamics. Bull/cow ratios in this area have fluctuated dramatically from year to year, but in general have exceeded the MDFWP population objective of a minimum of 10 bulls/100 cows for HD 240 (MDFWP 2004, amended).

Table 3-29: Elk Calf/cow and Cow/bull Ratios for Roaring Lion – Lost Horse Area

YEAR	RATIO CALVES/100 COWS	RATIO BULLS/100 COWS
2006	No data	No data
2007	20/100	7/100
2008	11/100	67/100
2009	18/100	26/100
2010	29/100	11/100
2011	40/100	6/100
2012	26/100	15/100
2013	No data	No data
2014	39/100	8/100
2015	39/100	6/100

Many of the elk counted in HD 240 have become year-round residents of the area between Roaring Lion and Chaffin Creeks and no longer migrate into the Bitterroot Mountains. As with elk in other areas, most of these elk reside on winter ranges on Forest lands near the Forest boundary or on private ranches that allow only limited hunting prior to the rifle hunting season (MDFWP 2004).

Elk on Bitterroot National Forest lands in the Westside project area are commonly seen in the area between Camas Creek and Gold Creek. This area provides a mix of forested and open habitats on gentle terrain that provides access to water and forage on adjacent private lands. It is currently unroaded, so provides a reasonable amount of security for elk despite the frequent passage of people using the Brown Jug loop trail. This area appears to be used as an elk calving area in at least some years.

Elk Habitat Classification

Elk habitat was classified across the project area for the existing condition using the R1-VMap dataset (PF-WILD-036; PF-WILD-037). Thermal cover was classified as areas with an estimated diameter class greater than 5” DBH, and canopy cover of 60% or greater. This does not exactly match the Forest Plan thermal cover requirement of 70% canopy cover, but is the closest category available in VMap. Hiding cover was classified as more mesic dominance classes with moderate to high canopy closure, or more xeric dominance classes with high canopy closure. Open areas were sparsely vegetated, grass, or shrub. Forested forage included all areas that did not fall into the other categories.

Thirty-eight acres of thermal cover are identified in the project area. About 31 acres of thermal cover in four small patches is within elk winter range. None of the thermal cover is within treatment units.

Only three percent of the project area qualifies as hiding cover. Wildlife habitat surveys verified the VMap estimate of limited hiding cover. However, the VMap parameters did not directly estimate sight distances so hiding cover may be underestimated in areas with open overstory canopy but dense understory.

Hiding cover is most prevalent in stands on north – northwest aspects or in higher elevation stands because they tend to contain denser stand structures, including more saplings and shrubs that limit sight distances. Previously harvested stands at mid-elevations that have not been

thinned provide some excellent hiding cover. Hiding cover is limited in most of the lower elevation portion of the project area because previous understory slashing for fuels reduction has removed most of the understory conifer layer. Many stands that do not qualify as hiding cover overall contain scattered patches of denser conifer regeneration and shrubs on minor north aspects. These patches provide opportunities for animals to hide and escape detection.

Open forage is somewhat limited in this area, and is mostly found in several open grassy meadows near the Forest boundary, or on steeper south to west facing aspects scattered throughout the area. Hot, dry conditions characterize these steeper openings, which often support sparse vegetation. Forested forage dominates the project area, including most of the previously harvested stands. These stands contain limited conifer regeneration and tend to be rather open underneath the canopy. Sight distances in these stands are restricted mostly by the boles of overstory trees, and are generally quite long. Many of the old harvest units that have been non-commercially thinned are classified as forested forage because they are too open to qualify as hiding cover but too heavily stocked to qualify as open forage.

The high amounts of forested forage and limited hiding and thermal cover make elk vulnerable to hunting mortality in the project area. At the same time, the shading caused by the canopies in these stands limits elk forage production, which may in turn increase winter mortality and reduce calf survival. Several invasive plants (mainly spotted knapweed and goatweed) also reduce forage production in areas where they have become established, such as on road shoulders and in some of the larger open areas

Thermal Cover in Elk Winter Range

The Bitterroot Forest Plan Record of Decision (USDA Forest Service 1987b) requires management of winter range vegetation to provide 25 percent of the winter range area in thermal cover as defined in Guides for Elk Habitat Objectives (USDA Forest Service 1978). This publication defines thermal cover as forested stands that average at least 40 feet tall with canopy closure of more than 70 percent. The purpose of the 1987 Forest Plan Record of Decision (USDA Forest Service 1987b) thermal cover requirement was to provide habitat that at that time was believed to be necessary to meet the Forest Plan goals and objectives of maintaining the State's population goals for elk. Recent research, however has questioned the necessity of thermal cover for survival of wintering elk (Cook et al. 1998). The researchers found "no significant, positive effect of thermal cover on the condition of elk during any of their six experiments. In contrast, dense cover provided a costly energetic environment, resulting in significantly greater over-winter mass loss, fat catabolism, and (in one winter) mortality." Whether thermal cover is necessary for individual elk survival or elk population viability seems open to question. As discussed under cumulative effects, large amounts of winter range thermal cover do not seem necessary to support the State's elk population goals on the Bitterroot National Forest.

Thermal cover was analyzed separately within the identified winter range that includes the Westside project area. Most of the Westside project area is within elk winter range (PF-WILD-036). The only part of the project area outside mapped elk winter range is the higher elevation area generally to the west of Units 3c, 4a and 7a. Identified winter range also extends uphill above the project area but within the larger cumulative effects area north of Camas Creek. Approximately 5,828 acres of Bitterroot National Forest lands between Roaring Lion and Lost Horse Creeks are classified as elk winter range. VMap estimates that only 31 acres (0.5%) of this winter range area qualify as thermal cover (PF-WILD-039). This amount of thermal cover does not meet the optimal thermal cover percentage referenced in Guides for Elk Habitat Objectives (USDA Forest Service 1978), or the 25% standard set in the Bitterroot Forest Plan Record of

Decision (USDA Forest Service 1987b). However, none of these thermal cover areas are within proposed units (PF-WILD-039). Since the project would not reduce the amount of thermal cover in winter range, there is no need for a site-specific Forest Plan amendment.

Elk Habitat Effectiveness

The Forest Plan standard for elk habitat effectiveness (EHE) is:

> manage roads through the Travel Plan process to attain or maintain 50 percent or higher EHE in currently roaded drainages (those where more than 25% of the potential road system was in place in 1987), and 60 percent or higher EHE in drainages where less than 25% of the roads had been built (USDA Forest Service 1987a, p. II-21).

EHEs of 50% and 60% equate to 2 miles and 1 mile of open road per square mile, respectively (Lyon 1983). This standard supports the Forest Plan objectives of maintaining habitat to support viable populations of wildlife species, and cooperating with the state of Montana to maintain the current level of big game hunting opportunities (USDA Forest Service 1987a, p. II-5). The EHE model described by Lyon (1983) does not explicitly factor in noise to determine the effects of motorized vehicles on the ability of elk to use habitat near roads. However, noise from vehicles likely affects the distance from roads or trails at which elk are disturbed, and would thus be one of the implicit factors that influenced the amount of elk use at various distances from open roads documented by Lyon (1983).

EHE percentages were calculated for the third order drainages that include the Westside project area using GIS and updated road status data contained in the INFRA database (PF-WILD-040).

Elk Security

MDFWP has divided the Bitterroot National Forest into elk trend counts units to monitor elk population trends. These trend count units are surrogates for elk herd units, since actual elk herd unit boundaries are unknown. Elk trend count units have been used for analysis of elk security at the project level. Herd units approximate year-round home ranges for elk groups based on where they are found in winter. Elk security was mapped as non-linear areas of cover that are greater than 250 acres and more than one half mile from a road open to motorized use during the rifle hunting season (Hillis et al. 1991). Adequate elk security exists when at least 30 percent of an elk herd unit qualifies as security (Hillis et al. 1991).

The Westside project area is part of one delineated elk trend count unit. The Roaring Lion – Lost Horse Creek elk trend count unit contains 7.8% elk security area, which is well short of the recommended level. Existing elk security in this trend count unit is limited to the area between Gold Creek and just south of Camas Creek. Other security areas in this trend count unit are:

- west of the project area boundary between Gold Creek and Camas Creek
- upper Hayes Creek drainage
- upper parts of the North Fork Lost Horse Creek and Tenmile Creek drainages
- north aspects in the middle of the Roaring Lion drainage
- south aspects in the upper South Fork Lost Horse drainage (PF-WILD-041).

Table 3-30 displays the existing EHE percentages of the five third order drainages partially within the Westside project area, and compares it to the current Forest Plan standard. For this analysis, roads that are closed to public use all year are counted as closed roads, though we know that some level of unauthorized OHV use occurs on some of the roads. Roads that are closed seasonally are considered open roads for the purposes of the EHE analysis because elk are

present in the roaded part of the project area during the period when these roads are open. Vehicle traffic on those roads thus reduces the effectiveness of elk habitat throughout the year. Using these assumptions, EHE standards are not currently being met in Hayes Creek and Lower Lost Horse third order drainages.

Table 3-30: Existing Elk Habitat Effectiveness Percentages by Third Order Drainage Compared to Forest Plan Standards

THIRD ORDER DRAINAGE NAME AND (NUMBER)	EXISTING OPEN RD. DENSITY (MI/MI²)	EXISTING EHE %	FP MINIMUM EHE
Judd-Roaring Lion (05c270-2)	0.1	93%	60%
Gold Creek (05c270-3)	0	100%	60%
Lower Camas Creek (05c271-2)	0.5	76%	60%
Hayes Creek (05d271-1)	1.1	59%	60%
Lower Lost Horse (05d276-2)	2.9	41%	50%

Environmental Consequences

Methodology

For each alternative two Forest Plan standards were evaluated:

- Thermal cover in elk winter range
- Elk Habitat effectiveness

Elk security is a third evaluation criteria was also used to predict impacts to elk.

Thermal cover in elk winter range was classified and mapped using canopy cover data included in the R1 VMap dataset. The wildlife biologist and wildlife technician validated the data set with walk-through exams.

Elk Habitat Effectiveness (EHE) was determined using the Forest's transportation system database to determine open road density within each third order drainage, and then converting that to EHE using the model described in Lyon (1983). Elk security area was calculated using GIS to overlay the transportation system database with the area that provides cover, based on the R1 VMap dataset.

Direct and Indirect Effects

A summary of effects on elk can be found in Table 3-31.

Alternative 1 (No Action Alternative)

Population

Alternative 1 would not affect elk populations in the short term. Elk populations might eventually return to the project area, or continue to reside in adjacent habitat. To some extent, there may be a further reduction in forage productivity resulting from increasingly dense conifer canopies, and/or the continued spread of invasive plants.

Elk Habitat Classification

Elk habitat classifications after treatment were predicted using the R1-VMap dataset (PF-WILD-036; PF-WILD-042) (Table 3-31).

The No Action alternative would not change existing elk habitat percentages in the short term. Thermal cover percentages may continue to decrease as bark beetle-caused tree mortality reduces or eliminates ponderosa pine and Douglas-fir crowns that form much of the canopy in some stands. Other insects and pathogens could also affect older, less vigorous trees in the overstory. Hiding cover percentages may increase over time as overstory canopies open up, allowing increased conifer regeneration and shrub growth. Increasing vegetation in the understory layer would result in reduced sight distances, which would in turn limit vulnerability to hunting mortality. Forested forage percentages may increase if loss of crowns reduces canopy closure below the 70% needed for thermal cover, but not enough to stimulate conifer regeneration or shrub growth. Open forage may decrease as conifers continue to colonize open areas. The area would continue to be at risk of a severe fire, which could reduce the amounts of both thermal and hiding cover, but increase forage productivity.

Table 3-31: Elk Habitat Classification in Westside Project Area, Existing Condition

Habitat Classification	Existing Elk Habitat in Trend Count Unit	Elk Habitat in Trend Count Unit Alt. 2	Existing Elk Habitat in Westside Project Area	Elk Habitat in Westside Project Area Alt. 2
	Acres (Percent)	Acres (Percent)	Acres (Percent)	Acres (Percent)
Open Forage	3,696 (29.2%)	3,715 (29.4%)	563 (10.0%)	582 (10.4%)
Forested Forage	7,901 (62.5%)	7,907 (62.5%)	4,838 (86.0%)	4,844 (86.1%)
Hiding Cover	826 (6.5%)	801 (6.3%)	183 (3.3%)	158 (2.8%)
Thermal Cover (also Hiding Cover)	220 (1.7%)	220 (1.7%)	38 (0.7%)	38 (0.7%)
Total	12,644 (100%)	3,715 (29.4%)	5,623 (100%)	5623 (100%)

Thermal Cover in Elk Winter Range

Alternative 1 would not change the existing percentage (0.5%) of thermal cover in elk winter range.

Elk Habitat Effectiveness

Alternative 1 would not change existing open road densities. Two of the third order drainages wholly or partially within the project area would not meet Forest Plan EHE standards. Elk disturbance from motorized vehicle use would continue at existing levels or increase.

Elk Security

Alternative 1 would not change the existing percentage of elk security area in the short term because it would not change existing road use restrictions or cover areas. The area would continue to be at risk of a severe fire which could reduce elk security area in the long-term by reducing hiding cover.

Alternative 2

Population

This alternative would increase elk vulnerability to hunting mortality by increasing sight distances in many of the treatment units in the short-term. Hunters would be able to detect and shoot at elk from longer distances within the units. In addition, the new road system built to access Units 2a, b and c would increase hunting pressure in areas that are somewhat remote. The new roads would not be open to motorized use, but it is likely hunters would use them to access these areas on foot or on bicycles. Increased hunting mortality might reduce the number of elk within the project area. However, the reduction of overstory canopies would increase forage production and attract elk to those areas. Increased forage production would improve elk survival through winter. This, in turn, could improve birth rates and calf survival, which may increase elk numbers. Overall, implementing Alternative 2 would cause little discernable change in elk numbers in this trend count unit. However, the combination of reduced cover and increased human access would displace elk onto adjacent private land during hunting season. It is difficult to quantify changes in elk populations attributable to Alternative 2 because elk populations are also affected by hunting regulations, predation levels, and weather. The 2015 elk trend count indicate that elk populations across Hunting District (HD) 240, which includes the project area, are about 27% above population objectives identified in the 2004 Montana Elk Management Plan (MDFWP 2004, amended).

Elk Habitat Classification

In general, this alternative would reduce hiding cover percentages and increase the amount of forested forage. Treatments would not affect thermal cover because there is no thermal cover in the treatment units (Table 3-31).

Hiding cover would be eliminated where it occurs in units scheduled for non-commercial or plantation thinning. Hiding cover may also be eliminated in portions of commercial harvest units on north aspects that support dense conifer or shrub understories. This would increase elk vulnerability to hunting mortality in some areas. Elk would rely on terrain, remoteness of the area, scattered patches of hiding cover and the limitations on sight distance provided by areas of forested forage to escape hunting pressure. More elk might escape hunting pressure by moving to private land during the hunting season. Cover percentages would be below the levels considered “optimal” in USDA Forest Service (1978), but forage productivity would increase. Recent research (Cook et al. 1998) indicates that higher levels of forested forage may be more beneficial to elk than high amounts of thermal cover.

Post-treatment prescribed fire in the commercial timber units would stimulate forage production in the short term, especially when combined with reductions in conifer canopy cover. Herbicide applications along skid trails, tracked line machine trails and temporary roads would limit the spread of invasive plants into areas that are currently weed-free.

Thermal Cover in Elk Winter Range

None of the identified thermal cover in elk winter range occurs within a proposed treatment unit. As a result, implementation of Alternative 2 would not affect existing levels of thermal cover in elk winter range.

Elk Habitat Effectiveness

EHE percentages were calculated for the third order drainages that include the Westside project area and road changes proposed in Alternative 2 (Table 3-32).

Table 3-32: Comparison of Alternatives 1 and 2 Elk Habitat Effectiveness by Third Order Drainage against Forest Plan Standards in the Westside Collaborative Vegetation Management Project Area.

THIRD ORDER DRAINAGE NAME AND (NUMBER)	FP MINIMUM EHE	EXISTING OPEN RD. DENSITY (MI/MI²)	EXISTING EHE %	ALT. 2 OPEN RD. DENSITY (MI/MI²)	ALT. 2 EHE (%)
Judd-Roaring Lion (05c270-2)	60%	0.1	93%	0.1	93%
Gold Creek (05c270-3)	60%	0	100%	0	100%
Lower Camas Creek (05c271-2)	60%	0.5	76%	0.5	76%
Hayes Creek (05d271-1)	60%	1.1	59%	1.1	59%
Lower Lost Horse (05d276-2)	50%	2.9	41%	2.6	44%

Alternative 2 would close about 1.4 miles of open roads in the Lower Lost Horse third order drainage. This would reduce the open road density and improve the EHE percentage in the Lower Lost Horse third order drainage, but not enough to meet the Forest Plan EHE standard. EHE in the Hayes Creek third order drainage would not change. To meet EHE standards in Lower Lost Horse and Hayes Creek drainages, portions of main arterial roads would need to be closed. Closing these sections of road would inhibit access to main recreation destinations. A site-specific Forest Plan amendment would be required for these two drainages since they cannot meet the Forest Plan EHE standard. The new roads constructed to access Units 2 a, 2b, and 2c are not included in the calculation of EHE because they would be closed to all motorized use year-round.

Elk Security

Alternative 2 would reduce the elk security area in the Roaring Lion – Lost Horse trend count unit by about 554 acres. Across the trend count unit, elk security would be reduced from 7.8% to 6.7% (PF-WILD-044). Elk in this area are vulnerable to hunting season mortality (Hillis et al. 1991). The fact that elk numbers in the area are relatively stable may be a reflection of the extremely rugged topography in much of the area, which limits hunter access to elk in areas that may not technically qualify as security area. Elk may also escape hunting pressure by moving to private land where hunting is limited or prohibited.

Summary of Alternative Effects

Table 3-33 summarizes the differences between Alternatives 1 and 2 on key elk habitat components relative to Forest Plan standards. Though there is little difference between the two alternatives, Alternative 2 slightly improves elk habitat effectiveness in one of the third order drainages that is below standards.

Table 3-33: Comparison of Forest Plan Elk Habitat Components Between Alternatives 1 and 2 in the Westside Collaborative Vegetation Management Project.

HABITAT COMPONENT	EXISTING CONDITION (ALTERNATIVE 1)	ALTERNATIVE 2
Thermal Cover in Winter Range	Below Standard 0.5% of area	Below Standard 0.5% of area
Habitat Effectiveness	2 Third Order Drainages Below Standards	2 Third Order Drainage Below Standards
Security	Does not meet recommendation in Trend Count Unit (7.8% of area)	Does not meet recommendation in Trend Count Unit (6.7% of area)

Cumulative Effects

Geographic and Temporal Boundaries

The defined cumulative effects analysis area for elk is the portion of HD 240 between Roaring Lion Creek and Lost Horse Creek (WILD-041). This analysis area is appropriate to analyze incremental effects of the proposed actions on elk habitat in conjunction with past, present, and reasonably foreseeable actions because it approximates the area of the elk herd unit included in the Westside project area. There are about 54,800 acres within the cumulative effects area. An assessment of information available at the Forest level is also considered to provide additional context.

Effects from Alternative 2 would last until understory conifer and shrub densities start to reduce sight distances and reduce elk vulnerability to disturbance or hunting mortality.

Activities within the Cumulative Effects Area

The existing condition represents the sum of past activities. Previous timber harvest in the late 1800s and early 1900s removed most of the trees across the project area. The existing forest is mostly second growth trees that regenerated naturally after the initial harvest. Much of the existing road system between Camas Creek and Lost Horse Creek was constructed around 1970, and a number of harvest units were logged from that road system at the time. The Hayes Creek timber sale thinned much of the lower elevation forest in the Hayes Creek drainage, which had regenerated after old apple orchards established in the area were abandoned. These prior harvests reduced elk thermal and hiding cover in the project area, but increased foraging habitat. Elk have benefited from the mosaic of cover and forage habitat. The high road density constructed to access the timber sales reduced elk habitat effectiveness and elk security in the southern portion of the project area. Increased hunter access to elk summer ranges combined with many new openings apparently increased elk harvest in this area.

A potentially serious effect on elk habitat is the introduction and spread of invasive plants. Invasive plants already established in the project area include spotted knapweed and goatweed. Recreationists and wildlife frequently disperse weed seeds, and the production of native forage plants can decline precipitously in weed-infested areas. Ongoing noxious weed control efforts using herbicides sprayed along roads limit the spread of these invasive plants. There are patches of knapweed and goatweed scattered across the project area where people and their animals frequent.

Trends & Broader Context

The Westside project area is within Hunting District (HD) 240. MDFWP's Elk Plan (MDFWP 2004, amended) combines HDs 240 and 260 and then identifies elk population objectives for this larger combined area. Elk trend counts for the past ten years for these sub-areas (from PF-WILD-035) are shown in Table 3-34. Trend count figures for 1987 are also shown for comparison with the Forest Plan objective. The elk count for HD 240 declined from its high point in 2004 to 2008, but has been on a generally upward trend since then. Large numbers of elk in the river bottom are a relatively recent development. The Montana Department of Fish, Wildlife and Parks population objective for HDs 240 and 260 combined is 750 (MDFWP 2004, amended). The 2015 combined trend count was 57.2% above the MDFWP objective.

Table 3-34: Elk Trend Counts for Hunting Districts 240 and 260

YEAR	1987	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
HD 240	480	870	802	598	642	683	650	652	742	760	955
HD 260	No data	No data	No data	No data	97	130	106	116	143	142	224
Total	480	870	802	598	739	813	756	768	885	902	1179

Elk Habitat Effectiveness

Since the Forest Plan standard for elk habitat effectiveness (EHE) was implemented (USDA Forest Service 1987a), many, but not all of the third order drainages on the Forest have been brought into compliance with the standard through additional road use restrictions. Approximately 3,280 miles of roads have been part of the Forest's transportation system at one time. Of these, about 600 miles have been decommissioned and are no longer open to any motorized use. About 460 miles of system roads are closed to all motorized use year-round. About 644 miles of system roads are closed to full-sized vehicles year-round, but allow access by OHVs and motorcycles on either a seasonal or a year-round basis. About 936 miles of system roads remain open year-round to use by any motorized vehicle, and about 640 miles of system road remain open seasonally to use by any motorized vehicle. Open road densities are inversely correlated with EHE, so this reduction in open road densities indicates a substantial but unquantified increase in EHE across the Forest.

The reduction in open road densities in many third order drainages has influenced the increase in elk numbers in the Bitterroot drainage. Elk spring trend counts increased from 3,537 elk in 1987, when the Forest Plan was signed, to a high of 8,169 elk in 2005. Numbers declined until 2008, but gradually increased to 8,054 in 2015 (PF-WILD-035). This increase in elk numbers, which is well distributed across the Forest, appears to indicate that the elk population as a whole is able to tolerate the level of open road densities (and resulting EHE) that currently exist on the Bitterroot National Forest.

Conclusion

Alternative 1 (No Action)

Implementation of this alternative would not directly change elk populations or habitat quality in the short term within the project area or at larger scales. Thermal cover would continue to decline as canopy cover provided by ponderosa pine and Douglas-fir is reduced by bark beetle infestations. Thermal cover, hiding cover, and forested forage would continue to be risk of severe fire due to heavy fuel loads.

Alternative 2

Implementation of Alternative 2 would have some slight, short-term reductions in hiding cover, but this is not expected to reduce elk carrying capacity in the project area. Elk would become somewhat more vulnerable to hunting or poaching mortality due to improved non-motorized access on the new road system and longer sight distances through treatment units. Timber harvest would reduce canopy closure, which would reduce thermo-regulatory benefits. However, reducing the canopy closure would also stimulate elk forage production. Treatments would reduce the risk of severe fire, and would improve stand composition and structure in the longer term, which would improve elk habitat quality. The sum total of these effects on elk habitat and elk security is expected to have little effect to elk population numbers in HD 240. The analysis area would continue to support elk populations within HD 240 and the Bitterroot drainage. Proposed treatments would help improve elk habitat and populations in the long term at both the local and Forest scales.

Pileated Woodpecker (Dryocopus pileatus)

(Management Indicator Species for old growth forests)

Affected Environment

Pileated woodpeckers are known to occur in the Westside project area but the Forest does not have population estimates for them. The wildlife biologist and a wildlife technician saw pileated woodpecker excavations and foraging evidence regularly, and saw or heard pileated woodpeckers occasionally while surveying wildlife habitat in the project area in 2014.

About 4,839 acres (86% of the project area) of suitable habitat were identified in the Westside project area using R1 VMap (PF-WILD-047; PF-WILD-048). Suitable habitat may currently have the components necessary to meet the nesting and foraging needs of pileated woodpeckers.

Pileated woodpecker habitat quality across the project area is moderate, with an overall habitat quality index of 0.42 on a scale of 0 to 1 (PF-WILD-048). Previous harvests around 1900 reduced the numbers of large snags needed for pileated woodpecker nesting in much of the area. Some nesting snags remain in more productive riparian areas and on north-facing slopes. Large, live, and dead cottonwoods along streams may provide important nesting habitat in the project area. Higher quality foraging habitat also tends to occur in these more productive areas because they tend to contain higher numbers of stumps and downed logs. The drier ponderosa pine stands at lower elevations provide few nesting snags and limited foraging opportunities due to previous timber harvest. Existing pileated woodpecker habitat quality within proposed treatment units is similar to that within the project area, with a habitat quality index of 0.39. The best pileated habitat within the area tends to be distributed along streams and north aspects.

Environmental Consequences

Methodology

The analysis for the pileated woodpecker focuses on the suitable habitat in the Westside project area. Suitable habitat is defined for the Westside project as habitat that may currently have the habitat components necessary to meet the needs of pileated woodpeckers. Suitable habitat typically includes dry to moderately moist forests in older seral stages, and usually contains old growth or mature forest, or multi storied structures. Suitable habitat is typically limited to elevations below 6200’ on the Bitterroot National Forest.

The wildlife biologist classified and mapped suitable pileated woodpecker habitat through a query of the R1 VMap dataset. The query identifies stands that contain forest structural

components (dominant tree species type, size class, and canopy cover) that are likely to meet the habitat needs of pileated woodpeckers. Habitat quality ratings were highest in areas that had a combination of dominance by more xeric overstory species, larger trees, and higher crown closures. The wildlife biologist modified the pileated woodpeckers habitat classifications based on extensive field verification (PF-WILD-003; PF-WILD-004). The total amount and quality of suitable habitat retained after Alternative 2 implementation was used to predict effects on pileated woodpecker.

Direct and Indirect Effects

Alternative 1 (No Action Alternative)

The No Action Alternative would not change existing habitat quality for pileated woodpeckers. In the short term, habitat quality would continue to improve at both lower and mid elevations as forests continue to mature, snags increase, and coarse woody debris accumulates. These processes would increase the amount of large snags and coarse woody debris over time, which would provide more nesting and foraging habitat for pileated woodpeckers. In the longer term, increasing tree densities and fuel loads would increase the probability of severe fire. A severe fire would create unsuitable pileated woodpecker habitat in areas that burned with moderate or high severity. Pileated woodpeckers are not strongly associated with recently burned landscapes as many woodpecker species are (Hutto 1995), and do not commonly nest in areas of recent stand replacing fire (Smith 2000).

Alternative 2

Alternative 2 includes treatments in about 1,866 acres (39%) of pileated woodpecker habitat in the project area (PF-WILD-049; PF-WILD-048). About 4,711 acres of existing pileated woodpecker habitat would still qualify as habitat following implementation of Alternative 2 (Table 3-35). The pileated woodpecker habitat quality index across the project area would be reduced from 0.42 to 0.36 on a scale of 0 to 1 (PF-WILD-048), which indicates that average pileated woodpecker habitat quality across the project area would be low to moderate. The pileated woodpecker habitat quality index within units would average 0.25, which indicates that most of the units would provide low quality habitat for pileated woodpeckers following treatment.

The treatments proposed in this alternative would reduce the quality of pileated woodpecker habitat by removing live and dead conifers in a variety of size classes. Larger live trees would be preferred for retention, but some would be removed. Existing snags would be left when not considered a safety hazard. However, numbers of existing and potential nesting and foraging trees, snags and downed logs would be reduced within all the units. 24 large snags and 86 live trees across the project area were signed as wildlife trees during wildlife habitat surveys. Most of the live trees signed as wildlife trees have fire scars, lightening scars, dead or broken tops, woodpecker foraging or nesting excavations, or other indications of internal decay such as conks. These trees and snags either currently provide valuable habitat for pileated woodpeckers, or will likely provide such habitat in the future.

Prescribed fire would follow commercial harvest and non-commercial thinning and would have effects similar to a low severity fire. Low severity reduces fuels while preserving most of the live trees, shrubs, and other forest vegetation. Prescribed fire could reduce the quality of pileated woodpecker nesting habitat by burning some of the large existing snags preferred for nesting. These snags can catch fire even during low intensity underburns, and once on fire will often burn through and fall. Prescribed fire can also create new snags if they generate sufficient heat around green trees, and some of these new snags may be large enough to accommodate

pileated woodpecker nesting. Given the standard burning prescription in lower elevation stands, it is likely that the trend in the number of large snags in these units would be downward. Overall, the effects of prescribed fire on pileated woodpecker nesting habitat would likely be neutral to negative in the short-term, unless some type of mitigation is undertaken to minimize the loss of existing large snags.

Table 3-35: Pileated Woodpecker Habitat Quality in the Westside Units and Project Area, Comparison of Existing Condition (Alternative 1) and Alternative 2

Pileated Woodpecker Habitat Class	Existing Pileated Woodpecker Habitat in Project Area	Alternative 2 Pileated Woodpecker Habitat in Project Area	Existing Pileated Woodpecker Habitat in Units	Alternative 2 Pileated Woodpecker Habitat in Units
	Acres (% of area)	Acres (% of area)	Acres (% of area)	Acres (% of area)
0 (Non-habitat)	783 (13.9%)	911 (16.2%)	458 (19.7%)	586 (25.2%)
1 (Low-quality Habitat)	1,761 (31.3%)	2,373 (42.2%)	599 (25.8%)	1,211 (52.1%)
2 (Moderate-quality Habitat)	1,813 (32.2%)	1,482 (26.4%)	833 (35.8%)	502 (21.6%)
3 (High-quality Habitat)	1,265 (22.5%)	856 (15.2%)	434 (18.7%)	25 (1.1%)
Total Habitat	5,622 (100%)	5,622 (100%)	2,324 (100%)	2,324 (100%)

Prescribed fire could also reduce the quality of pileated woodpecker foraging habitat by burning decayed logs and stumps that provide habitat for carpenter ants. An Oregon study showed that pileated woodpeckers foraged significantly less in units that had been burned using prescribed fire, because these units contained less dead wood habitat for ants, the primary prey of pileated woodpeckers (Bull et al. 2005). Prescribed fire could also create new smaller snags that would attract bark beetles and other insects, but these insects form a minor part of the diet of pileated woodpeckers. In the short term, the effects of prescribed fire on pileated woodpecker foraging habitat would be negative.

The average pileated woodpecker territory size within the project area would likely increase in the short term because the proposed treatments would reduce habitat quality in some territories. As a result, pileated woodpecker carrying capacity in the project area could decline from the existing condition. The reduction in carrying capacity is not quantifiable, but is likely to be small.

In the long term, this alternatives would reduce the risk of severe fire that would reduce the amount of suitable pileated woodpecker habitat in the project area. This alternative would help move treated stands towards mature or old growth conditions in the long term by reducing stocking densities and fuel loads. Most of the treatments would favor stands dominated by ponderosa pine, which develops more desirable old growth conditions for pileated woodpeckers than shade tolerant tree species such as Douglas-fir or subalpine fir.

Cumulative Effects

Geographic and Temporal Boundaries

The defined cumulative effects area for pileated woodpeckers is the Westside project area and the portions of the Bitterroot National Forest west of the project area. The cumulative effects analysis area includes all of the Moose Creek, Hayes Creek, Camas Creek, Gold Creek and Judd Creek drainages, and a small portion of the adjacent Lost Horse and Roaring Lion Creek drainages outside of the canyons. The analysis area totals about 12,600 acres of mostly forested habitat. Assuming that territory size for pileated woodpeckers in western Montana ranges from 500 to 1000 acres, it is reasonable to assess effects within the forested habitat of the cumulative effects analysis area. Incremental effects of proposed activities of this project on nesting territories outside the analysis area would not be measurable. An assessment of the habitat and population viability at the Regional and Forest levels provides additional context.

Activities within the Cumulative Effects Area

The existing condition represents the sum of past activities. Most of the project area was clearcut in the late 1800s and early 1900s, which likely eliminated pileated woodpecker habitat across the lower elevations of the cumulative effects area for many years, and continues to limit the availability of important pileated habitat components such as mature or over-mature forests, large snags and downed logs. More recent regeneration timber harvest around 1970 in recovering pileated habitat between Camas Creek and Lost Horse Creek reduced or eliminated habitat quality in those units. Commercial thinning harvest in 2006 in the Hayes Creek timber sale may have accelerated the recovery of pileated habitat in abandoned apple orchards by increasing conifer growth rates in areas that were marginal pileated woodpecker habitat.

Pileated woodpecker habitat at higher elevations west of the project area was generally not harvested, but portions have burned over the past century. Most recently, the Ward Mountain fire in 1994 and subsequent salvage harvest converted many acres of mature and old growth mixed conifer forest to young age classes that have limited habitat value for pileated woodpeckers. These activities all reduced the pileated woodpecker carrying capacity of the area. The habitat quality index for the cumulative effects area is 0.30, which indicates that the overall habitat quality for pileated woodpeckers across the cumulative effects area is generally low, although there are many areas of higher quality habitat. The relatively low habitat quality index implies that pileated woodpecker territories in this area are likely larger than average to incorporate sufficient habitat to support a breeding pair.

Pileated woodpeckers may be vulnerable to the repeated action of fire suppression, which modifies forest structure and composition. Over the past 80 years or so, fire suppression in coniferous forests in which ponderosa pine or western larch were historically dominant or co-dominant has shifted dominance to shade-tolerant tree species. In the Westside project area, Douglas-fir has changed the composition and structure of stands by out-competing the shade-intolerant ponderosa pine. This shift in dominant tree species has decrease the representation of preferred nest tree species.

Trends & Broader Context

Pileated woodpecker population information on the Bitterroot National Forest is based on long-term monitoring transects reported in the Forest Plan Monitoring Report (PF-MONITOR-001). The information is not sufficient to establish population densities or trends, but the number of pileated woodpeckers detected per mile of transect has generally increased since 2000. Pileated woodpeckers appear to be common and well distributed at low to mid-elevations across the Forest as indicated by frequent detections of their unique foraging excavations and calls.

Most of the Forest's recent management activities in lower elevation forests emphasize restoration of mature ponderosa pine habitats, which should benefit pileated woodpeckers over time (PF-MONITOR-001).

Snag retention guidelines in place since the 1980s have reduced the loss of potential pileated woodpecker nesting snags in harvest units on the Bitterroot National Forest. Monitoring of recent vegetation management activities (PF-WILD-006; PF-WILD-007) indicates prescriptions for snag retention have consistently been met. Samson (2005, pg. 60), stated that timber management in the Northern Region in 2004 amounted in total to 0.0009% of the landscape, and is not affecting short-term species viability.

Regional habitat models using FIA data estimate that the Bitterroot National Forest contains sufficient suitable nesting habitat to support about 91 pairs of pileated woodpeckers, and enough winter foraging habitat to sustain almost 800 pairs (Samson 2005). This habitat is well-distributed across the Bitterroot National Forest at lower to mid-elevations. Habitat estimates are for National Forest only and provide about 86% of the habitat necessary for a minimum viable population, which is estimated to be 180 individuals (Samson 2006). Additional nesting habitat for pileated woodpeckers is in the Bitterroot Valley in the mixed cottonwood and ponderosa pine forests along the Bitterroot River and its larger tributaries on private lands. These bottomland forests provide some of the most productive habitat for this species, and also serve to connect subpopulations in the surrounding mountains. The presence of large amounts of high quality habitat on private land indicates that the Bitterroot drainage is capable of supporting a much larger population of pileated woodpeckers than indicated by estimates based only on the Bitterroot National Forest.

At the Regional scale, habitat modeling estimates that there is enough suitable nesting habitat to support about 2,362 pairs of pileated woodpeckers, and enough winter foraging habitat to sustain about 19,430 pairs of birds (Samson 2005). Again, this estimate does not include the high quality habitat located along the river and stream corridors on private land. Median dispersal distance for pileated woodpeckers is estimated to be about 150 miles, which indicates that pileated woodpeckers across the entire Region belong to a single, well connected population. The Lolo, Clearwater, and Nez Perce National Forests adjoining the Bitterroot National Forest to the north and west have pileated woodpecker habitat in excess of the quantity modeled to maintain a minimum viable population (Lolo - 165%, Clearwater - 346% and Nez Perce - 459%). Samson (2005) concluded that habitat estimates for the pileated woodpecker based on the Regional nest tree habitat model show nest site habitat is abundant and well distributed across the Northern Region by National Forest, and the pileated woodpecker habitat on today's landscape is abundant.

Although no population estimates are available, the large amount of apparently suitable habitat well distributed across the Region combined with the interconnectedness of the population indicates pileated woodpeckers are viable in the short-term (Samson 2005).

Conclusion

Alternative 1 (No Action)

Implementation of this alternative would not change pileated woodpecker populations or habitat quality in the short term within the project area or at larger scales. Pileated woodpecker habitat would continue to be at higher risk of severe fire created by increasing growth and prevalence of Douglas-fir and heavy fuel loads.

Alternative 2

Implementation of Alternative 2 would have minor short term negative effects on pileated woodpecker nesting and foraging habitat, and could reduce the pileated woodpecker carrying capacity in the project area. Treatments within pileated woodpecker habitat would reduce the risk of severe fire, and would improve stand composition and structure in the longer term. Improved forest structure and composition would improve pileated woodpecker habitat quality. Though pileated woodpecker numbers in the project area might be reduced in the short-term, the species would still be present and would contribute to the maintenance of population viability at the Forest scale. Treatments would improve pileated woodpecker habitat and populations in the long term at both the local and Forest scales.

Northern Goshawk (*Accipiter gentilis*) *(Species of Interest)*

Though northern goshawk are considered habitat generalists at large spatial scales and use a variety of forest types, they nest in a relatively narrow range of structural conditions (Reynolds et al. 1992, Squires and Reynolds 1997). Research indicates that goshawks prefer to nest in mature forests with large trees, relatively closed canopies, and open understories (summarized in Squires and Kennedy 2006; Clough 2000).

A variety of forest structural stages are recommended in a goshawk home range to provide a variety of habitat conditions and prey species, as well as mimic historic forest conditions (Reynolds et al. 1992, USDA Forest Service 2009, Squires and Kennedy 2006 including extensive internal citations). Management in the project area and surrounding landscape has changed historic forest composition, structure, and distribution. Most of the project area was clearcut in the late 1800s or early 1900s, and some areas of second growth have been thinned more recently. At the same time, successful fire suppression has reduced the role of fire as an ecosystem process. The combination of these management actions has created a younger forest with more uniform and continuous structure than was present historically.

Great horned owls are a known goshawk predators (Rohner and Doyle 1992, Boal and Mannan 1994) that occur in a wide variety of habitats, but prefer open and second-growth temperate woodlands, swamps, orchards, and agricultural areas including some open areas (Houston et al. 1998). Squires and Kennedy (2006) speculate that great horned owls are the dominant predator of goshawks in North America because of their wide distribution, abundance, and capacity to prey on large raptors. Goshawk nestlings are more often the target of great horned owl predation but adults are occasionally taken (Rohner and Doyle 1992). Wildlife biologists have documented several instances of great horned owl predation of nestling goshawks on the Bitterroot National Forest. Predation is a natural mortality factor in raptor populations. It is unknown if forest management increases goshawk predation rates or if predation rates greatly reduce survival (Squires and Kennedy 2006). It seems likely that reducing forest canopies could make the landscape more suitable for great horned owls and increase the risk of owl predation on goshawks but by how much is unknown.

Affected Environment

The Westside project area contains two known goshawk nest clusters that are active on a regular basis, and another cluster that has only been active once to our knowledge. Territory 02-07 in the center of the project area contains three known nests located within the same nest stand along the Coyote Coulee trail. This nest cluster is fairly well known because the goshawks aggressively defend their nestlings from trail users in years when one of the two nests immediately adjacent to the trail is active. The Forest typically posts signs notifying trail users of

the presence of aggressive goshawks, and recommends that users avoid the section of trail where the nests area located. One or the other of the three known nests in this cluster has been active in 9 of the 15 years since the first nest was discovered in 2001. The territory was active and fledged 3 young in 2015. The stand in this nest area is composed of a mix of ponderosa pine and Douglas-fir. Many of the pines have been killed by bark beetles in the last few years, so the canopy closure has declined.

Territory 02-01 in the northern part of the project area also contains three known nests located within the same nest stand, plus another in an adjacent stand that may actually be a Cooper's hawk nest. One or the other of the three known nests in this cluster has been active in 11 of the 21 years since the first nest was discovered in 1995. The territory was active and fledged 3 young in 2015. The stand in this nest area is mostly Douglas-fir mixed with a few ponderosa pine. Recent tree mortality is not been noticeable in this stand.

Territory 02-08 in the southern part of the project area contains one known nest, plus the remnants of another that has almost completely fallen out of the nest tree. The remaining nest has never been active since it was discovered in 2000. Another nest in the territory was discovered in 2003 when it was active and fledged two young, but that nest fell out of the tree in 2004. The Forest has not documented any goshawk activity in this territory since 2003, and it appears as though the territory was abandoned.

Environmental Consequences

Methodology

The effects analysis for northern goshawk focuses on habitat structure in known nest areas (approximately 30 acres around nests) and post-fledging areas (PFA) (420 acres around known nests). In addition, goshawks can be sensitive to human disturbance at nesting sites during the nesting season. Therefore, disturbance impacts on potential goshawk nesting sites are evaluated for each alternative.

Direct and Indirect Effects

Alternative 1 (No Action Alternative)

The No Action Alternative would not directly change existing habitat quality for goshawks in nest areas or PFAs because it would not implement any vegetative treatments. In the short term, habitat quality would be unchanged or would continue to decline slowly as more trees are killed by bark beetles or spruce budworm. In the longer term, increasing tree densities and fuel loads would increase the probability of a severe fire. A severe fire would create unsuitable goshawk nesting habitat in areas that burned with moderate or high severity. Alternative 1 would not directly change existing levels of human disturbance on goshawk nest areas or PFAs because there would be no treatments in goshawk territories or change of travel patterns on roads and trails.

Alternative 2

Alternative 2 would directly impact the nesting area for Territory 02-07. The new road to access Unit 2c would pass through this nest area and permanently open the canopy through it. The road would be within 20 meters of Nest A, 40 meters of Nest D, and 60 meters of Nest C. Reynolds et al. (1992) recommend that activities which reduce overstory canopy closure not occur within nest areas. USDI Fish and Wildlife Service (1998) stated that some level (threshold) of change in habitat can render an area unsuitable for goshawks, and that threshold may vary by geographic region). Some studies show that removing nest trees, modifying or removing entire nest stands, and removing canopy, mature trees, snags, and downed wood can reduce the

quality and quantity of nesting and foraging habitat (Squires and Kennedy 2006). However, these studies show that goshawks can tolerate a considerable amount of timber harvest within nest stands and territories and reproduce successfully (Squires and Kennedy 2006). After reviewing the pertinent literature, USDA Forest Service (2009) found that goshawk response to disturbance from vegetation treatments and human activities near nests is inconclusive and may vary from complete site abandonment and nest failure to some level of tolerance.

Since the nest area for Territory 02-07 is small, and a large part of the PFA around this nest area was harvested in 2006, establishing a new road corridor through the nest stand would likely reduce or eliminate goshawk nesting activity in the short-term. The road corridor may increase the risk of great horned owl predation and potential non-motorized use of the new road at the close of the project may continue disturbance. However, it is possible that goshawks may continue to use this area as a nest stand, since there are other goshawk nests on the Forest that are located within 50 meters of roads open to motorized use year-round. Goshawks would probably continue to use the territory, since there are likely more alternate nests in other nest areas that biologists have not discovered.

Assuming that the nesting area comprises a 30-acre circle centered at the centroid of the three known nests, about 1 acre of the nesting area is within commercial harvest Unit 2c, and about 6 acres are within aspen restoration Unit 39 (PF-WILD-050; PF-WILD-051). None of the known nests is within a treatment unit. Treatments in Units 2c and 39 would have very minor effects on actual nesting habitat, as neither unit provides suitable nesting structure. Assuming the PFA is a 420-acre circle centered at the centroid of the three known nests, about 117 acres of the PFA are within Unit 2c and 22 acres are within Unit 39 (PF-WILD-050; PF-WILD-052). Treatments would occur in about 33% of the PFA. Treatments in those units would reduce the amount of cover that protects fledglings from predators and thereby reduces the security of the PFA. Treatments may also reduce fledgling hunting opportunities by reducing the number of available perch trees from which to hunt. Treatments would change the goshawk prey base in the PFA by reducing habitat values for squirrels, hares, and grouse. Other prey species such as ground squirrels may become more abundant.

If monitoring determines that a goshawk nest is active in this nesting area, project activities such as road construction or timber harvest in Units 2c and 39 would not occur in the PFA during the nesting season (March 15 – August 30). Avoiding project implementation activities around an active nest site ensures goshawks would not be disturbed during this critical life stage.

Alternative 2 would directly impact the nesting area for Territory 02-01. Assuming that the nesting area comprises a 30-acre circle centered at the centroid of the four known nests, about 7 acres are within non-commercial thin Unit 20 (PF-WILD-050; PF-WILD-051). None of the known nests is within a treatment unit. Treatment in Unit 20 would have little impact on actual nesting habitat, as the unit does not provide suitable nesting structure. The PFA includes about 25 acres of Unit 1 and 65 acres of five non-commercial thin units (PF-WILD-050; PF-WILD-052). Effects on habitat in the PFA would be similar to those described above for Territory 02-07, but would occur over 21.5% of the PFA. Seasonal restrictions on treatment activities as described above should be applied if monitoring determines that an active goshawk nest is present within this nesting area.

Alternative 2 would directly impact the nesting area for Territory 02-08; however, this nesting area has not been active since it was discovered in 2000. About five acres of the nesting area are in commercial harvest Unit 7a, seven acres are in commercial harvest Unit 5, and seven acres are in non-commercial thin Unit 26 (PF-WILD-050; PF-WILD-051). The nest itself is not within a

treatment unit. Treatments in these units would reduce the value of goshawk nesting habitat in this nesting area by reducing canopy closure. In addition, work required to decommission and restore the contour of a portion of NFSR #5620 would partially occur in this nest area. About 192 acres of the PFA is within eight commercial harvest units, 99 acres are within two non-commercial thin units, and 12 acres are in aspen restoration Unit 40 (PF-WILD-050; PF-WILD-052). Effects on habitat in the PFA would be similar to those described above for Territory 02-07, but would occur over 72.3% of the PFA, which would likely render the PFA ineffective. If monitoring determines that a goshawk nest is active in this nesting area, seasonal restrictions on activities as described above would be applied. The application of this design feature is unlikely since the only known nest has not been active since it was discovered.

Overall, proposed treatments would reduce the number of potentially suitable goshawk nest areas across the project area by reducing canopy closures. Changes in stand structure would likely alter the number and species of goshawk prey. Goshawks are prey generalists that could adapt to the new prey composition, but prey availability could be reduced by competition from raptors adapted to more open forests, like red-tailed hawks and great horned owls. In addition, a more open stand structure might reduce cover needed to protect nestlings and fledglings from predators. As a result, the area's carrying capacity for goshawks would likely decrease.

Cumulative Effects

Geographic and Temporal Boundaries

The defined cumulative effects analysis area for goshawks is the Westside project area. This analysis area is appropriate to analyze effects from the proposed actions on this species in conjunction with past, present, and reasonably foreseeable actions as incremental effects on goshawks outside of the analysis area would not be measurable. An assessment of populations at the Forest and Regional levels is also considered to provide additional context.

Activities within the Cumulative Effects Area

The structure, function, and quality of both nesting and foraging habitat has been affected by prior timber harvests in the Westside project area. Most of the lower portion of the cumulative effects area (up to around 6,000 ft) was essentially clearcut in the late 1800s and early 1900s. Lower elevations between Moose Creek and Coyote Coulee were converted to apple orchards in the early 1900s. These were subsequently abandoned and regenerated naturally to mostly ponderosa pine. Additional road building and timber harvest occurred in the area between Camas Creek and Lost Horse Creek in the 1970s. The Hayes Creek timber sale around 2006 thinned the ponderosa pine forest that had over grown the former apple orchards. These management practices reduced canopy cover, and removed snags and decreased the amount of coarse wood that support goshawk prey populations. Timber harvest reduces and fragments mature forest habitat preferred by goshawks and favors early successional competitors and predators such as red-tailed hawks and great horned owls. The likelihood of nestling and juvenile goshawk predation increases when forest habitat becomes more open and fragmented (USDI Fish and Wildlife Service 1998).

Past fire suppression activities may have increased goshawk nesting habitat in the Westside project area in the last several decades. Douglas-fir and grand fir have increased in numbers and matured in the absence of frequent fires that may have favored more fire adapted species. This has resulted in numerous mature Douglas-fir trees that potentially could be used for nesting. In some areas, where the succession of Douglas-fir has altered what was once open forested habitat, fire suppression may have negatively affected flight lanes used for foraging.

Changes in forest composition and structure have also altered goshawk prey species. With fire suppression activities continuing, some of these stands of currently suitable goshawk habitat will become unsuitable in time. The loss could be due to stand densities that don't allow open flight or to loss through fire.

Trends & Broader Context

The Bitterroot National Forest is estimated to have sufficient suitable nesting habitat to support a minimum of 340 goshawk nests, which would provide nesting habitat for at least 57 to 170 goshawk pairs. Modeling also estimates that there is enough suitable post-fledging habitat to support a minimum of 68 to 135 goshawk pairs, and enough suitable foraging habitat to support a minimum of 87 goshawk pairs (Samson 2005). Therefore, as a conservative estimate, the Bitterroot National Forest has enough suitable goshawk habitat to support all life stages of at least 57 goshawk pairs and it is well distributed across the Forest.

At a Forest wide scale, habitat modeling based on FIA data estimates that there are 347,917 acres of goshawk habitat more than what is necessary to maintain a minimum viable population, which is estimated to be 110 individuals (Samson 2005, Samson 2006). Another way to say this is that we have an estimated 1,254% of the habitat necessary to maintain a minimum viable population of goshawks on the Forest. Alternative 2 would reduce the amount of suitable nesting habitat within the Westside project area, and would reduce goshawk habitat quality in the PFAs surrounding the three known nest clusters. Most of the treatment units would continue to provide suitable goshawk foraging habitat, although the prey species or densities in those units may change. Because the potential effects of the alternatives are relatively limited in the context of the apparently adequate and excess habitat Forest wide, the predicted impacts on potential goshawk habitat would not influence population or species viability.

The Bitterroot National Forest monitors goshawk nests and as of 2015, have identified 108 northern goshawk nests across the Forest in 35 different territories. Of the known nests, 59 have been active at least one year since we found them, and 18 have been active more than one year. We have documented at least 184 juvenile goshawks fledged from these nests (PF-MONITOR-001).

Since goshawks are well distributed across the Forest, abundant (given their large territory size), and have good fledging success, we are confident that the goshawk population across the Forest is doing well and positively contributes to the viability of goshawk populations in western Montana.

Conclusion

Alternative 1 (No Action)

Implementation of this alternative would not change northern goshawk populations or habitat quality in the project area or at larger scales over the short term. Goshawk habitat would continue to be at increased risk of a severe fire due to the development of Douglas-fir thickets and heavy fuel loads.

Alternative 2

Implementation of Alternative 2 would negatively affect northern goshawk nesting habitat, and cause minor and short-term negative impacts on foraging habitat. These effects could reduce the goshawk carrying capacity in the project area. Treatments in goshawk habitat would reduce the risk of severe fire and would move stand composition and structure into mature and over mature age classes in the long-term. This would improve goshawk habitat quality in the future. Though goshawk numbers in the project area may decline in the short-term, the species would

be present and contribute to the maintenance of population viability at the Forest scale. Treatments would help improve goshawk habitat and populations in the long-term at both the local and Forest scales.

Forest Land Birds

Affected Environment

Forest land birds include all avian species in our area, except waterfowl and game birds. There are more than 100 species of land birds on the Bitterroot National Forest according to our land bird monitoring results. No birds in the group are listed as endangered or threatened on the Bitterroot National Forest. The United States Fish and Wildlife Service (USFWS) lists the yellow-billed cuckoo (*Coccyzus americanus*) as a threatened species that may occur on the Bitterroot National Forest. There are only three records of this species in Ravalli County and all are on private land. It is likely that this species only occurs in Ravalli County as a non-breeding vagrant. Bald eagles (Haliaeetus leucocephalus), black-backed woodpeckers (*Picoides arcticus*), flammulated owls (Otus flammeolus) and peregrine falcons (*Falco peregrinus*) are listed as sensitive species. The willow flycatcher (*Empidonax traillii*) and olive-sided flycatcher (*Contopus cooperi*), are listed as species at risk in Quigley and Arbelbide (1997). Sauer et al. (2011), in their analysis of Breeding Bird Survey results, show that willow flycatchers have been declining on average of two percent per year over the last 25 years. Olive-sided flycatchers have declined about five to six percent per year in the same period. Willow flycatchers are shrub associates, and are most abundant in very wet sites. Olive-sided flycatchers are most often found around or in recently burned areas, most often nesting in young conifers, often lodgepole pine (Baicich and Harrison 1997). In the Northern Rockies, Hutto (1995) found they occurred most often in spruce-fir, marsh-wetland, and mixed conifer types (Montana Partners in Flight 2000).

Any treatment, including no action, positively affects some species at the expense of others. It would be impractical to treat all the individual species separately. However, individual species habitat needs are represented by other species discussed in the analysis, e.g. dry site species are represented by flammulated owls; old growth associates by flammulated owl, pileated woodpecker, fisher and marten; and snag dependent species by black-backed and pileated woodpeckers. Maintaining or trending habitats toward their historical range of conditions is presumed to provide for habitat needs of birds that have evolved with and adapted to the vegetation structures and functions characteristic of the Bitterroot National Forest.

The Northern Region Forest Land Bird monitoring program objective is to monitor trends in land bird populations. Since the inception of the program in 1994, more than 20 permanently marked point-count transects have been established on the Bitterroot National Forest. Other land bird monitoring efforts include five Breeding Bird Survey routes, (following the protocols established for a nation-wide network by U. S. Fish and Wildlife Service) and two Monitoring Avian Productivity and Survivorship bird banding stations (following the nation-wide protocols established by the Institute for Bird Populations).

Forest personnel also participate in and monitor citizen land bird monitoring efforts, such as the nationwide Christmas Bird Counts and the Migratory Bird Count. The objective of the Migratory Bird Count is to provide a nation-wide snapshot of the progress of migration on the second Saturday in May of each year. None of the ongoing monitoring has raised concerns about declines of any species.

Environmental Consequences

Direct and Indirect Effects

Alternative 1 (No Action Alternative)

The No Action Alternative would allow existing vegetation trends to continue. Existing trends in bird populations would follow the habitat trends. In the short term, older trees would continue to die as a result of moisture competition and attacks by insects and pathogens. The snags created by continued mortality would provide nesting and foraging habitat for pileated, hairy (*Picoides villosus*), and three-toed woodpeckers (*P. tridactylus*), and red-breasted nuthatches (*Sitta canadensis*). The nest cavities created by these birds would in turn be available for secondary cavity nesters such as flammulated, boreal (*Aegolius funereus*) and northern saw-whet owls (*A. acadiucs*) and northern pygmy-owls (*Glaucidium gnoma*), and would also provide denning and resting habitat for mammalian species such as marten, fisher and northern flying squirrels (*Glaucomys sabrinus*). Extensive areas of closed-canopy mature Douglas-fir and mixed conifer forests would continue to provide abundant habitat for birds that nest and feed high in continuous conifer canopies, such as Townsend's warbler (Dendroica townsendi), ruby-crowned (*Regulus calendula*) and golden-crowned kinglets (*R. satrapa*), Cassin's vireo (*Vireo cassinii*) and mountain chickadees (*Poecile gambeli*) (Hutto and Young 1999). Other species that are associated with closed-canopy, mesic forests include hermit thrush (*Catharus guttatus*), varied thrush (*Ixoreus naevius*), gray jay (*Perisoreus canadensis*), Hammond's flycatcher (*Empidonax hammondii*) and northern goshawk (*Accipiter gentilis*).

In the long term, this alternative would increase the risk of moderate to high severity fire that would remove most of the overstory and understory canopies and create thousands of new snags. These conditions would benefit bird species closely associated with early post-fire conditions, such as black-backed, three-toed and hairy woodpeckers, mountain bluebirds (*Sialia currucoides*), olive-sided flycatchers and Townsend's solitaires (*Myadestes townsendii*) (Hutto 1995).

While this alternative would benefit some bird species in both the short and long terms, it would not trend towards the range of habitat conditions that occurred historically in this area. Bird species diversity would decline as habitat diversity decreases with the continued loss of more open habitats dominated by ponderosa pine, shrubs or grasses and forbs. Because of this downward trend in habitat diversity, this alternative may reduce the diversity of the bird community in this area in the long term.

Alternative 2

In the short term, Alternative 2 would open up the canopies of existing relatively closed-canopy forests on about 1,305 acres of commercial harvest units and 666 acres of non-commercial thinning units. The canopies in most of these units are becoming more open as ponderosa pine and lodgepole pine trees die from the mountain pine beetle infestations. Therefore, habitat quality for birds strongly associated with closed forest canopies are declining regardless of treatment. The plantation thinning would restore more open stand conditions in dense sapling stands and would provide suitable habitat for many more bird species, especially as the accelerated growth rates produce taller trees with good cone crops. This alternative would maintain a more open-canopy forest suitable to the VRUs in the project area and provide suitable habitat to maintain populations of bird species adapted to these conditions.

The treatments included in this alternative would improve habitat quality for bird species adapted to more open stand conditions because they would reduce the number of trees on these sites, create spaces between the canopies of individual trees, and favor ponderosa pine by

removing much of the Douglas-fir. They would reduce the number of snags available for woodpeckers, but would retain snags at levels similar to what was present in these stands historically. Bird species associated with more open forest conditions include Williamson's sapsucker (*Sphyrapicus thyroideus*), northern flicker (*Colaptes auratus*), western tanager (*Piranga ludoviciana*), yellow-rumped warbler (*Setophaga coronata*), dusky flycatcher (*Empidonax oberholseri*), and chipping sparrow (*Spizella passerina*) (Hutto and Young 1999). These treatments would also increase shrubs and native forbs growth because they would increase light penetration through the conifer canopies. Bird species associated with shrubs and forbs include orange-crowned warbler (*Vermivora celata*), MacGillivray's warbler (*Oporomis tolmiei*), lazuli bunting (*Passerina amoena*), spotted towhee (*Pipilo maculatus*), and rufous hummingbird (*Selasphorous rufus*).

In the long term, this alternative would reduce the risk of moderate to high severity fire that would benefit the bird species strongly associated with post-fire habitats. However, it would not completely eliminate the probability of a severe fire.

Overall, this alternative would increase habitat diversity across the project area, and would trend towards the range of historical habitat conditions. Bird species diversity would trend towards historic levels with the restoration of more open habitats dominated by ponderosa pine, combined with maintaining portions of the existing closed canopy habitat. This trend towards historic conditions would benefit the bird community as a whole, because it would provide more sustainable habitat conditions for an increased number of bird species.

Cumulative Effects

Geographic and Temporal Boundaries

The defined cumulative effects analysis area for land birds is the Westside project area. This analysis area is appropriate to analyze any incremental effects from the actions of this project on land birds in conjunction with past, present, and reasonably foreseeable actions. Effects of proposed activities of this project on land birds outside of the analysis area would not be measurable. An assessment of information available at the Bitterroot Valley level is also considered to provide additional context.

The effects of the actions in Alternatives 2 would last until the forested stands returned to the seral stage at which they are now.

Other Actions and Trends

Ongoing monitoring of land birds does not indicate that past actions have affected land birds as a group within the Bitterroot Valley. It is highly probable that management actions have caused alterations in habitat that favored some species over other species but monitoring indicates that land bird species viability, as a whole has not been affected. We predict that effects of current actions and proposed actions will not affect viability for land birds. The most likely activity to affect land birds in the analysis area would be activities that affect the shrub component, a habitat component of many warblers and flycatchers.

Prescribed fire would follow commercial harvest and non-commercial thinning and would have effects similar to a low severity fire. Land bird species that benefit from low severity fires will benefit from this burn, while other land bird species not associated with low severity fire regimes will be negatively impacted in the short term.

Animal Movement, Migration, and Dispersal (Fragmentation and Corridors)

Affected Environment

Harrison and Voller (1998) discuss the broad concepts of connectivity and fragmentation and summarize the literature on these topics from numerous studies. Much of the scientific literature that describes the effects of habitat fragmentation on wildlife is based on studies in areas that originally supported large, homogeneous areas of relatively stable, late successional forests, such as the eastern United States, the Pacific Northwest, or the Amazon (Wilcove et al. 1986). The effects of fragmentation on wildlife species documented in these areas do not directly apply to the Inland Northwest and northern Rocky Mountains because ecosystems were created and maintained by frequent disturbance events that resulted in a high degree of forest fragmentation.

Wildlife populations need to remain connected to other populations to promote genetic exchange that enables smaller populations to persist over time. Forested habitats in the Westside project area and the rest of the Forest and Region are naturally fragmented, and native wildlife populations are adapted to moving through these fragmented landscapes. Numerous studies (Gruell 1983, Hessburg and Agee 2003, Gallant et al. 2003) show that forests in the Interior Columbia Basin are less fragmented now than they were historically due to fire suppression. This implies that native wildlife populations that are adapted to fragmented forested habitats should be able to move through the modern forested landscape and keep populations connected. The wildlife species most likely to become isolated from other populations are those specialized to grass and shrub habitats. These habitats have become reduced in size and distribution with the succession to conifers (Leiberg 1899, Gruell 1983, Habeck 1994).

Movements by large, wide-ranging mammals will be analyzed from a regional perspective, including linkages from the Frank Church-River of No Return, Selway-Bitterroot, and Anaconda-Pintler Wildernesses to the Allan Mountain Roadless Area. The emphasis is on potential barriers to free movement into and through the Bitterroot National Forest. An analysis of animal movement at the local, regional, and grand scales was completed in the Trail Creek Supplemental Information Report (USDA Forest Service 1991, pages 20-30); much of that analysis applies to the Westside project analysis. Animal movement analysis considers their daily activity patterns of animals and their interactions with the habitat at the local scale. Daily activities depend on contiguous suitable habitat, or at least suitable food, cover, and water juxtaposed in an area small enough for daily use.

Migration is the periodic (seasonal) movement of animals between suitable summer and winter ranges (Kendeigh 1961). In most cases, we think of the relatively short migrations of big game between high elevation summer ranges and winter ranges below high snow accumulation zones. However, neotropical migratory birds spend more time during winter in western Mexico or Central America than they do during breeding season in western Montana. In this analysis, we can manage only lands involved in shorter migrations between summer and winter ranges. We have no control over or direct effect on habitats beyond National Forest boundaries. We can only assure suitable seasonal habitats for sustained productivity of long-range migrants.

Dispersal is a one-way outward movement of individuals from suitable, occupied habitat (Kendeigh 1961). The movements appear random, almost erratic, and most involve young animals and genetic exchange between populations in insular habitats.

Dispersal of individuals between populations of wildlife species is an important component of genetic diversity and adaptability of a species to its habitat. Isolated populations are particularly susceptible to loss of genetic diversity if no movement among populations can occur. It has been postulated that providing suitable corridors for successful dispersal of at least one individual per generation can help maintain genetic diversity (Morrison et al. 1992). Dispersing individuals often travel through areas of unsuitable habitat. A corridor is defined as an area through which species can move from one place to another in response to changes in environment or as a natural part of their life history. The Trail Creek analysis (USDA Forest Service 1991, including extensive internal citations) lists four general characteristics of effective corridors:

- "The wider the corridor, the better. Acceptable widths will vary depending on the habitat structure and quality within the corridor, the nature of surrounding habitat, human activities, and the species expected to use the corridor. Hunter ... noted type of movement as an additional factor.
- “The shorter the connection, the better. Thomas ... and others recognized that dispersal success decreased with increasing distances between habitat blocks.
- “Ridges and stream courses provide natural travel ways and their dendritic pattern works well to tie various landscape features together.
- “Corridors comprised of suitable habitat for the species in question work best for allowing dispersal."

The concept of corridors suggests there are specific places that certain species of animals use to move from one area to another. Though there may be preferred travel routes, the historic fire patterns on the Bitterroot National Forest and elsewhere in the Northern Rockies, suggests species were able to move freely enough to successfully evolve and avoid genetic isolation regardless of the sudden and extensive changes in vegetation from fire.

Roads, and the access they provide humans, potentially influence animal movement and vegetation patterns. Impacts from roads throughout the Bitterroot National Forest have been partially mitigated with minimal clearing distances, low use, and travel restrictions. Major linkages between refugia like the Selway-Bitterroot, Frank Church-River of No Return, and Anaconda/Pintler wildernesses, and the Allan Mountain Roadless Area are no more interrupted in the current landscape patterns than they were by the major fire occurrences of the past.

Roads create a linear feature on the landscape that interrupts the forest cover, but provide corridors for movement of some plants and animals into areas from which they may have been excluded, for instance, the spread of spotted knapweed by vehicles using roads. Roads also increase forest edge and may lead to incursions of wildlife species (e.g., brown-headed cowbirds) into interior forest habitats.

The landscape pattern of vegetation successional stages and topographic features strongly influence daily activity patterns of animal populations. All animals need food, cover, and water to survive, and the needs must be met within the daily home range. For small mammals, necessities need to be met in a few square yards, for larger mammals or birds daily movements may occur over several square miles. Existing vegetation and fire severity maps reveal a highly variable vegetation pattern with a wide diversity of habitats. The analysis also indicates that patch size and connectivity of forested areas have increased since the advent of fire suppression, and favor species that need continuous forest environments. The same suppression actions have degraded habitat for species adapted to forest structures typical of a frequent fire regime.

The 1987 Northern Rocky Mountain Wolf Recovery Plan delineates the Stateline ridge at the head of the West Fork of the Bitterroot River as a "potential dispersal corridor" between the Yellowstone and Central Idaho recovery areas. Since the Plan was written, we have found that wolves disperse widely, and do not necessarily follow the defined potential corridors. The Final Gray Wolf Recovery Plan made major changes in recovery zone boundaries and did not delineate dispersal corridors (USDI Fish and Wildlife Service 1994).

Environmental Consequences

Direct and Indirect Effects

Both Alternatives

The alternatives in the Westside project would retain most forest cover where it currently exists in the short term. Alternative 2 would reduce forest density but the treated units would be similar to forested stands that occurred in this area under historic disturbance processes. None of the proposed activities would alter landscapes beyond the range of natural variation, so none would substantially interrupt existing animal movement and dispersal patterns. Three and a half miles of permanent roads and 4.7 miles of temporary road would be built, but forest roads do not generally present barriers to movement or dispersal of wildlife species. The reduction of forest canopies may alter movement pathways for some species, but would not prohibit movements between or among forested landscapes.

Cumulative Effects

Geographic and Temporal Boundaries

The defined cumulative effects analysis area for animal movement, dispersal, and migration is the Bitterroot National Forest. This analysis area is appropriate to analyze any incremental effects from the actions of this project in conjunction with past, present, and reasonably foreseeable actions.

Other Actions and Trends

Forest ecosystems throughout the Inland Northwest, including the Rocky Mountains, were created and maintained by frequent disturbance, principally fire and flooding (Hessburg and Agee 2003). These disturbances and the extensive topographic variation in the region resulted in naturally patchy forest patterns (Tewksbury et al. 1998). Human alteration of natural disturbance regimes (fire suppression) has created forest patterns that are much more homogeneous and extensive than existed before Euro-American settlement (Gallant et al. 2003). Hessburg and Agee (2003) report that the most widely distributed change in forest structure across the Interior Columbia Basin was sharply increased area and connectivity of intermediate (not new or old) forest structures, and Gruell (1983) states that the most striking change in forests of Region 1 has been the widespread increase in distribution and density of conifers. Gallant et al. (2003) found in the Greater Yellowstone ecosystem that the primary forest dynamic in the study area is not the fragmentation of conifer forest by logging, but the transition from a fire-driven mosaic of grasslands, shrub land, broadleaf forest, and mixed forest communities to a conifer-dominated landscape. In their study area, the area of conifer-dominated landscapes increased from 15% in 1856 to 51% in 1996, while area dominated by aspen and grasslands declined by 75% and 40% during this period, respectively. Similar patterns of conifer encroachment into grasslands and shrub lands have been documented by many others (Leiberg 1899, Gruell 1983, Habeck 1994). Because of these changes, more forest exists today in the northern Rockies than at any time since European settlement (Samson 2006).

Disturbance and resulting habitat fragmentation are natural parts of forest ecosystems in our area, and native wildlife are adapted to dynamic ecosystems. Many organisms are adapted to

localized fire regimes and dependent upon either early or late seral habitats (Hutto 1995). Species breeding in ecosystems where frequent small and large-scale natural disturbances have occurred historically may be more resistant to habitat changes (Schmiegelow et al. 1997) and less affected by habitat fragmentation (Samson 2006).

Native wildlife species have evolved in a landscape with a high degree of fragmentation, abundant edge, and relatively small patch sizes, the result of natural processes and topography. This situation on the Bitterroot National Forest landscape has not been appreciably altered by any past actions on the landscape except for perhaps high volume road systems and fire suppression. Highway 93 is the only road that appears to have affected wildlife. Effects of fragmentation on wildlife dispersal or movement between various habitat elements (water, forage, winter/summer range, breeding areas) has not affected the viability of any wildlife species on the Forest as discussed in each of the species narratives in this section.

All proposed actions would move forest structures towards historical patterns in the project area, and to restore habitat conditions more similar to those created by disturbance regimes typical of the Bitterroot National Forest.

Watershed Conditions

This analysis describes the affected environment of the watersheds surrounding the Westside project area and potential effects of the proposed action. In this analysis, the hydrologist characterizes the physical features of Roaring Lion, Judd, Gold, Camas and Lost Horse watersheds and summarizes their existing conditions. Details of the proposed action are described in Chapter 2 and the Silviculture Section in Chapter 3.

Affected Environment

This section describes the existing conditions and environmental setting of water resources in the Westside project area. It serves as the baseline for the comparisons of the environmental effects.

Physical Characteristics of Watersheds in the Analysis Area

The water resources analysis area includes Forest Service-administered lands within the Roaring Lion, Judd, Gold, Camas, and Lost Horse 6th-level watersheds. Water resources within these watersheds may be affected by the Westside project (Figure 3-18). The hydrologist also assessed water resources on private lands but in less detail. Initial project analysis indicates that potential effects on private lands would be low. Table 3-36 displays basic information about the watersheds.

The project area is very small relative to the watershed area in Roaring Lion and Lost Horse watersheds, but information on the entire watershed provides context to the analysis of environmental effects. In the Roaring Lion watershed, less than one percent of the contributing area has management activity proposed (Table 3-36). Less information and analysis is needed to discuss possible effects on this watershed because such a small portion of the watershed would be affected.

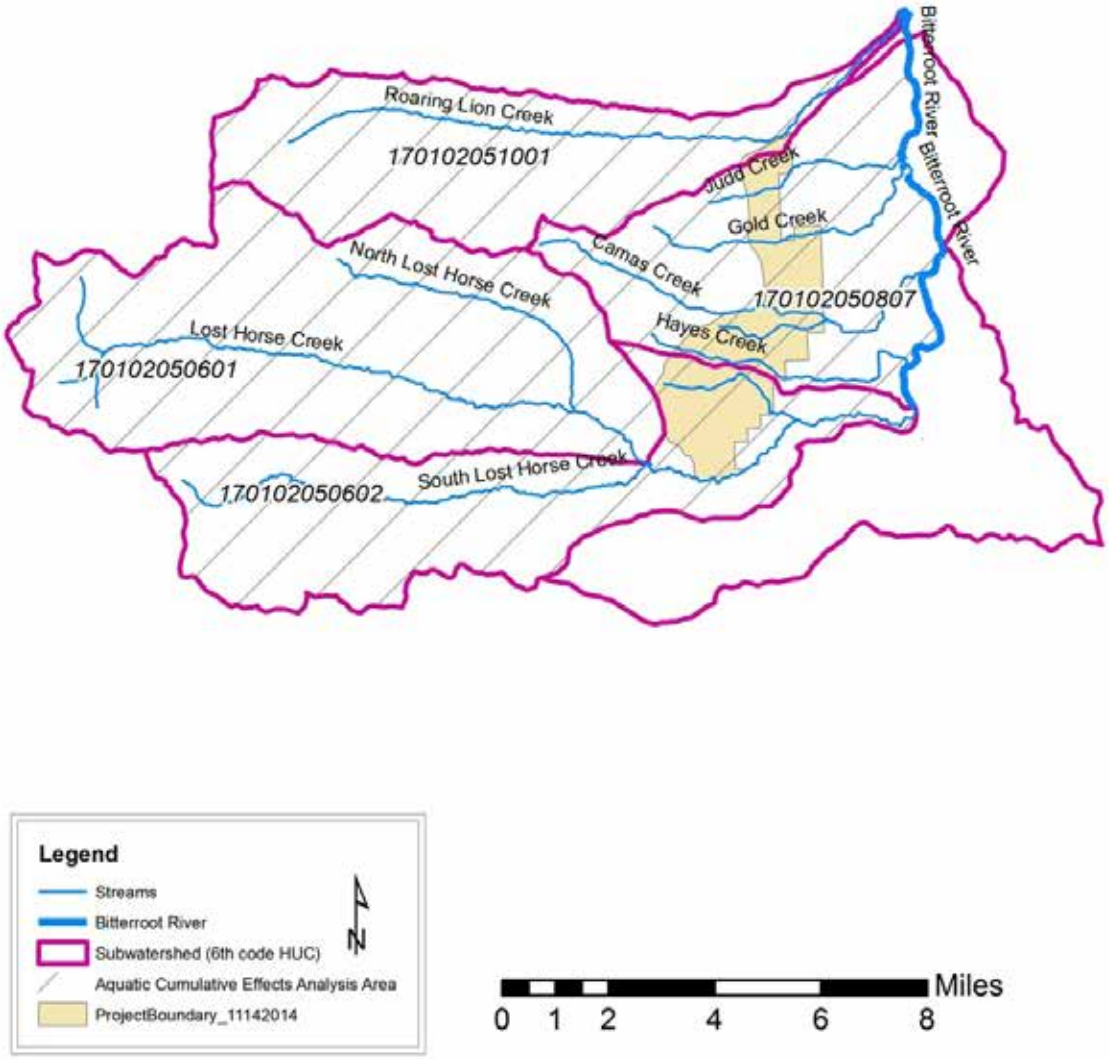

Figure 3-18 : Boundaries of the Watershed and Aquatic Species Analyses for the Westside Project.

Water resources in the analysis area are comprised mainly of the stream channels listed in Table 36, their intermittent and perennial reaches, and their adjacent riparian areas. Wetlands are limited to streamside areas and occasional scattered small seeps and springs. No beaver ponds were found on National Forest in the analysis area. Good beaver pond sites are very limited because there are few wide valley bottoms with willow-cottonwood plant communities.

Precipitation in the analysis area watersheds comes mainly as snow between October and April, but May and June often have substantial rainfall. Mean annual precipitation in the analysis area ranges from 12-13 inches at lower elevations and up to about 70 inches at the upper elevations near the Bitterroot Divide. Long-term average precipitation across the project area is estimated at 15-20 inches. Precipitation for 2014 and 2015 has been about average. The general climate can be described as semi-arid, with a shortage of precipitation and soil moisture between July and October.

Table 3-36: Characteristics of Watersheds in the Westside Analysis and Project Areas

WATERSHED (HUC)	PROXIMITY OF STREAMS AND ACTIVITIES WITHIN THE PROJECT AREA BOUNDARY	ACRES WITHIN ANALYSIS AREA[1]	ACRES[1] IN PROJECT AREA	% OF WATERSHED [1] IN PROJECT AREA	% OF WATERSHED[1] IN DESIGNATED WILDERNESS
Roaring Lion 170102051001	Unit 1 is the primary activity in Roaring Lion Watershed	15,263	90	0.6%	83.1%
Judd 170102050807	Non-commercial fuel treatment	1,031	483	46.8%	0%
Gold 170102050807	Non-commercial fuel treatment	2,007	655	32.6%	0%
Camas 170102050807	Several activities. Bridge proposed near Forest boundary	4,192	1,256	30.0%	0.2%
Hayes 170102050807	Several activities	1,720	1,045	60.8%	0%
Lost Horse 170102050601 & 602	Several activities north of Lost Horse Creek. Creek is the southern boundary of the project.	45,307	2,089	4.6%	26.9%
Total		69,517	5,618		35.9%[2]

[1] Includes area within HUC under USFS jurisdiction.
[2] Area within HUC, and within Westside Project activity area.
[3] Percent of USFS-administered HUC within Westside Project activity area

The four drainage basins are relatively rocky, with frequent bedrock outcrops and talus slopes. Geology is mainly glaciated, decomposed granites (Idaho Batholith). Granitic soils in the project area are generally well-drained but prone to erosion, depending on vegetative cover, rock content and slope.

Analysis area stream flow follows a typical snowmelt-driven pattern. Peak flows generally come in May, and subside from late spring through fall. Fall rainstorms may provide enough groundwater to boost flows in perennial reaches before freezing temperatures reduce flow again in winter. Most runoff occurs between April and July, and flow response to summer thunderstorms is generally minimal due to soil and vegetation characteristics. Intermittent channel reaches rapidly lose flow when snowmelt ends, generally in June or July, depending on elevation. Flow may pick up again whenever precipitation and ground water become sufficiently recharged, which is typically late fall but in some cases, as late as the following spring. Several ephemeral draws exist in the project area that rarely flow water except in response to hydrologic events such as storms or rapid snowmelt that have long time lapses between events.

Vegetation communities on National Forest are mainly coniferous forests with dryland shrubs (e.g., ninebark, huckleberry) and grasses (pine grass and bear grass) in the understory. Forest plant communities in the project area are fairly consistent but vary with elevation, aspect, and

soil changes. Forest management has occurred in the analysis area, but has been very limited in the past 20-30 years. Historical harvest methods ran the spectrum from partial cuts to regeneration cuts but at this time, forest cover is nearly continuous in the project area watersheds.

Land Uses and Watershed Conditions

In the analysis area, recreation has been the main use of National Forest for the last 30 years. Only minor timber harvest has occurred since the 1970s, and little road building since the 1980s. The most recent timber harvest in the project area was the Hayes Creek Fuel Reduction project in 2003. This project included commercial harvest, prescribed burning, and non-commercial thinning on 700 acres in the Hayes Creek and Moose Creek drainages. Timber harvest, grazing, agriculture (mainly hay crops), road building, and housing development occur on private lands in the watersheds. Since these activities and their effects may overlap in time and space, they are analyzed for potential cumulative effects.

Streamside, wetland, and riparian habitats in the analysis area are limited by low annual precipitation and associated streamflow, well-drained slopes, and mostly narrow, V-shaped valleys. Riparian wetlands can be found in several locations in lower Lost Horse Canyon, which has been glacially influenced. On National Forest, native vegetation dominates all riparian areas and streamsides in the analysis area watersheds. Some weedy areas occur on formerly disturbed upland sites, near road cut-and-fill slopes, and road/stream crossings. In the valley bottoms, on both private and public lands, wetlands and riparian areas tend to be more common due to wide stream floodplains, irrigation ditch leakage, flood irrigation, and relatively flat terrain.

Although overall water quality meets all assigned beneficial uses in the analysis area, roads are likely having minor adverse effects on water quality around crossings. Road density and number of road crossings is highest in the Hayes Creek and Lost Horse Creek Watersheds. The crossings in Table 3-37 likely contribute minor amounts of fine sediment to Hayes Creek (Tributary to Camas Creek) and Moose Creek (tributary to Lost Horse Creek) during occasional large precipitation events. The lower 0.6 miles of road 5620 parallels an intermittent tributary of Moose Creek. Due to its close proximity to the stream channel and steep grade, it routinely delivers low to moderate amounts of sediment to the channel. The roads in the project area incorporate sediment and water control features but the sites listed in Table 3-37 are in need of maintenance to make them more effective.

Table 3-38 displays the miles of roads within 100 and 300 feet of streams, and the number of road crossings on National Forest for each analysis area watershed. These areas have the greatest potential sediment risk.

Lost Horse Road (NFSR 429) parallels the stream for an extended distance, but much BMP work has been accomplished over the last decade to stabilize the road and minimize sediment contributions (see Watershed Improvement Projects section). None of the project area streams are listed in MDEQ 2014 303(d)/305(b) water quality report as impaired for sediment. However, irrigation diversions on Lost Horse Creek result in some seasonal dewatering, and minor aquatic habitat impairment. The other streams in the project area appear to support all beneficial uses while on National Forest.

Table 3-37: Current system roads and undetermined status roads that are proposed for decommissioning or storage in the Alternative 2

NFSR ID AND POINT NUMBER[1]	AREA	CONDITION
496-3 to 496-8	Moose Creek	Numerous ephemeral streams receiving small amounts of sediment due to numerous plugged cross drains.
496-12	Hayes Creek	Perennial stream overtops bank above culvert during very high flow events. Resulting water flowing down roadside ditch.
496-13 to 496-22	Hayes Creek	Numerous ephemeral and intermittent streams receiving small amounts of sediment due to numerous plugged cross drains.
62953-1	Moose Creek	Perennial stream receives small to moderate amount of sediment from road surface. Install up gradient road drainage control feature and harden crossing with gravel.
62953-2	Moose Creek	Perennial stream, moderate amount of sediment mobile on road surface, very little makes it to stream. Install up gradient road drainage control feature.
62953-3	Moose Creek	Perennial stream, moderate amount of sediment mobile on road surface, moderate amount of sediment makes it to stream. Install up gradient road drainage control feature and harden crossing with gravel.
62953-4	Moose Creek	Intermittent stream, moderate amount of sediment mobile on road surface, small amount of sediment makes it to stream. Install up gradient road drainage control feature and harden crossing with gravel.
5620-1 to 5620-6	Moose Creek	Intermittent stream, moderate amount of sediment makes it to stream. Road is immediately adjacent to channel and has steep grades that make water and sediment control difficult.
429-1	Moose Creek	Side channel approximately 50' west of perennial stream crossing receives flow during very high flow events. Resulting water flowing down roadside ditch.

[1] PF-WAT-001 is the Crossings with Maintenance Needs map with reference numbers.

Private lands within the 6th-level watersheds occupy the lower elevations, have lower average precipitation, and produce little stream flow. Much of the private land is irrigated agricultural tracts, and water management is intensive enough to dry out natural channels of the smaller tributary streams somewhere between the Forest and the Bitterroot River. Streamside areas vary from healthy riparian gallery forests to pasture or hayfield. Residential development is moderate in all four watersheds, with varying streamside activities including construction and livestock grazing. Private land forest management has been predominately un-even age, utilizing

partial cut and thinning prescriptions. Aerial photos indicate and field observations confirm harvested areas are currently covered with forest re-growth and have good ground cover.

Table 3-38: Miles of Roads within 100 and 300 Feet of Streams and Road Crossings in the Westside Project Area.

WATERSHED	MILES W/IN 100 FEET OF PERENNIAL AND INTERMITTENT STREAM	MILES W/IN 300 FEET OF PERENNIAL AND INTERMITTENT STREAM	NUMBER OF PERENNIAL AND INTERMITTENT STREAM CROSSINGS
Roaring Lion	0	0.2	0
Judd	0	0	0
Gold	0	0	0
Camas	0.1	0.5	2
Hayes	0.8	2.2	16
Lost Horse	4.3	15.7	16

Watershed Improvement Projects

Recent watershed improvements have focused on analysis area roads. Lost Horse Road (FR429) has had extensive improvements, including a new aggregate surface in 2015, to reduce road surface erosion and effects to Lost Horse Creek and improve access to popular recreation areas in the headwaters. Other treatments have included concrete plank sections, additional culverts and drive-through dips to reduce road-surface erosion. Hayes Creek Road (NFSR 496) had additional culverts and aggregate surfacing installed in 2010 to improve cross-drainage and reduce road surface erosion.

Environmental Consequences

Alternative 1 – No Action

Direct and Indirect Effects

Under the No Action alternative, ground and forest cover characteristics would be similar to the existing condition. Natural disturbances, such as fire or beetles, would periodically thin forest cover under the No Action alternative. In between these disturbances, forest stands would re-grow or be replaced by new species. These changes, with the exception of high severity wildfire, would have little effect on water resources within the project area due to low annual precipitation and associated low water yields. The likely short-term (10 to 20 years) effect of the No-Action Alternative would be conditions similar to those described in the Affected Environment. Over the longer term, as natural disturbances reduce forest stand density in the project area, soil moisture would increase in proportion to the scale and intensity of the disturbance.

The potential for atypical wildfire effects on forest hydrology increases with forest density, especially in forests that evolved under low-severity fire regimes (Agee 2002). Surface erosion, caused by overland flow, is the dominant post-fire landscape response in the Northern Rocky Mountains (Wondzell and King 2003), while debris flows and mass wasting are the dominant responses in Coastal and Interior Northwest regions. Watershed “sponge & filter” functions are often severely degraded, resulting in heavy sediment delivery to streams, channel adjustments, and higher-than-normal mortality in local aquatic organism populations. For those forest types that typically experience stand-replacement fires (lodgepole pine and some mixed conifer), the

high severity fire and associated erosion are part of a natural cycle, although they can negatively affect human values and downstream water uses. There would be a moderate increase in fire-related watershed risk over the long-term (20 years or longer) under the no-action alternative.

With the No-Action Alternative, the current levels of sedimentation from road use would continue and watershed conditions and water quality would generally remain the same as described in the Affected Environment, unless a wildfire occurred. Overall, sediment production in the analysis area would remain low under Alternative 1.

Cumulative Effects

The cumulative effects analysis area for water resources includes public and private lands within the Roaring Lion, Judd, Gold, Camas, and Lost Horse 6th-level watershed boundaries, as water resources that may be affected by this proposal fall within these boundaries. The most likely result of the No-Action alternative is the status quo for water resources. Other ongoing or proposed activities such as road and trail use, road maintenance, prescribed fire, culvert replacements, timber harvest, and recreation would continue but cumulative effects on water resources would be limited because these projects are or would be designed to minimize watershed impacts. Stream health conditions in the lower watersheds would also likely remain the same as they are now, unless other activities are proposed to improve them.

Summary of the no-action alternative:

- No area is proposed for treatment. The no-action alternative would retain present trends of increasing stand density and moisture stress, although there is a high potential for increased beetle kill, which would thin stands and relieve moisture stress. Water yield from the forested portions of the watersheds would vary with natural disturbance over both the short- and long-term, with relatively less contribution from low elevation areas.
- Roads would continue to contribute small amounts of sediment to streams at several crossings under the no-action alternative.
- Predicting future fire effects is difficult, as fire may be either beneficial or detrimental to watershed health and water quality depending on its characteristics. Implementing the no-action alternative would maintain the current risk of watershed damage from high-intensity wildfire, and increase it over the longer term. Over the next 10-years there is a moderate risk of substantial high intensity fire in the analysis area.
- Wetlands and floodplains would continue in their current condition and trends.
- Land use on the private portions of the analysis area watersheds would continue on current trends, along with the associated effects.

Alternative 2

All harvest and road construction operations would apply pertinent design features, BMPs, and Forest Plan guidance to reduce sediment contributions to the least amount possible (Table 2-4, Appendix A). Bitterroot National Forest monitoring indicates that design features in recent timber harvest operations and application of pertinent BMPs produce few negative watershed effects (PF-Monitor-002).

Direct and Indirect Effects

Table 3-39 displays the portion of each analysis area watershed that would be thinned, along with a worst-case estimate of soil disturbance. Area disturbed was estimated using the maximum allowable disturbance under the Region 1 soil disturbance guidelines (15 percent) over the commercial treatment area and the area predicted to be disturbed by permanent and

temporary roads. Non-commercial thinning uses no heavy equipment and therefore creates no soil disturbance.

Table 3-39: Alternative 2 Treatment and Estimated Disturbance Levels within Analysis Area Watersheds

WATERSHED NAME	FS WATERSHED WITHIN ANALYSIS AREA (AC.)	AREA WITHIN FS WATERSHED PROPOSED FOR THINNING TREATMENT (AC) (DSD[1] AC.)	FS ROAD MILES (AC.)	TOTAL ACRES IN DISTURBED CONDITION[2]	PERCENT OF WATERSHED AREA IN DISTURBED CONDITION
Roaring Lion	15,263	34 (5.1)	1.4 (3.5)	8.6	<<1%
Judd	1,031	7 (1.1)	0	1.1	<<1%
Gold	2,007	109 (16.3)	0	16.3	<<1%
Camas	4,192	430 (64.5)	3.4 (8.5)	73.0	1.7%
Hayes	1,720	30 (4.5)	5.1 (12.8)	17.2	1.0%
Lost Horse	45,307	694 (104)	36.4 (91.0)	195.0	<<1%

[1] Commercial thinning acres x 15% maximum detrimental soil disturbance (DSD)
[2] Commercial DSD acres + Road acres (miles x 2.5 acres/mile)

Water Quality

All analysis area watersheds would have extremely low disturbance levels, due to relatively small areas proposed for commercial thinning and comparatively large inventoried roadless and wilderness areas. These low disturbance levels are very unlikely to drive changes in water quality because they are isolated from streams by vegetation. The majority of the activities associated with the project occur in the Camas and Lost Horse Creek analysis area watersheds and they could experience up to two percent disturbance from combined harvest and road building activities. The WEPP (Watershed Erosion Prediction Project) erosion and sedimentation model was used to assess the potential that harvest disturbances would affect local water resources. Results suggest a fifty-year return interval precipitation event on a skid trail would produce a 48 percent probability of an erosion event (0.2 tons/acre), but only an eight percent probability of the eroded soil reaching a stream through the 300 foot stream buffer. For harvest areas other than skid trails, the erosion and sedimentation probability were both two percent, which is similar to undisturbed forest floor. This suggests there is about 98 percent probability that a 50-year return precipitation event would not erode soil in harvest units enough to enter streams. In other words, harvested and unharvested slopes have the same low probability of producing sediment in a 50-year return precipitation event.

Sediment contribution to streams from harvest units would be unlikely with the application of Design Features and BMPs. The short timber sale duration would also limit the amount of time erosion events could occur. The potential for harvest-related effects on water resource is very low and more detailed analysis is not warranted.

Water Yield

The proposed vegetation thinning is likely to increase soil moisture within the harvest units by reducing a portion of the transpiring vegetation. These changes generally benefit vegetation within and adjacent to the treated areas, as lack of soil moisture during the growing season

limits growth and vigor in semi-arid settings such as the project area. All proposed thinning prescriptions in the 6th-level watersheds leave stocked stands of mature trees. The remaining overstory greatly limits water yield increases, because the remaining trees would use much, if not all of the moisture made available by the treatments.

Expansive studies by MacDonald and Stednick (2003), Stednick (1996), and Bosch and Hewlett (1982) suggest an ECA of at least 15 - 25% is needed to produce a measureable water yield increase during wet years, depending on several environmental variables. These studies were reviewed and results applied to the Westside project. For the following reasons, the amount of water yield increase, and therefore the potential for adverse channel adjustments from increased water yield, would be very low:

- The amount of area and type of forest treatment does not reduce forest cover enough to increase water yield in the analysis area (Table 3-39).
- Annual precipitation in the project area is quite low (15-20" MAP) and is unlikely to produce substantial water yield increases. Precipitation in the analysis area is at the low end of the range capable of producing a measureable increase.
- Water yield increases tend to be quickly diluted by fully-forested or non-contributing (low precipitation) zones downstream.
- Thinned forest stands in semi-arid climates similar to the project area tend to respond positively to soil moisture increases, utilizing all available water during the hot, dry growing season. The proposed harvest prescriptions leave vigorous forest stands occupying the thinning sites. The transpiration associated with retained forest cover depletes soil moisture, which means more of the wet season precipitation is used to recharge soils rather than produce surface flow.
- Most of the analysis area watersheds is in wilderness or inventoried roadless area, and the proposed activities are limited to very small portions of them. With only small proportions of the watersheds affected, the probability of water yield increases diminishes.
- The project has a net reduction in area affected by permanent roads, thereby increasing the area able to absorb and filter precipitation.

For the above reasons, the hydrologist expects water yield increases would be extremely minor, pose no threat to local channel stability or beneficial uses, and does not warrant further analysis or discussion.

Road Construction, Transportation System Changes and Use

The proposed crossing locations would be selected to minimize road surface sediment and provide adequate road drainage on the crossing approaches. The main Camas Creek crossing (NFSR 74967) is proposed as a single-span bridge with abutments outside of the channel. The design would minimize in-channel disturbance, and pass fish and 100-yr flood events. There may be minor amounts of sediment contributed around these new crossings on Camas Creek and Coyote Coulee for about two years, until the vegetation recovers. The new system roads would be closed to motorized access, which would reduce continual sedimentation. All applicable BMPs would be followed during the new crossing construction and further oversight is included with SPA124 permitting with MDEQ (Table 3-40).

Table 3-40: Road/Stream Crossing Density by Alternative and by Drainage

WATERSHED	ROAD/STREAM CROSSING DENSITY[1]		
	ALTERNATIVE 1	ALTERNATIVE 2	CHANGE IN # OF CROSSINGS
Roaring Lion	0	0	0
Judd	0	0	0
Gold	0	0	0
Camas	0.3	0.6	+2-4
Hayes	5.9	3.6	-9[2]
Lost Horse	0.4	0.3	-2

[1] Includes intermittent and perennial streams.
[2] Many of these crossing were removed in the 1990s, but the roads remained on the Forest Service road inventory. The proposed action removes these roads from the road inventory and the risk the crossing would be used and contribute sediment.

All new temporary road-related disturbances would occur more than 100 feet from perennial or intermittent stream channels, avoid terrain features that would concentrate surface flows, and stay in upland locations. Thus, potential sedimentation from these sites would be greatly reduced. Mean annual precipitation for the area is low, which also greatly limits the risk of surface flow or erosion from disturbed sites and sediment potential to local streams. Sediment would not likely reach any water-related features because of the filtering capability of ground cover between the potential disturbance and the streams. Culverts would be used in permanent and temporary road prisms where ground features (e.g. scoured areas, litter/needle movement) suggest surface flow may occur. Proposed permanent and temporary road construction, including landings, would disturb about 72 acres of ground cover and soil across the entire project area. Road disturbance farther than 100 feet from ephemeral swales would have an extremely limited ability to affect water resources due to distance from stream channels, filtering capability of the forest floor, low annual precipitation, drainage design, and use of BMPs, and are not analyzed further.

Proposed temporary and new permanent roads will have to cross at least one active irrigation ditch. There are many instances in Ravalli County of existing public and private roads crossing irrigation ditches. With the proper design and conservation practices, and in consultation with the easement holder, ditch crossings would be constructed such that there would be no short- or long-term adverse effects to the ditch, beneficial uses, or the irrigation water user. Ditch water would be pumped around the site during culvert installation as needed, providing the ditch operator uninterrupted use of their irrigation water.

The decommissioning and rerouting of the lower 0.6 miles of NSFR 5620, the only proposed haul road in the project area that closely parallels a channel, would eliminate what is currently the largest source of sediment in the project area. Road maintenance needs listed in Table 3-37 would be completed prior to log hauling from proposed commercial thinning activities. The combination of improvements to existing roads and road decommissioning would reduce overall long-term sediment and offset sediment created by the proposed activities.

Surface runoff from landings would be dispersed by shaping and filtered by vegetation. Timber sale administrators (TSAs) would halt operations or add drainage features if unwanted surface

flow patterns develop. Potential effects on water resources would be minor for the same reasons as listed for temporary roads.

Haul Routes

Haul roads for the Westside project are Camas Creek Loop (Hayes Creek Road – NFSR 74967 and Blue Jay Lane – NFSR 74964), Lost Horse Road (NFSR 429 to NFSR 496), and to a lesser degree Roaring Lion Road (NFSR 701). Sediment potential was assessed throughout the project area but focused on the perennial or intermittent stream crossings that would have timber haul traffic. Road design and condition of the crossings were inspected and identified the road maintenance needs (PF-Transport-001) that would be implemented before timber haul. The potential for sediment contributions from the crossings would be minor after road maintenance because of low precipitation, effective road and ditch drainage, and enforcement of the timber sale contract. The TSA would suspend timber haul in response to rutting and road surface water flow, which would minimize sedimentation at crossings. Decommissioning and rerouting the lower 0.6 miles of NSFR 5620 would eliminate a substantial sediment source. The combination of improvements to existing roads and decommissioning of NSFR 5620 would result in an overall net reduction in long-term sediment and offset the effects of sediment potentially generated by new roads in the project area.

Cumulative Effects

The cumulative effects analysis area is the Roaring Lion, Judd, Gold, Camas and Lost Horse 6th-level watersheds, including both Bitterroot National Forest and private lands. Cumulative effects discussion considers the direct and indirect effects from past, present and foreseeable future thinning, road system management, road use and prescribed fire discussed above, in context of existing conditions and watershed sensitivity.

Field surveys and MDEQ databases suggest that water quality in the assessment area meets all beneficial uses assigned by the state. No unusual sediment sources or deposits were found during stream surveys, and road surveys suggest only minor drainage issues. Local streams support cold water fish and appropriate invertebrate species. It is therefore likely past project effects, if any, have decreased with time and the overall cumulative effects level is sufficiently low to support good water quality.

Analysis indicates the potential for direct or indirect effects on water quality and water yield are minor and unlikely to change the beneficial uses attainment. The proposed timber harvest, thinning, prescribed fire, and road activities are designed to protect water resources (Table 2-4, Appendix A) and would affect only small proportions of each watershed (Table 3-39). Proposed road decommissioning and maintenance activities will remedy the sediment sources found during project surveys. The good existing condition of analysis area watersheds and the minimal potential for proposed activities to directly or indirectly affect water resources, indicate that cumulative effects are unlikely.

The Ward Mountain fire burned less than 750 acres in the headwaters of Judd Creek in 1994 and is fully revegetated. No other wildfires larger than 100 acres have occurred in the analysis area over the past 20-30 years. Timber sale activity has been minimal. In 2003 the Hayes Creek fuels reduction project used timber harvest, non-commercial thinning, and prescribed burning to reduce fire hazard on 700 acres of the Moose and Hayes Creek watersheds. This project left fully stocked stands with low potential for water yield increases. Widespread mature forest cover and few recent timber sales or wildfires suggest there is insufficient management-related water yield increase to adversely impact water resources.

The Como Forest Health project, which started operations in October 2015 has thinning treatments scheduled in Lost Horse Creek watershed. Less than one percent of this large, mostly unmanaged drainage will be treated in the Como Forest Health project, suggesting negligible cumulative effect from that project in the Lost Horse Creek watershed.

Low-elevation ponderosa pine/Douglas-fir (VRU1/VRU2) forest dominates the project area. This forest type has a frequent fire return interval that reduces competition between trees, recycles nutrients, and maintains the open, forested savanna characteristics. There are no recent incidents where a prescribed fire has killed large (> 100 acres) portions of forest in the analysis area. Therefore, we expect water yield or sediment increases from prescribed fire would be negligible. Low-intensity fires generally benefit watershed condition by thinning forest stands, reducing moisture stress, and increasing vigor of remaining trees and shrubs. Prescribed fire also reduces fuel buildup, decreasing the risk of high intensity fire.

Private Lands

The Roaring Lion, Judd, Gold, Camas, and Lost Horse watersheds have a mix of private and Federal lands. Only small portions of the private lands in the analysis area has been harvested in the past 20 years. Forest management activities on private land would increase soil moisture slightly but not enough to increase streamflows because of the low annual precipitation at this elevation and at least partial retention of forest canopy. Private land water management in the analysis area generally depletes in-channel flows of all analysis area streams for agricultural uses such as hay field irrigation and stock watering, which causes channels to decrease in size and capacity. In late summer, only Lost Horse tends to connect to the Bitterroot River, but streamflow is minimal and fish habitat suffers from low water issues. Beneficial uses for agriculture are fulfilled but cold water fisheries and aquatic life uses are reduced downstream of the forest boundary.

Other than flow depletion, there are no known activities proposed on private land that would substantially change the cumulative effects on water resources. We expect ranching activities to continue on most of the private land and minor increases in residential development over the next 20 years.

Summary of Alternative 2

- Thinned areas would have reduced tree density and moisture stress on remaining trees. There is negligible potential for water yield increases due to low annual precipitation and forest cover remaining after treatments. As in the No-action alternative, natural disturbances may affect the amount of forest cover and soil moisture, and therefore, water yield.
- Roads would continue to contribute small amounts of sediment to streams at several crossings under the action alternative, and proposed timber hauling is likely to produce minor increases for the duration of the sale. Road improvements included in the project would reduce sediment contribution to the practical minimum as long as they are maintained, with the potential to provide long-term benefits. Re-routing traffic on the Old Mine Road (NFSR5290) and obliterating the decommissioned segment would substantially reduce sediment to Moose Creek.
- Predicting future fire effects is difficult, as fire may be either beneficial or detrimental to watershed health and water quality depending on its characteristics. Implementing the action alternative would reduce the current risk of high-intensity wildfire within the thinned areas for the next 10 – 20 years. Risk would slowly increase if fuels are allowed to increase, but may be maintained at a relatively lower level if prescribed fire is used in

the future. Areas not treated by this project would continue to increase in fire risk as fuels increase.

- Wetlands and floodplains would continue in their current condition and trends. Beneficial uses would continue to be supported, and may be improved in some stream reaches (see no. 2, above). BMPs and other protective measures would keep water resource effects at minor levels.
- Land use on the private portions of the analysis area watersheds would continue on current trends, along with the associated effects.

Fish and Other Aquatic Animals

Good quality native fish habitat is cold, clean, connected, and complex (Montana DNRC 2005). These quality criteria provide a solid basis for evaluating the effects of projects on native fish. These habitat criteria are defined as follows:

- Native fish need cold water. Projects that affect the amount of shade along streams or the amount of water in streams can affect native fish.
- Native fish require clean water and substrates, particularly for rearing and spawning.
- Habitat that is connected at multiple scales (ranging from very small streams to large rivers) is important to allow distribution of populations and access to habitats for various life stages.
- Habitat complexity provides space for many aquatic species and their life stages. In the Westside project area, habitat complexity is related to the amount of large wood that accumulates in channels and floodplains. Habitat complexity in this area is also related to maintaining the natural variability in channel types and floodplains. Floodplains in the Westside project area are generally very narrow and confined.

Biological factors such as interactions with non-native species like brook trout, and invasive aquatic plant and invertebrate species also affect aquatic habitat quality.

Affected Environment

Fisheries

The Westside Collaborative Vegetation Management analysis area is home to bull trout (*Salvelinus confluentus*), a threatened species, and westslope cutthroat trout (*Oncorhynchus clarki lewisi*), a sensitive species. Roaring Lion, Lost Horse, Hayes, Camas, Gold, and Judd Creeks are the fish-bearing streams in the project area. All of these streams eventually flow into the Bitterroot River.

Bull trout inhabit the two largest streams, Lost Horse and Roaring Lion Creek, and the Bitterroot River. Lost Horse and the Bitterroot River are listed as bull trout critical habitat. Both of these streams have brook trout that compromise the genetic purity of the populations in these streams. Bull trout are currently common in a short mid-elevation reach of Lost Horse Creek, and rare in lower Lost Horse Creek, and Roaring Lion Creek (MT FWP 2012; Bahn 2007).

Fluvial native trout, bull trout and cutthroat trout, migrate from the Bitterroot River to spawn in some Bitterroot tributaries. They are considered rare in Lost Horse and Roaring Lion creeks, and absent from portions of the smaller streams on the Bitterroot National Forest. Migratory fish provide for genetic exchange and re-establishment of populations should catastrophic events occur. A decline in these valuable large-bodied migratory forms of native trout decreases the long-term viability of the remaining resident life forms.

The migratory native trout are far below their historical levels in the Lost Horse Creek drainage (Bahn 2007, USDA Forest Service 2013), and are presumed to be rare in Lost Horse and Roaring Lion creeks. Potential reasons for low numbers of migratory native trout include:

- High water temperatures in summer that may form thermal barriers or cause mortality in Lost Horse and Roaring Lion creeks
- Predominance of non-native brook trout in Roaring Lion Creek and lower Lost Horse Creek, and the increasing number of brown trout in the lower reaches of these streams
- Nearly complete stream dewatering in lower Lost Horse and Roaring Lion creeks, and
- Anchor ice that forms along the channel bottom sealing-off winter habitat. Streams most susceptible to this are wide, shallow, and lack a forest canopy (such as: lower Lost Horse and lower Roaring Lion creeks).

Westslope cutthroat trout inhabit all the fish bearing streams. Data suggests that Hayes, Gold, Judd and Roaring Lion, contain genetically pure populations. Lost Horse and Camas populations are hybridized with Yellowstone cutthroat trout (from Lost Horse Lake) or rainbow trout (from Fish Lake). Brown trout appear to be increasing and more common. Brown trout do not hybridize with the native fish, but prey upon them and compete with them for food and space.

Other native fish species known to occur in the Lost Horse and Roaring Lion Creek include largescale sucker (*Catostomus macrocheilus*) and slimy sculpin (*Cottus cognatus*). Surveys that included searching for Western pearlshell mussel, a native invertebrate that is listed as sensitive, have not detected the species in the analysis area.

Fish Habitat

Habitat for fish and aquatic species, on the Forest, benefits from being relatively pristine in the headwater reaches and generally becomes less pristine as it flows downstream toward the Forest boundary. The streams near the Forest boundary are larger and less steep, and have potential to be productive for native fish. The habitat in the lower reaches changes from water withdrawal and historical or ongoing disturbances such as roads, trails, and tree harvest. Table 3-41 summarizes the existing condition of the four key native fish habitat characteristics on the Forest.

On private lands, the situation varies but streambanks tend to be more eroded and less shaded, and the stream reaches generally provide substantially lower quality aquatic habitat. Timber harvest, livestock grazing, agriculture (mainly hay crops), roads and housing development occur on private lands in the watersheds. Since these activities and their effects may overlap in time and space, they are included in the cumulative effects analysis.

Fire plays an important role in maintaining western forests, and in the streams running through them. The natural role and recurrence of fire has meant that native fish in the Bitterroot River drainage had to evolve adaptations to the disturbances created by fire (Sestrich 2005). Equally recognizable is the concept that aquatic populations may not be resilient to changing fires regimes resulting from changing climate.

Riparian Areas and Large Wood (Complex Habitat)

Riparian areas on the Forest are dominated by dense native vegetation, but tree stumps provide evidence of past harvest of mature trees along streams in the project area. Therefore, it is likely that past harvest of conifers led to a reduction in the number of large trees and amount of large wood that would have been in the areas streams. It is likely that past harvest, in the absence of wildfire, helped maintain some of the deciduous species in the riparian areas.

Table 3-41: Issues and Analysis Methods to Evaluate Potential Effects of the Project on Fish and Aquatic Species

ISSUE	EXISTING CONDITION ON THE NATIONAL FOREST	POTENTIAL EFFECT OF THE PROPOSED ACTION	ANALYSIS METHODS
Clean water and substrates with limited amounts of fine sediment.	Upper Lost Horse, upper Camas, Gold, Judd, and Roaring Lion creeks have relatively pristine headwaters. Hayes and some Lost Horse tributaries are relative exposed to the effects of roads.	Roads and their use could increase fine sediment levels. Use of potential pollutants such as petroleum fuels and oils, and herbicides carry some risk.	Change in road density including temporary roads The adequacy of the riparian habitat conservation area (RHCA), based on field & literature reviews Observations and measurements of erosion and sediment deposition Effectiveness of design criteria to limit risk
Cold water - optimal growth range, for WSCT1 is 10° to 17°C (Bear et al. 2005). Bull trout are usually associated with colder water	A range of temperatures (too warm to appropriately cool). Also, reduced flow volume, which is generally not under FS authority, has a strong correlation with	Very minor loss of shade in the riparian areas of small fish-less streams.	Review of stream temperature data, field and literature reviews, including the Hydrologists Specialist Report for this project.
Connected flow-paths and aquatic migration corridors within and among waterways assist long-term species persistence.	One barrier is at Hayes Creek (NFSR #496. Other barriers result from irrigation water management.	No change will occur. The NFSR #496 barrier may protect WSCT[1] from brook trout invasion. Preventing stream dewatering is not within BNF authority.	Analysis of flow alterations and barriers to aquatic species movement.
Complex habitat is required to provide the quality of habitat needed for native fish. It is related to the amount of large wood in streams, stream shape, and bank stability.	The fish-bearing portions of all the creeks in the analysis vary from natural levels of complexity (e.g. Roaring Lion and Lost Horse creeks, on the Forest) to simplified habitat (e.g. Hayes Creek).	Negligible effects from the Proposed Action. Activities in the RHCAs would be limited to existing disturbed areas, or areas and activities that would not affect channels and water quality. Examples of activities are: use of existing roads and deciduous stand treatments along non-fish bearing streams.	Assessment of the Proposed Action's effects, with special emphasis given to activities within the RHCA.

Issue	Existing Condition on the National Forest	Potential Effect of the Proposed Action	Analysis Methods
Subpopulation size and life history characteristics	Low numbers of genetically pure native fish adults. Migratory life history form of native fish is practically absent	No Change due to the proposed project.	Review of monitoring of fisheries after similar vegetation management projects.

Large wood in streams and floodplains contributes to habitat complexity by adding cover and maintains features such as pools, gravel bars, and backwater areas. It provides nutrients to streams, as well as substrate for aquatic invertebrate production (Dwire et al. 2010, Montana DNRC 2005).

Roads within the project areas' riparian zones may also affect streams. Meredith, et al. (2014) found that streams in the interior Columbia Basin that were within 100 feet of a road had 37% fewer pieces of pool-forming wood. It concludes that there was "strong evidence that the presence of roads has significantly reduced habitat conditions for salmonids" and it illustrates the need for reducing the effect of roads on streams.

Upstream of the project area, in Roaring Lion and Camas watersheds, there is little evidence of harvest or roads, and large wood and habitat complexity is in a relatively undisturbed state. Lost Horse watershed is different because road NFSR 429 parallels the main stem and accesses popular sites in the headwaters. The intensity of the impact appears to be low because extensive sampling of large wood in Lost Horse Creek in 2014 showed that it had average amounts of large wood. This was based on a comparison with sampling done in the Bitterroot's less disturbed streams (USDA Forest Service 2015).

Connectivity of Habitat

In the project area, withdrawal of stream water for irrigation complicates and modifies the stream network. This is particularly evident on the Forest near private lands and on private lands downstream of the Forest boundary. Head gates and ditches sometimes dewater streams. They may also connect streams that were not naturally connected and provide routes for fish and other species, including undesirable species, to move between watersheds that were previously inaccessible. An example is the Clauson-Kramis Ditch that connects Lost Horse Creek to Hayes Creek (Montana DNRC 1958).

Barriers are seasonally present, especially downstream of the Forest, because of stream dewatering, irrigation ditch intersections, and small diversion dams. Other types of barriers to aquatic species movements, such as undersized or overly steep culverts, are uncommon on the fish-bearing streams in the project area. A culvert on NFSR 496 in Hayes Creek creates a fish passage barriers. We are not proposing to replace this barrier because it may protect the upstream cutthroat trout from non-native brook trout invasion.

Temperature (Cold Water)

Westslope cutthroat trout appear to experience stress when temperatures in the upper Bitterroot River approach 17.7°C (64°F). Trout mortality is more commonly observed when river

temperatures exceed 21°C (70°F) (C. Clancy, personal communication 2014). Bull trout tend to require colder water than westslope cutthroat trout.

Records of Lost Horse Creek water temperature shows that it generally increases in the downstream direction, including the area from the Forest boundary to the mouth at the Bitterroot River. Lost Horse watershed is somewhat different because Twin Lakes, a managed reservoir in the headwaters, releases water seasonally and causes unnatural water temperature changes, especially in the upper half of the drainage.

Stream temperatures in the private land section of Lost Horse Creek were surveyed with thermal infrared digital imagery in 2004 (MT DEQ 2011). The upper end of the private land reach was 17.4°C and the temperature downstream was 21.6°C. This is a dramatic increase of 4.2°C in 5.2 miles. However, the temperature on this section of stream was not constant. Cool side channels and ground water likely create pockets of cooler water that may be refuges for native fish.

In 2015, temperatures in the three largest streams were recorded near the Forest boundary. Lost Horse (river mile (rm) 5.4) and Camas (rm 2.5) creeks temperatures appear to be similar. The temperature in Roaring Lion Creek tends to be cooler at rm 3.3 (Figure 3-19). Lost Horse (rm 5.4) reached a 7-day mean maximum of 66°F (18.8°C), and had a maximum temperature of 69°F (20.8°C) on August 14th. Based on these temperatures and the correlation of temperatures shown in Figure 3-19, the maximum temperatures in Roaring Lion would be a couple of degrees cooler and Camas Creek is estimated to be similar to Lost Horse (Table 3-42).

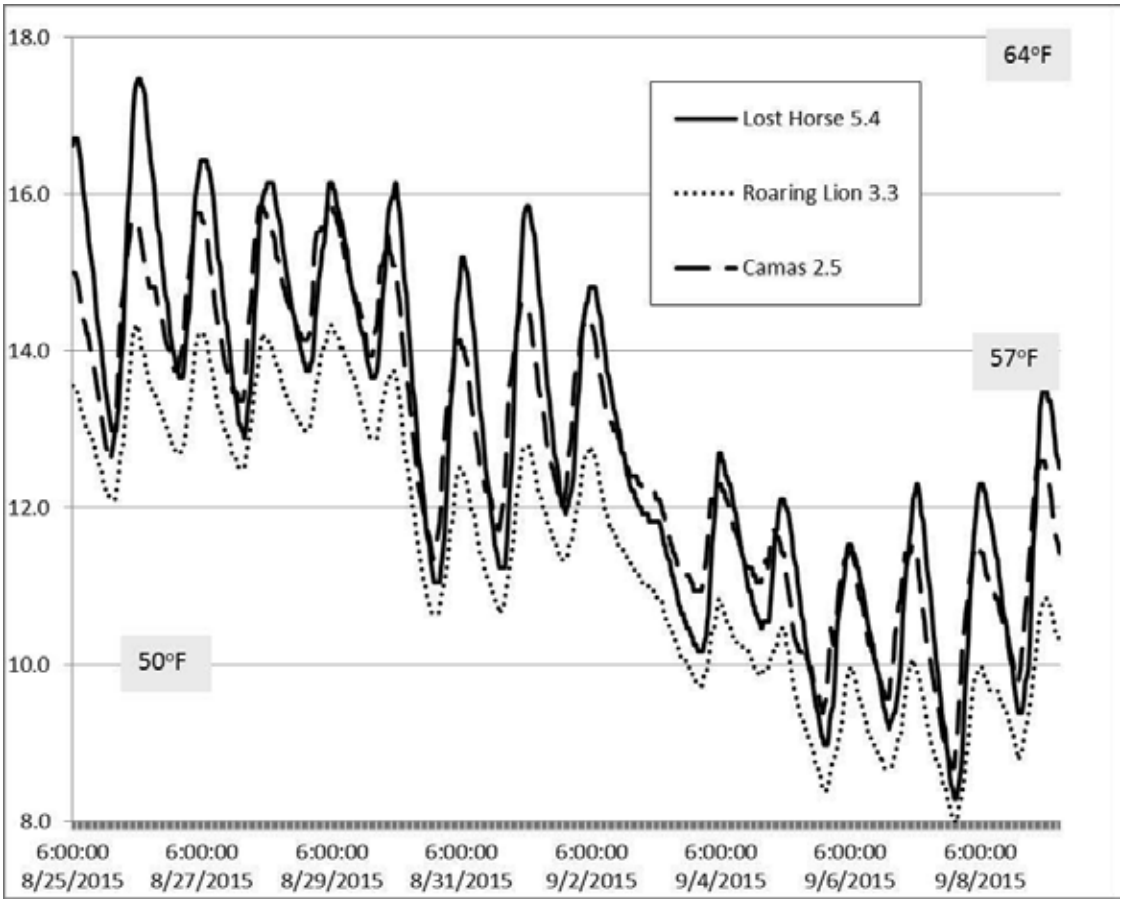

Figure 3-19 : Late summers stream temperatures in the analysis area's three larger streams.

Sediment (Clean Habitat)

The hydrologist report summarizes the geology, vegetation and the characteristics of road crossings at streams in the analysis area. The conclusion is that existing roads in the area currently have an effect on sediment accumulation in Hayes and Moose Creek. Moose Creek is a fishless tributary of Lost Horse Creek. Cutthroat trout inhabit Hayes Creek.

Embeddedness, a measure of the sediment in the streams substrate, was sampled and noted as being extremely low in Roaring Lion, Camas, and Lost Horse Creeks. The low amount of fine sediment is beneficial to native fish because it improves egg survival, and provides inter-gravel hiding cover for juveniles and their macroinvertebrate prey. The low amount of fine sediment in the project area's major fish-bearing streams is likely related to the geology of the area and low road density.

Riparian Management Objectives

INFISH defined four riparian management objectives (RMOs) for fish habitat in forested ecosystems: pool frequency, water temperature, large woody debris, and width to depth ratio. The RMOs provide criteria for the larger streams and rivers (3rd to 6th order) to measure progress toward attainment of riparian goals (Table 3-42).

Lost Horse Creek exceeds the INFISH RMOs for large wood but does not meet the RMO for pool frequency, water temperature, and width to depth ratio.

Camas Creek does not meet the INFISH RMOs for pool frequency, water temperature, and width to depth ratio. The amount of large wood varies; near the National Forest boundary, Camas Creek is on the low end of the objective for large wood. Near the upper end of the project area, the habitat is less disturbed and has more large wood.

Table 3-42: Riparian Management Objectives and the existing condition of the three major streams in the analysis area.

Watershed	Pool Frequency (Pools per mile)		Water Temperature (°F)		Large Wood (Pieces per mile)		Width : Depth	
	RMO	Existing Condition	RMO	Existing Condition	RMO	Existing Condition	RMO	Existing Condition
Lost Horse Creek	26	14 (low)	<59	66 (High)	>20	77(Meets)	<10	28 (High)
Camas Creek	96	50-60 (low)	<48	66 (est.) (High)	>20	20 to 80 (Meets)	<10	20(High)
Roaring Lion Creek	26	>26 (Meets)	<59	64 (est.) (High))	>20	Low	<10	High

Lower Roaring Lion Creek, at the northern project boundary, has low amounts of large wood. However, this segment is steep and contains large boulders. The steep gradient tends to produce water velocities that move large wood from the segment, and the boulders provide the habitat complexity and many pools. Roaring Lion is the coldest of the three larger streams, but is still warmer than the INFISH objective.

Surveys of lower Roaring Lion Creek and Camas creek, which are the segments in the project area, were complicated by the presence of private land. The private lands within National Forest

have different management goals and objectives, but affect National Forest and stream segments downstream.

RMOs were assessed by:

- Snorkel surveys of lower Roaring Lion Creek (2015), Lost Horse (2006 and 2012).
- Large wood survey of Lost Horse Creek (2014)
- Water temperature data loggers (2015)
- Habitat Data Surveys – Camas Creek (2014); Lost Horse Creek (1995)
- Notes and photos collected during electrofishing and RHCA reconnaissance

Environmental Consequences

The effects discussion assumes that appropriate BMPs, design features, and mitigation measures for timber harvest and roads will be implemented for the action alternative. Monitoring of design features and BMPs found that effects of harvest are generally within analysis predictions, with minor, localized exceptions (Monitoring Item 22, Forest Plan Monitoring Reports: 2004, pg. 90; 2006 pg.76; 2008, pgs. 80-85; USDA Forest Service 2004, 2006, and 2008).

To provide a broad view of the analysis area attributes, the watershed area in the project area is compared to the watershed area (Table 3-36). This analysis shows that 30% or more of the Judd, Gold, Camas, and Hayes creek watersheds are in the project area and less than one percent is in Wilderness. This means the streams are more susceptible to the effects of proposed activities. The proposed activities in Gold and Judd creek watersheds are limited to non-commercial activities: non-commercial thinning, prescribed fires, and noxious weed control. Hayes Creek has the most potential for effects because 60% of the watershed is in the project area, and activities would include road construction and maintenance, and commercial harvest. There are no wilderness headwaters to buffer the effects. Camas Creek includes similar activities as Hayes Creek, but is less roaded than Hayes Creek and has 30% of its watershed in the project area.

In contrast, the larger watersheds of Lost Horse and Roaring Lion have less than 5% of their watershed in the project area and have 26% and 83% of their watershed in Wilderness, respectively.

Methodology

The aquatic habitat analysis area extends from Lost Horse Creek on the south boundary to Roaring Lion Creek to the north boundary. Other fish bearing streams within this area include Hayes, Camas, Gold, and Judd creeks. All of these streams eventually flow into the Bitterroot River (Fig. 3-18). The flow paths in these watersheds have been complicated and modified by ditches and channelization, particularly on private lands downstream of the Forest boundary.

The analysis area includes six subwatersheds that are potentially affected by the project, and the Bitterroot River that connects the subwatersheds. The analysis area boundary did not follow the often-used Hydrologic Unit boundaries because the Camas/Gold Creek unit (HUC 170102050807) includes area outside the watersheds (as far away as Lick Creek). Using the larger and unaffected area of the HUC would dilute the project effects.

Analysis methods include measuring the change in road density, assessing the adequacy of the RHCA, field observations and measurements of erosion, sediment deposition, and stream temperatures, and assessing the effectiveness of design criteria to limit risk. These analyses include field and literature reviews (including monitoring reports of similar projects), and using knowledge of other interdisciplinary team members and their reports. The duration of effects is estimated as:

- short term: 0 to 2 years
- mid-term: 3 to 10 years
- long-term: 10 years or longer.

Analysis of the road effects emphasized road segments within 100 feet of streams. There was also an overview of roads within 300 feet of streams to account for the larger distances that sediment has been measured to travel from roads. Using 100 feet highlights the segments that are most likely to affect streams (PF-FISH-015) because it avoids including distant road segments that are much less likely to contribute effects to streams (Elliot et al. 2000).

Alternative 1

Direct and Indirect Effects

There are no direct effects from the No Action Alternative (Alternative 1). Overall, indirect effects of the Alternative 1 are negligible. There is a potential for minor negative effects from Alternative 1 because it maintains the risk of insect outbreaks or severe fire. This potential is unquantified because the effects of not managing are not clear. Microclimates in the riparian areas differ from the drier uplands, and the riparian areas vary in their shape, sun exposure, and vegetation types. The riparian areas have different fire frequencies complicating the accuracy of predicting longer term consequences from thinning or fuel treatment (Six and Skov 2009; McIver et al. 2013).

Regardless of the alternative chosen, only a small portion of the analysis area would be thinned, and much of the assessment area would retain the current risk for high-severity fire. Therefore, in the short term it is unlikely that foregoing the thinning treatments would impact the characteristics of riparian vegetation to the extent of negatively affecting aquatic species.

Foregoing removal of conifer trees in the aspen stand may lead to a reduction in the diversity of the riparian aspen habitat. Leaving conifers in aspen habitat may retard attainment of Riparian Goal (5) in INFISH (1995) that is to restore the diversity and productivity of native and desired non-native plant communities in riparian zones.

Severe fire may decrease water quality and quantity large enough to cause fish mortality if the fire is followed by extreme storms (Burton 2005, Wondzell and King 2003). The No Action Alternative creates minor negative effects by maintaining the probability of severe fire.

Cumulative Effects

The cumulative effects analysis area for aquatic species includes public and private lands within the analysis area watersheds and the section of the Bitterroot River that connects these tributaries (Fig. 3-18). Since these activities and their effects may overlap in time and space, they are included in the cumulative effects analysis.

There would be no cumulative effects associated with the No-Action alternative.

Alternative 2

Direct and Indirect Effects

There would be minor and short-term effects on the quality or quantity of aquatic habitat from the proposed non-commercial thinning and commercial harvest. The effects would be at a small site-specific scale. Potentially negative effects, such as increases in the amount of fine sediment reaching aquatic habitat would be minor because BMPs would be applied during harvest. The BMPs limit the potential for soils to move toward streams and wetlands and reduce the potential for road-related sediment to enter streams. The treatments would improve the long-term

survival of the large, ecologically valuable conifers, and promote vegetation diversity in the deciduous stands.

Commercial Harvest

Most of the commercial harvest would occur outside the RHCAs. There are a few exceptions with commercial harvest from deciduous stands in RHCAs. These RHCAs are in non-fish bearing drainages and the reduction of shade would be minor and return to the existing condition in three to four years (Jones et al. 2005). The INFISH (1995) standard TM-1(b) allows silvicultural treatment to achieve Riparian Management Objectives (RMOs) (INFISH 1995; p. A-4). Tree thinning is proposed in the RHCAs to maintain long-term riparian ecosystem integrity.

Commercial harvest of ponderosa pine would require the use of a borate compound to prevent the spread of annosus root disease. Exposure scenarios of the EPA-listed antimicrobial indicate that aquatic animals and plants are not affected by the compound at the levels applied (USDA Forest Service 2006).

Non-commercial Thinning

Non-commercial thinning units would include a portion of RHCAs when thinning is likely to assist in attaining riparian management objectives (RMOs; INFISH 1995). Thinning would occur within 50 feet of wet areas when it would improve the diversity of the ecosystem, tree growth, and resistance to fire, insects, and diseases. Tree thinning may improve water availability more predictably than without treatment (Luce et al. 2012).

Deciduous Stand Treatments

Approximately 92 acres of aspen stands would be treated by removing the conifers. Of these 92 acres, about 42 acres are in RHCAs of non-fish-bearing streams. These treatments would not affect native fish because they are far from fish-bearing streams. It is unlikely that any sediment produced by soil disturbance in these areas would reach tributaries that would flush the sediment into fish-bearing streams. The effect on water temperature would also be negligible because of the distance to fish-bearing streams and the rapid growth response of the deciduous vegetation to the increased light. The deciduous vegetation may take one or two growing seasons to shade the tributaries to the same level as the existing vegetation. Aspen treatment in uplands would have no effect on aquatic habitat.

Prescribed Fire

Prescribed fire is planned and controlled to retain specific vegetation characteristics and is not expected to adversely affect aquatic species or their habitats. No adverse effects are expected from the proposed prescribed fire in the short-term. Field observation on the Bitterroot National Forest indicates there is very low risk of fire escaping control and the prescribed fires have superficial short-term effects on the issues listed in Table 3-41. The mid- to long-term effects of prescribed fires would likely be slightly beneficial. Prescribed fires tend to lower the probability of severe fire

Fire lines would not occur in RHCAs. In and near the RHCAs, prescribed fires would be controlled by lighting technique, timing with weather conditions, and using water (hose-lines and pumps). Hand ignition is allowed in the RHCAs but not in wetlands; though fire is allowed to burn into wetlands. The effect of using water to control fire spread is slight because of the amount of water required, season of use (prescribed fires are not used in drought periods), and the standard operating procedures of pump and water use during prescribed fires.

Riparian areas frequently differ from adjacent uplands in vegetative composition and structure, geomorphology, hydrology, microclimate, and fuel characteristics that often contribute to lower

severity burns. Riparian and aquatic ecosystem adaptations to fire moderate the effects of fire. Forest fisheries biologists and hydrologists monitored prescribed burns on the Forest (USDA Forest Service 2008: pgs. 67-68) and found that most of the RHCA areas in prescribed fire units do not burn during the fires, and where fire does burn, it tends to burn at low severity in a spotty pattern. These factors likely contribute to the lack of effect on native trout abundance in streams disturbed by fire (Valdal and Quinn 2010).

Roads

Another emphasis area of INFISH is to manage road infrastructure to avoid adverse effects on native fish. The ID Team conducted a Minimum Road System Risk- Benefit Analysis that highlighted NFSR 5620, the Moose Creek Road, as having moderate adverse effects on aquatic species. The lower 0.6 mile of this road would be decommissioned and recontoured. A segment of road (0.1 mile) would be added to the system to reconnect the upper NFSR 5620 with 496. This new segment is in an upland location.

Road-related activities proposed in Alternative 2 have the potential to affect aquatic habitat in positive and negative ways. The condition of the road surfaces and associated drainage features along the road prism, and the amount of traffic on a road, influences the amount of sediment generated. Maintenance retains the shape and drainage features in a road. Relative to poorly maintained roads, adequate maintenance of moderately and heavily used roads can reduce long-term sediment production (Burroughs and King 1989). Conversely, road surface maintenance can cause short-term, accelerated erosion from water handling structures, especially roadside ditches. This is because maintenance often loosens the road surface exposing fine particles to erosion. Frequent maintenance can cause chronic sediment contributions to streams, particularly where there are pathways from road features to stream channels.

Road density was used to assess the effect of road maintenance on aquatic habitat. Generally, road densities in the project area are low, less than 1 mile per square mile (mi/mi^2). The exception is Hayes Creek, which is 1.9 mi/mi^2. Alternative 2 would decrease road density by 0.4 miles per square mile in Camas Creek drainage, 0.1 in Gold Creek drainage, and negligible amounts in the other subwatersheds. The change from 1.9 to 1.23 in Hayes Creek has the potential to have a long-term minor positive effect.

Alternative 2 would be unlikely to change to the erosion rate, size and proximity of existing roads to the magnitude that there would be measurable effects on aquatic habitats. The effect of proposed road activities on the aquatic species and habitat are based on field observations of the existing condition of roads, road proximity to aquatic habitat, road grade, treatments prescribed, and the predicted amount of future use. Road densities (Table 3-43) suggests that cumulatively and over the long-term, proposed road management would not appreciably change aquatic habitat in the analysis area.

The amount of log hauling determines the amount of road maintenance required. Alternative 2 would produce 6.3 mmbf and that equates to approximately 1400 truckloads (4.5 mbf/truck). From a water quality perspective, the main haul routes are stable, reasonably well maintained. The loads would be divided between the routes of:

- Camas Creek Loop (Hayes Creek Road – NFSR 74967 and Blue Jay Lane – NFSR 74964)
- Lost Horse Road (NFSR 429 to NFSR 496), and to a lesser degree
- Roaring Lion Road (NFSR 701)

Table 3-43: Changes in Road Density by Alternative and by Drainage

WATERSHED	ROAD DENSITY (MILES/ SQUARE MILE)		
	NO ACTION	PROPOSED ACTION	CHANGE
Roaring Lion	0.06	0.06	0
Judd	0	0	0
Gold	0	0.10	+0.10
Camas	.52	0.92	+0.40
Hayes	1.90	1.23	-0.67
Lost Horse	0.51	0.48	0.03

It is difficult to predict the effects of road traffic on erosion and therefore streams. It varies due to differences in traffic intensity, weather (precipitation duration and intensity, or lack of precipitation), differences in road materials (gravel and binder quality and depth), or how well the road sheds water. That is related to the road's shape (such as its crown), grade, length, surface area, and degree of rutting. Consistent road maintenance and restrictions on road use while the road is too wet or dry, minimize the effects of traffic on roads and the effect to aquatic habitat (Sheridan et al. 2006).

The number of stream crossings of roads in analysis area is important because they are points where sediment in more likely to reach a stream (Table 3-40). Stream crossings are often on curved sections where the road follows the contour. Fine road materials detached from roads by trucks is higher on curved sections of road. The torque applied to the road surface by the vehicles' tires is greater while the vehicle is changing direction (Sheridan et al. 2006). This can be observed in the field by looking for an accumulation of loose road surface material on sharp corners.

Analyses of road crossings and road proximity to streams support the conclusion that proposed road management would not appreciably change aquatic habitat in the analysis area. The analysis using 100-foot corridor and 300-foot corridors both show there are only minor changes to the amount of proposed roads along streams (Table 3-38).

With the quality and maintenance levels expected for the forest roads in the area during the implementation of Alternative 2, the level of truck traffic has the potential to increase the sediment concentration of water discharging from the roads. Although traffic is discouraged during snowmelt and runoff events, there are periods when operators push the limits of the design criteria. The result can be wheel ruts that channelize water, inhibit lateral drainage of the road profile, and cause accelerated erosion of the road surface (USDA Forest Service 2012).

The effect of log hauling on National Forest would be difficult to observe or measure in Lost Horse and Roaring Lion subwatersheds because the road is beyond 300 feet from the main channel and the topography between the road and the creek is relatively flat. The effect of log-hauling would be measureable near NFSR 496 in Hayes Creek because of existing road crossing conditions and areas downstream of the cross-drains where fine sediment is visible. This area drains towards Hayes Creek. There would be no log-haul in Judd or Gold creek watersheds. The only points where log-haul would affect Camas Creek would be near the proposed bridge, and an intermittent crossing of Coyote Coulee.

Fixing the road-related fish barrier in the project area is not proposed in this alternative. The Hayes Creek crossing of NFSR 496 is a fish passage barrier, but may prevent brook trout movement into the upper reach. Therefore, this is a low priority culvert for replacement on the Forest.

Specified Road Construction

The only segment of new system road that could directly affect aquatic habitat is the 1.6-mile segment with a bridge over Camas Creek and a crossing over an intermittent portion of Coyote Coulee (Table 3-44). Minor amounts of sediment would be contributed for about 2 years until the vegetation around the crossings recovers. There would be no substantial direct effect on extensive wet areas or measurable effects on fish habitat. The basis for this conclusion is most of the specified road is outside the RHCA, the distance of the site conditions at the planned crossings, and the proposed design and construction of adequate road drainage on the crossing approaches.

Indirect effects of roads are that they get used as access to firewood cutting, trash dumping, and illegal cross-country travel. Even though there is a Forest-wide prohibition against cutting firewood within 150 feet of waterways, it happens. This indirect effect would be limited in time because the new system roads would be placed in storage at the conclusion of the project.

Table 3-44: Relative effects of new specified roads in the Westside Project Area

MILES	UNITS ACCESSED	POSITIVE OR NEGATIVE FEATURES
1.6	Commercial Unit 2c Noncommercial Unit 39	(-) One intermittent crossing at Coyote Coulee (-) Moderately steep grade
1.9	Commercial Units 2a, 2b, Noncommercial Units 23 and 36, 37	(-) Crossing of Camas Creek: Bridge. (-) Crossing one ephemeral drainage and one intermittent channel (Zig Creek)
0.1	Connects NFSR #496 and #5620	(+) Needed to decommission 0.6 miles of 5620, (+) Avoids channel crossings, (-) Moderately steep grade.

Temporary Road Construction and Rehabilitation

The potential for detrimental effects from the proposed temporary road segments is very low because the road segments are located outside of the RHCAs and not in areas prone to soil mass movement (PF-FISH-015). They are located on previously disturbed areas such as old roadbeds and would be rehabilitated at the end of the project. Therefore, the potential these road segments would contribute sediment to streams is very low.

Forest fisheries biologists and hydrologists monitored four temporary roads in the 2001 Burned Area Recovery project that were constructed on uplands outside of RHCAs, and recontoured after use. Sediment did not move more than a few feet off the road shoulders, and there was no sediment delivery to streams (USDA Forest Service, 2006: pg. 82).

Road Decommissioning and Storage Treatments

Although difficult to measure at the watershed scale, the sediment reductions that occur slowly over time from road decommissioning and storage would slightly improve habitat for native trout and westslope cutthroat trout over the long-term. Road densities are well document as contributing to reduced productivity of trout streams. Recent studies also reinforce the conclusion that the potential for negative effects on trout abundance is a function of road

density in the near-stream zone and not simply road density in the watershed (Valdal and Quinn 2010). In Alternative 2, there would be no substantial change to road densities in the near stream zone (Table 3-38).

Monitoring data, literature, and model predictions, support the prediction that decommissioning and storing roads in Alternative 2 may contribute small amounts of sediment to streams in the immediate vicinity of culvert removals and recontoured road fills near streams. The ephemeral channel or dry swale locations of the culverts removed in Alternative 2 prevent sediment from entering fish habitat.

Cumulative Effects

The incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future actions, would not collectively result in significant actions taking place during the foreseeable future. The effect of actions on private lands, are variable as evidenced by stream conditions. The conditions are variable, but in general, activities have and will continue to cause more eroded and less shaded streambanks, and the stream reaches with substantially lower aquatic habitat quality. Private lands are downstream of the Forest and extend to the Bitterroot River. From the aquatic habitat view, the most important effect of private land management is the management of water and the streamside vegetation. Private land water management generally depletes and degrades in-channel flows in favor of agricultural uses such as hay field and pasture irrigation, and stock watering. Channelization of streams to keep them from meandering simplifies the channel and exposes it to sun and anchor ice.

The timber on private lands within the analysis area has been partially harvested in the past several years. Early twentieth century harvest in the uplands on the private land had an effect on streams because of a disregard for riparian areas and streams. Since 1993, timber harvest in Montana is regulated by the Stream Management Zone Law and harvest has much less impact on streams. However, cutting trees near streams (for firewood or other reasons) and livestock grazing and watering continue to degrade aquatic habitat.

Soils

Affected Environment

The landscape of the project area consists of tertiary stream terraces, alluvial fan remnants, at the base of the Bitterroot front. Steep mountain slopes and remnant glacial moraines comprise the remainder of the project area. Slope gradients on the stream terraces and alluvial fan remnants are typically very gentle (less than 20 percent gradient). Soils are moderately deep (40 – 60 inches) and have loamy texture. The majority of these areas are well suited for ground-based yarding of timber.

Treatment units located on mountain slopes tend to be steeper with slope gradients ranging up to 40 percent and greater in some locations. Mountain slopes are moderately incised with major drainages occurring every ¼ to ½ mile from north to south. Ground-based yarding is less feasible but locations such as ridgelines present some opportunities. Most of the treatment units on steep mountain slopes are suited only for skyline yarding. Soils on mountain slopes tend to be less developed and are moderately deep (40 – 60 inches) and have loamy texture with high coarse fragment content. Soil properties for the treatment units are included in PF-SOILS-003.

Design features (Chapter 2) are prescribed for ground-based yarding to reduce potential effects on soil productivity. All proposed commercial thinning treatments would be implemented under timber contract provisions, which include soil and water resource protections listed in Montana BMPs for timber harvest and the Soil and Water Conservation Practices (SWCPs) (FSH 2509.22).

Soil textures in the Westside project area are dominantly coarse textured with some soils having some finer textured silt loam horizons. Coarse fragment content of these soils is high in most areas due to soil development from unconsolidated glacial deposits (PF-SOILS-004).

Evidence of past ground-based operations, primarily from old skid trails, was noted in several units with root limiting soil compaction. Past displacement of organic horizons has recovered naturally in some locations with the development of duff and surface organic horizons. In some cases, organic horizons and duff on the old skid trails resembled that of adjacent undisturbed areas.

The most disturbances from past skidding were noted in Unit 3e. Ground-based winter yarding or skyline harvest is proposed to minimize the amount of cumulative soil disturbance in this unit.

Environmental Consequences

Methodology

The analysis area for soils encompasses all land within individual treatment units. In general, soils outside treatment unit boundaries (activity areas) are not expected to be directly, indirectly, or cumulatively affected by this proposal (no harvest or post-harvest equipment will operate off system roads outside the unit boundaries).

Sources of information used in the description of soil resources include:

- Field assessment of existing soil conditions in proposed treatment units conducted by a professional journey level soil scientist.
- Soils within the analysis area have been mapped and are described in the Bitterroot National Forest Land System Inventory (NRCS soil survey).

Westside proposed treatment units were assessed by field reviews using walkthrough surveys and traverses. Satellite image interpretation and GIS data analyses assisted in the assessment and refined the soils field review. Soil surveys followed Regional and Forest survey protocols and guidance (PF-SOILS-002). Soil assessment in the field was based upon a number of factors, including:

- Potential for ground-based harvest and yarding activities as a function of slope gradient. Currently, the Bitterroot Forest Plan does not allow for ground-based yarding on slopes steeper than 40 percent. To further minimize disturbances, ground-based yarding operations on the Bitterroot National Forest are generally restricted to slopes less than 35 percent.
- Potential for proposed treatments to cause detrimental disturbances on the soil types in the area. Ground-based yarding typically incurs some of the highest soil disturbance of forest management activities whereas maintenance and prescribed burning treatments are typically of low severity and have a low risk of affecting soil quality.

Alternative 1

Direct and Indirect Effects

Soil Productivity

The Alternative 1 would not alter the current soil erosion and mass wasting regimes in the project area. Natural and human caused wildfires will likely continue to affect the project area and cause consumption of the protective layer of litter and duff on the soil surface (PF-SOILS-007).

The Soil Scientist did not identify Indicators of slope instability during field surveys. The gentle to moderate slope gradients also reduce the potential slope failure in the event of high severity wildfire. Loss of productive organic horizons through fire consumption and subsequent erosion would be of greater importance for soil productivity than mass wasting in the project area.

Organic Matter, Groundcover and Coarse Woody Material

In absence of high severity fire, Alternative 1 would allow all standing trees (dead and alive) to shed needles and fine branches that would accumulate on the soil surface over time. Eventually, trees would fall and provide coarse wood for decomposition into the soil. Soil organisms would slowly decompose the organic materials, adding beneficial humus to the soil. The primary source of soil organic matter is the decomposition of fine roots rather than the decomposition of surface organics (Powers et. al. 2004). Nutrients from decomposed plant material would slowly become available for plant growth. This process would continue until a major disturbance such as fire consumes or partially consumes the accumulated litter, duff, and woody material.

Long-term effects on soil health and productivity would likely to be relatively small from future fires that are within the historic range of variability (Brown et al. 2001). However, fire severity exceeding the historic range of variability could have detrimental effects on soil productivity and health through the oxidation and loss of soil organic matter and associated soil biota, as well as through accelerated rates of erosion (Harvey et al. 1987, Harvey et al. 1988, Hungerford 1995).

Nutrient Cycling

Microorganisms would continue to populate the soils, contributing towards site productivity through nutrient cycling and development of soil structure aggregates in areas of poorly developed mineral soils. The occurrence of severe fire may alter soil microbial communities by super heating mineral soils and consuming organic matter necessary for microorganism functions.

Soil Disturbance

Alternative 1 would not lead to direct detrimental soil disturbances (DSD) in the project area. However, current forest conditions across portions of the project area are at risk of bark beetle outbreaks. Not treating at risk forest may indirectly reduce soil productivity in the event of severe fire.

Alternative 2

The proposed treatment units were designed with mitigation measures to minimize loss in soil productivity or increases in soil disturbance. Furthermore, this effects analysis assumes that BMPs, Region 1 SWCPs Handbook 2509.22, and Forest Standards and Regional Guidelines will be implemented and effective. Soil technical support has been provided for all project alternatives throughout project design and planning.

Direct and Indirect Effects

Soil Productivity

The proposed thinning treatments would not affect surface stability on the gentle to moderate slope gradients across much of the project area. The risk of landslide initiation from timber harvest and thinning is very low.

Risk of mass movement from prescribed fire is also very low. Prescribed fire is typically ignited when soils are moist and weather conditions are cool and humid. Intense heating of the soil and complete consumption of organic soil horizons typically does not occur except in select cases where a log or accumulated fuel pile burns for an extended period. The probability of these small areas of disturbance altering slope stability is very low. Also, mature trees are not typically affected during prescribed burning. The rooting systems of these mature trees would remain intact to provide surface stability.

Organic Matter, Groundcover and Coarse Woody Material

Alternative 2 is designed to leave a variety of organic matter on the site. Leaving organic matter on site provides substrates for microbes to maintain site productivity (Harvey et al. 1994). Vegetation and organic matter protects the soil surface from raindrop impact, dissipates energy of overland flow, binds soil particles, and dampens soil temperature extremes and daily fluxes. Logging slash would add to effective ground cover until fine logging slash decomposes over several decades (Clayton 1981).

Any increase in groundcover or fine logging slash through harvest may be offset by fuel treatments. Prescribe fire may reduce the amount of organic matter and groundcover in the short-term (0-5 years after treatment). In the long-term (greater than 5 years), re-growth of vegetation and annual needle drop would provide groundcover and leaf and litter material necessary for soil organic matter development.

Summer Ground-based Harvest Effects

Compaction and displacement of topsoil horizons are the main soil concern with ground-based yarding in the project area. On lightly used trails (one or two passes), displacement of topsoil would be minimal. Compaction of mineral soils may occur on trails with more than two passes depending on coarse fragment content and soil depth. Proper skid trail designation and spacing will ensure soil disturbance does not exceed Region 1 soil quality standards (R1 SQS).

Coarse Woody Debris

All harvest prescriptions would leave a portion of the existing stand on the site. Coarse woody debris (material greater than 3 inches in diameter) would be available from leave trees, both standing and down, and from breakage of limbs and broken tops that occur during harvest. To the extent feasible, the largest coarse wood (snags or logs) will be left on-site to satisfy coarse woody material requirements for each treatment unit.

Currently, most of the coarse woody debris in treatment units is rotten logs that will not persist more than 10 years. Additional, sound coarse woody debris would be required in treatment units as part of the commercial and non-commercial treatments. The amounts of coarse wood listed in Table 2-4 would maintain soil productivity.

Nutrient Cycling

The proposed commercial and non-commercial treatments would leave slash on the ground through the winter and into late summer or fall before prescribed burning treatments would occur. This delay of burning the slash provides the opportunity for nutrients to leach into the soil (PF-SOILS-001).

Maintaining organic matter and ground cover on at least 85 percent of the site, as prescribed in the Alternative 2, would ensure nutrient cycling and nutrient availability would not change. The Design Features (Chapter 2) and R1 SQS are prescribed to achieve this outcome. Localized losses may occur at landings, or where severe fire occurs.

Soil Disturbance

Detrimental soil disturbance (DSD) would occur during commercial harvest in Alternative 2. Ground-based yarding operations tend to cause the largest disturbance. Temporary roads and excavated skid trails associated with commercial harvest are of particular concern.

Summer Ground-based Yarding

Summer ground-based yarding would cause about 11 percent DSD or less after treatment and will meet R1 SQS in individual units (activity areas). Ground-based yarding of Unit 3e would be required in winter to minimize DSD. Winter ground-based yarding in Unit 3e would create less than four percent DSD. Skyline yarding is also a viable option for Unit 3e (PF-SOILS-001).

Design features (Table 2-4), Montana BMPs, and SWCPs are prescribed to limit the severity of soil damage or its areal extent. The design features are also intended to expedite recovery and reduce the area of DSD on temporary roads, skid trails, and landings.

Skyline Yarding

Areas of reduced soil productivity from skyline yarding include skyline corridors, temporary roads, and landings. Design criteria and SWCPs are prescribed to limit the severity of soil damage or its areal extent. Skyline yarding would cause about nine percent DSD (PF-SOILS-001).

Temporary Roads and Rehabilitation

Soils along the entire length of temporary roads are detrimentally disturbed and are considered DSD even after rehabilitation activities. The rehabilitation treatments are intended to enhance natural recovery processes and the detrimental effects will diminish over time. The detrimental soil conditions from temporary roads may reduce soil productivity for several years until vegetation, organic matter, and hydrologic function are restored.

Rehabilitation activities include recontouring, slashing, and seeding to restore soil productivity to the extent possible. Recontouring expedites the process of vegetation and hydrologic recovery. By completing the rehabilitation activities, the detrimental soil conditions would not persist and would not be a permanent loss in soil productivity.

Landing Construction and Use

Frequent, small, roadside landings would be used for the skyline and ground-based operations. These landings would be located on the edge of existing system roads and generally within the road rights-of-way. Disturbances associated with roadside landings are typically not considered DSD since these landings are part of the forest transportation system (SOILS-001).

Landings internal to a unit (often adjacent to a temporary road) will range in size from 1/10 to 1/4 acre. Disturbances from internal landings are included in the calculations for DSD (PF-SOILS-001). Erosion controls (slashing, waterbars) and revegetation would inhibit invasive plant establishment.

Specified Road Construction

About 13 acres would be removed from the productive land base in Alternative 2 based on road clearing limits of 30 feet for specified roads.

Cumulative Effects

Alternative 2 would cause soil disturbance that overlaps in time and space with the existing soil conditions. Alternative 2 has the potential to increase soil disturbance on about 147 acres (PF-SOILS-001) for a total DSD of 193 acres. No units will exceed the R1 SQS for soil quality in Alternative 2. Areas of reduced soil productivity from proposed thinning treatments include skid trails, temporary roads, and landings. Design features (Table 2-4) and BMPs would limit the severity of soil damage and its areal extent.

Rare Plants

Affected Environment

No plants listed as threatened, endangered, or candidates for listing are found in the Westside project area and they will not discussed in this analysis. Sensitive plants are species, subspecies or varieties of plants whose populations or habitat capability have current or predicted downward trends (FSM 2670.5). Three sensitive plants are found in the project area (Table 3-45). Species of Concern are determined by the State of Montana to be rare plants or plants with declining populations; this list includes species listed as threatened, endangered, or sensitive by Federal agencies. Sensitive plants and plant Species of Concern may have a restricted range in Montana, or they may be sparsely distributed over a larger area.

The Bitterroot National Forest currently analyzes and manages for 108 sensitive plants species (USDA Forest Service 2011) and three plant species that are forest species of interest because of tribal interest in these plants. These 111 plants are known, suspected, or have potential to occur on the Bitterroot National Forest, due to habitat being present. The Forest Botanist compiled a list of rare plant species, which are known or have potential to occur in the Westside project area (PF-BOTANY-001).

Environmental Consequences

Methodology

The Forest Botanist surveyed the project area for rare and invasive plants in 2014-2015. The Montana Natural Heritage Program database, aerial photographs, and Bitterroot National Forest records were reviewed to identify known rare plant populations in or near the project area. The Forest Botanist also surveyed the project area for rare plant habitat and compiled a table of rare plants found in the project area and potential habitat (PF-BOTANY-001). The Forest Botanist prepared a Biological Evaluation based on the information available in the database and records review, and field surveys (PF-BOTANY-001).

Incomplete and Unavailable Information

Specific information about the natural history of the many threatened, endangered, or sensitive plant species are not available, so species may be found in areas outside of what is currently thought to be "suitable" habitat. Therefore, cursory surveys for plants outside their known distribution occurred during field surveys.

Alternative 1 – No Action

Direct and Indirect Effects

Alternative 1 would have no direct effects on rare plants.

Table 3-45: Sensitive Plant Species Found in the Westside Project Area and Population Information.

SENSITIVE PLANT SPECIES			
SPECIES	**COMMON NAME**	**POPULATIONS FOUND IN PROJECT AREA**	**STATUS**
Athysanus pusillus	Sandweed	6	G4/S1
There are 11 known populations found on the northern part of the Forest. The 11 populations found on the Bitterroot National Forest are the only known populations found in the state of Montana. The species is found in open full sun habitats that are vernally moist. Plants are found on open slopes on shallow soil rock outcrops. Populations found in the project area are threatened by invasive plants. At high risk because of extremely limited and/or rapidly declining population numbers, range and/or habitat, making it highly vulnerable to extirpation in the state.			
Idahoa scapigera	Scalepod	3	G5/S1
There are 10 known populations found mostly on the northern part of the Bitterroot National Forest. The only known populations of this species are found along the western portion of the state with the majority of the populations found on the Bitterroot National Forest. There is one population found near Missoula and 3 populations found near Kalispell. The species is found in full to partial sun. Plants grow in vernally moist areas on a mat of moss over bedrock. Populations found in the project area are threatened by invasive plants. At high risk because of extremely limited and/or rapidly declining population numbers, range and/or habitat, making it highly vulnerable to extirpation in the state.			
Mimulus ampliatus	Stalk-leaved monkeyflower	1	G3/S3
There are 12 known populations found on the Bitterroot National Forest. Fourteen other populations are found in western Montana. This species is found in full to partial sun. Plants occur in water seeps. The population found in the project area is in a highly disturbed area with St. John's wort. Potentially at risk because of limited and/or declining numbers, range, and/or habitat, even though it may be abundant in some areas.			

All populations of sensitive plants are threatened by invasive plants. Populations that currently have invasive plants within the population, or on the perimeter of the population, would greatly benefit from treatments to reduce or eradicate invasive plants. Invasive plants threaten the long-term viability of these species in Montana.

Populations of sensitive plants, *Athysanus pusillus, Idaho scapigera,* and *Mimulus ampliatus* occur in the non-commercial thin units. Fuel loads and forest canopy cover would be higher under Alternative 1 and competition between these plants and conifers, grasses, forbs, and shrubs would continue. These sensitive species require open areas that would be diminished as forest density increases. Individuals or populations of sensitive plants would likely decrease.

No sensitive plants were found in commercial harvest units though unoccupied rare plant habitat was found (Table 1 PF-BOTANY-001). In the event of a severe fire that damages soils and rare plant habitat, invasive plants may out-complete these rare plants.

Cumulative Effects

The extent to which rare plants and their habitat have been impacted by past management activities is unknown. More suitable, open habitat existed in the early to mid-1900s (Fig. 3, silviculture). Prior to the introduction and spread of spotted knapweed, St. John's wort, and

cheatgrass, sensitive plants and their habitats may have been more numerous. Invasive plant spread is attributed to many factors including wildlife grazing, road construction, timber harvest, recreational use, fire, and drought. The effects of these activities on sensitive plants is speculative because there is little information about their earlier populations.

Continued fire suppression with no fuel reduction activities in the Westside project area could increase the potential that a fire would be mixed to high severity. A more severe fire could contribute to further spread of spotted knapweed on drier, south and west-facing aspects and increase the spread of cheatgrass and St. John's wort.

Alternative 2 – Proposed Action

Direct and Indirect Effects

Design features applied to protect sensitive plants and unoccupied rare plant habitats in the project area would prevent direct effects on rare plants, though some unoccupied rare plant habitats may be indirectly affected. Implementation of Alternative 2 would not contribute to the listing of sensitive plants.

Non-commercial units, that are not plantation units, will retain forest overstory. In these units healthy, large ponderosa pine and Douglas-fir trees would be retained and smaller diameter trees would be removed from the understory. Hand crews will thin the units without using heavy equipment. Soil disturbance will be minimal and limit invasive plant introduction and spread. Populations of *Athysanus pusillus*, *Idahoa scapigera*, and *Mimulus ampliatus* will be buffered from non-commercial thinning to protect them from being crushed and covered with slash. Buffers would be expanded beyond the actual population in order to protect habitat for population expansion. Thinning would benefit these sensitive plant populations because they require open habitats. The silviculturist and forest botanist will designate the removal of encroaching trees to protect and enhance habitat characteristics for these plant populations.

There are no known sensitive plants in the commercial harvest units, although there is unoccupied rare plant habitat. Harvesting activities disturb soil, which increases the potential for invasive plant colonization. Design features in the Westside project (Chapter 2) would reduce the potential spread of invasive plants and competition for rare plant habitat. The design features prevent disturbance in sensitive plant habitats, revegetate disturbed areas with native plants, and reduce invasive plant populations. Buffers will not prevent established invasive plants from colonizing new sites in the buffer. Although, buffers would limit the dispersal of invasive plants within the buffers, they would not eliminate the potential for dispersal.

Prescribed fire does not require using heavy equipment because thinning and fire control lines are created using hand tools. Ground disturbance will be minimal. Excess slash will be hand piled and burned in some units. Two types of piles would occur Alternative 2, hand piles and landing piles. Hand piles are 6-8 ft. in diameter, created from small diameter slash, and scattered through the units. Landing piles are large piles at the landings created from the limbs and non-merchantable material removed from the logs before they are loaded on trucks. Landing piles would be placed in areas of past disturbance and will be seeded and fertilized after they are burned. They are priority areas for post-treatment monitoring and possible herbicide treatment. Based on past observations, hand piles and landings have a high risk for invasive plant infestations. The high intensity burning in confined areas essentially sterilizes the soil and greatly inhibits native revegetation (Hebel et al. 2009). Although invasive species are also inhibited by the lack of nutrients, they are better adapted to sterile soils. Once they are introduced, there are no natural barriers to prevent their establishment and persistence. All

units where the understory is slashed, will be reviewed by the Fuels Specialist, Silviculturist, Botanist, and Wildlife Biologist to identify whether there is excess slash that should be piled.

Underburning will occur in all non-commercial thin units. Known populations of *Athysanus pusillus*, *Idahoa scapigera*, and *Mimulus ampliatus* will be buffered from prescribed fire. These plants' habitats are very fragile and highly vulnerable to fire. Although the area was historically subject to frequent, low severity fires, these species are found on a thin layer of moss or soil over bedrock and are vulnerable to high temperatures. However, these species are found in open areas and need partial to full sun. Prescribed burning would remove small trees growing in the outer perimeter of the populations.

Understory burns would occur when the prescription objectives would be met. The reduction of conifers would benefit sensitive plants in the long-term by reducing overstory cover and maintaining open habitats.

Prescribed underburns may create areas of low to moderate intensity fire, but damage to habitat would not last long. Soils would recover from moderate to high severity fire within two to three years. There is potential for expanding invasive plant populations into these areas when opening the canopy by thinning and disturbing the ground. Fuels treatments would maintain sensitive species habitat while reducing the likelihood of moderate to high severity wildfires. If a wildfire occurs without the proposed vegetation management activities, the fire would be likely be high severity, create more bare soil, and increase the potential for invasive plant spread. Invasive plants would spread into areas where native plants are destroyed. Prescribed fires burning under cooler conditions than a wildfire would create less soil exposure and maintain native plant structures so they would be able to compete with invasive plants. The trade-off is whether to burn under controlled conditions where most of the native plant community will be left intact, or risk the occurrence of a natural fire in the hotter summer months. In either case, spotted knapweed and other invasive plants are likely to increase, but prescribed burning, would reduce the risk of spread. Prescribed fires in the Westside project area would occur under cooler conditions, which would reduce the fire severity and ground disturbance leading to invasive plant spread. As invasive plants increase and change the native plant community, the more difficult it will be to return the area to a pre-invasive fire regime (Brooks et al 2004). Though native plants may be damaged during prescribed fires, the plant communities would remain intact and out-compete invasive plants. Natural fires in untreated stands have the potential of being high severity that would cause extensive damage to rare and native plants and favor invasive plant colonization

Temporary and new road construction is not proposed in any units with rare plant populations, however, the roads cross rare plant habitats. Direct effects on unoccupied sensitive plant habitats from temporary roads, would be the removal of vegetation, removal of top soil, and soil compaction. The construction of new road template removes vegetation, often putting it to the side of the corridor where it is left to decompose. Equipment compacts the soil creating a drivable surface. Road construction removes the area from the productive land base for the life of the road and prevents the re-growth of native vegetation. Generally, temporary roads are on the landscape for the life of the project and then blocked and rehabilitated or re-contoured at the end of the project. If the road is rehabilitated by ripping and putting back the native surface or re-contouring, eventually native vegetation will grow back, if not outcompeted by invasive plants (soils report). If the road is left on the landscape without reclamation, vegetation will still grow back, but plant growth would be hindered due to soil compaction and lack of nutrition, and invasive plants will have the competitive edge in the harsher growing environment. Project

design features will eliminate some, but not all effects mentioned above. The potential for populations of new invasive species cannot be eliminated.

Cumulative Effects

No additional sources of disturbance affecting sensitive plant communities have occurred in the past or may occur in the reasonably foreseeable future. Therefore, there would be no cumulative effects on known sensitive plant populations. Regular disturbance in the project area is associated with the trail and open road system. This disturbance does not affect the sensitive plants because they are located away from these systems. Invasive plants associated with these trail and road systems are treated on a scheduled basis to prevent their spread.

Invasive Plants

Affected Environment

Invasive plant surveys of the Westside project area documented the presence of Priority 2B and Priority 3 species on the Montana Noxious Weed List. Invasive plants on the Priority 2B list are categorized as abundant and widespread in Montana. Those on the Priority 3 list are regulated but not designated as noxious or requiring treatment action. Table 3-46 summarizes the species, densities, general locations, and current or proposed treatment in the project area.

BMPs as described in FSM 2080 (pending replacement by FSM 2900) directives including off-road equipment cleaning are included in the project design features listed in Table 2-4. The design features would prevent the introduction and spreads of invasive plants.

Invasive plants are present at varying densities and composition throughout much of the project area. There are large, continuous portions of the project area landscape, mostly under a timber canopy, that have light to no presence of invasive plants. The project area presents a mosaic of invasive plant infested and uninfested vegetation cover types. St. Johnswort and spotted knapweed are the most common and widespread invasive plants in the project area, followed closely by cheatgrass.

Invasive plant populations in the project area have received chemical and biological control treatments since 2003. Herbicide treatments along roadsides and trails on the Forest have shown measureable success in the suppression and containment of invasive plants (PF–Invasives-002-010). System roadside densities of St. Johnswort in the project area have fluctuated with the treatment rotation. Currently, roadside densities are high and moderately continuous along NFSR 496 and some associated side system road as a result of two years of non-treatment in the scheduled intervals. Treatments are scheduled annually in the near term until biological (biocontrol) control agents can maintain a low density of plants.

Revegetation and rehabilitation of disturbed soils has been successful in establishing and sustaining native plant species and preventing colonization by invasive plants on many sites of the Bitterroot National Forest including decommissioned roads (PF-Invasives-011) and Sweeney Timber Sale (PF-Invasives-013).

Repeated biological control introductions of *Chrysolina* spp. (Klamath beetle) during 2004-2007 has resulted in a noticeable decrease of St. Johnswort in the understory of lower elevation ponderosa pine stands in the project area (PF-Invasives-014). Recent sampling and trend plot measurements (PF-Invasives-015) confirm the reproduction and persistence of *Chrysolina spp*. and other St. Johnswort biological controls in the area. St. Johnswort densities are higher in the upper elevations of the project area.

2015 field surveys of the most dense spotted knapweed stands in the project area showed an absence of the important biocontrol insect species, *Cyphocleonus achates* (root miner weevil).

Table 3-46: Existing Status and Treatment Summary of Invasive Plants in the Westside Collaborative Vegetation Management Project Area

Invasive Plant Species	Montana Priority List Category	Locations in Project Area	Density	General Description of Infested Sites and Current or Proposed Treatment
Leafy spurge (*Euphorbia esula*)	Priority 2B: abundant and widespread in MT	Unit 26	Single infestation; previously mapped; 2015 density status consists of about 20 plants	Currently treated with herbicides annually; project mitigation action will isolate the infestation from disturbance during harvest activity to prevent the spread of propagules.
Oxeye daisy (*Leucanthemum vulgare*)	Priority 2B	Units 9B and 9C	Lightly scattered along existing roadsides	Currently treated along roadsides according to rotation schedule; additional pre and post treatments planned for the project.
St. Johnswort (*Hypericum perforatum*)	Priority 2B:	Scattered throughout much of the project area	Generally light to moderate with patches of heavy density on open canopy sites at higher elevations within the project area	Mitigation/ treatment will consist of biocontrol releases around disturbed sites along with spot herbicide treatments along roads, skid trails and landings. Current roadside herbicide applications will continue on the established rotation schedule.
Spotted knapweed (*Centaurea maculosa*)	Priority 2B	Scattered throughout much of the project area	Generally light to moderate with patches of heavy density on open canopy sites at higher elevations within the project area	Mitigation/ treatment will consist of biocontrol releases around disturbed sites along with spot herbicide treatments along roads, skid trails and landings. Current roadside herbicide applications will continue on the established rotation schedule.
Canada thistle (*Cirsium vulgare*)	Priority 2B	Isolated patches associated with mesic sites in two units	Light	Herbicide treatment of isolated patches with objective of local eradication
Sulfur cinquefoil (*Potentilla recta*)	Priority 2B	Scattered	Light	Herbicide treatment along roadsides and disturbed sites
Cheatgrass (*Bromus tectorum*)	Priority 3: regulated – may not be intentionally spread or sold	Scattered throughout project area	Generally light with heavy patches in open canopy sites	Implementation of routine BMPs to prevent further spread within project area and export out of project area.

The heavy stands of spotted knapweed in the project area occur in isolated pockets surrounded by woody vegetation that poses an obstacle to the surface migration of this insect species from outside the area. The introduction of the root miner weevil into the denser stands of spotted knapweed would increase the opportunity for the eventual suppression of spotted knapweed in the area. Story (2008) has demonstrated that biocontrol success with spotted knapweed may take decades to produce noticeable results.

The small infestation of leafy spurge in Unit 26 has reduced in size since its discovery and first treatment several years ago. The Forest has shown dramatic success in reducing the size and number of leafy spurge infestations in the Sapphire Mountain foothills since 2003 through a regular schedule of herbicide treatments (PF-Invasives-001). The prognosis is good for eventual eradication of the isolated occurrence of leafy spurge in Unit 26 of the Westside project through continued herbicide applications.

Environmental Consequences

Alternative 1 – No Action

Direct and Indirect Effects

Wildlife, livestock, humans, vehicles, wind, and overland surface water flow would continue transporting invasive weed seed into open areas (Zouhar 2001a) and throughout the project area.

The current program of integrated treatment of invasive plants on the established road system, select priority sites such as the leafy spurge infestation and supplemental biocontrol release on St. Johnswort and spotted knapweed would continue under the No Action Alternative.

High severity wildfire in the project area carries the strong likelihood of an increase in density and extent of spotted knapweed, St. Johnswort, sulfur cinquefoil, and cheatgrass (Sutherland 2005). Low to moderate severity fire has a lower risk of invasive plant increase and a higher probability of maintaining native plants at current levels (Sutherland 2005).

Cumulative Effects

Past management activities in and around the project area such as road construction and timber harvest have increased invasive plants in the Westside project area. In addition, ongoing occurrences such as recreational foot and horse traffic, activities on adjacent private land and wildfire have all contributed to the spread of invasive plants. These factors will continue to act as vectors for the introduction and spread of invasive plants. Under the No Action Alternative, no additional soil disturbance by timber harvest will occur that might facilitate noxious weed spread. However, the continued trend of fuel build-up from the lack of thinning and prescribed burning will increase potential fire severity in the project area. An increase of fire severity will increase the risk of expansion and higher density of invasive plants (Sutherland 2005).

Alternative 2 – Proposed Action

Direct and Indirect Effects

Ground disturbance and open forest canopies created by timber harvest, thinning, and road construction would create additional opportunities for the spread and colonization of invasive plants shown in Table 3-46. However, the design features (Table 2-4) would reduce the opportunities for introduction and inhibit the spread of invasive plants in the project area in the short- and long-term.

The long term effects of low intensity prescribed fire in Alternative 2 will produce minimal opportunity for the expansion of existing noxious weed stands (Sutherland 2005). Prescribed fire effects on sulfur cinquefoil (*Potentilla recta*) indicate that hotter, fall burns were more likely to increase it and damage native grass species than cooler spring burns (Lesica and Martin 2003).

Cumulative Effects

Wildlife, livestock, humans, vehicles, wind, and overland surface water flow would continue transporting invasive plant seed into open areas (Zouhar 2001) and throughout the project area independent of any vegetation management project activities.

The design features (Table 2-4) would limit the risk of invasive plant spread onto adjacent private land or national forest.

Scenery

Affected Environment

Existing Landscape Character or Place Setting

The existing landscape character or place setting provides a framework for predicting the degree of scenery modification and creating design criteria and mitigation measures to reduce or limit that modification. The project is located in the rolling foothills of the towering Bitterroot Mountains. Several creeks and small intermittent streams flow through the hillsides and define the undulating terrain of the project area. Ponderosa pine is the dominant tree species in the project area though Douglas-fir and aspen are well represented. Small and sporadic pockets of aspen create visual interest in the landscape. Recreation trails, day use areas, and a trailhead parking area are in project area. Past management activities created some variety in vegetation age and density. Roaring Lion Creek, Judd Creek, Gold Creek, Camas Creek, Coyote Coulee, Hayes Creek, and Lost Horse Creek all drain toward the Bitterroot River to the east through the project area. They are distinguished by the tall green riparian masses of aspen, cottonwoods and willows. Below the mountains, flat to slightly undulating agriculture fields and forests are scattered with houses and barns. This rural setting fills most of the basin below the grassy foothills that lie beneath the forested slopes of the Bitterroot Valley.

The Bitterroot Mountains provides a dramatic rising backdrop for the entire valley. Conifer covered foothills contrast with the edge of lower pasturelands. Brown areas of dead trees from past fires or disease are also intermixed across the mountain slopes. Across the surrounding hillsides, natural appearing openings show as sparse, lighter colored grassy areas and sharp edges of past clear cuts contrast against the dark green slopes. Mountain peaks contrast against the skyline creating a visually dominating horizon edge. Within the project area, recreation trails, roads, and the trailhead are evidence of the affinity the public has for the area.

Landscape Visibility

Distance zones indicate the degree of potential effect because as the distance increases, the level of visible detail decreases. Also, as distance increases so does the opportunity to mitigate the impacts. Visibility is also affected by topography, steep terrain, ridges, and road cuts that can affect sightlines.

Topography and vegetation are factors that also determine visibility. Distance zones are measured from the viewpoint and are divided into five (5) categories:

- Immediate Foreground, 0 to 300 feet
- Foreground, 300 feet to ½ mile
- Middleground, ½ to 4 miles
- Background, 4 miles to horizon
- Seldom seen, areas not normally visible from the ground due to topography and lack of access.

Concern (or Sensitivity) levels are a measure of the degree of importance the public places on a landscape being viewed from a particular travelway or use area. Three (3) sensitivity levels are used. Level 1 is the most important and Level 3 the least important. Sensitivity level is a function of both the number of visitors as well as their intent.

- Level 1 is associated with major highways, areas of concentration such as recreation facilities, special designations such as scenic byways or national recreation/historic trails and cultural sites. Users have a high level of concern for scenery. These can be roads, trails or waterways.
- Level 2 areas are of lesser importance such as state highways, county roads, secondary trails, scenic overlooks, summer home tracts, etc.
- Level 3: low use areas and low volume roads, trails, waterways, or recreation facilities

Visibility levels were identified through existing data compiled during the Forest Plan visual analysis process (Scenery Management System Inventory 2006) and verified by field observation in October 2014. The project analysis area has high concern levels because of its high visibility from a large part of the Bitterroot Valley. Many areas in the middleground and background views are open, however vegetation and topography conceal some areas. Additionally, the immediate foreground has high visual sensitivity because of the high level of recreation use.

Use Areas are locations that receive concentrated public viewing use. They include vista points, trailheads, urban areas, towns, suburbs, and other gathering places. Travelways represent linear concentrations of public viewing, including freeways, highways, roads, trails, and rivers. Table 3-47 identifies use areas and travelways not completely screened from the proposed treatment areas by vegetation or topography. The Distance Zone and Concern Level were identified from the 2006 SMS and verified by field observation.

Viewsheds are visible portions of the landscape seen from viewing locations. Three levels of screening were also considered based on intervening terrain, vegetation, and or structures. Open views exhibit minimal to no screening; partially screened views include areas where viewing opportunities are intermittent; screened views include areas where terrain, vegetation, or buildings obscure views. The level of screening within the project analysis area varies greatly. Figure 3-20 identifies area screened by topography using a Geographic Information System (GIS) 10 meter Digital Elevation Model. The areas shown in light red are completely screened (i.e. a standing individual would not have a view of the proposed skyline treatment area from this location). However, areas not screened by topography may be partially screened by vegetation, structures, or by topography not within the limits of the 10-meter elevation accuracy.

The heavily used Highway 93 corridor and connected secondary roads provide intermittently open views. Structures and vegetation comprise most of the screening. The open views expose the upper east facing slopes of the proposed treatment areas, which are visible from middleground and background views. Views from trails or roads within the foreground of the analysis area are primarily screened by vegetation except where these travelways are within or adjacent to proposed treatment units. Numerous viewpoints were identified including

Table 3-47: Summary of Sensitive Areas: Travelways and Use Areas in the Westside Project Area

NAME	DESCRIPTION	VIEW DIRECTION	DISTANCE ZONE	CONCERN LEVEL
Highway 93 Corridor	Open to partially screened views from vegetation and topography	Southwest	Middleground, Background	High
Private residences	Open to partially screened views.	Generally west	Immediate foreground/ Foreground/ Middleground	High
Lake Como	Mostly screen with an upper portion of the analysis area visible.	North	Middleground	High
Bitterroot River	Mostly screened because of the low relief of the river banks.	West	Middleground	High
Roaring Lion Road (6801)	Views are primarily screen by vegetation, with open views near the trailhead.	West to Southwest	Immediate foreground/ Foreground/ Middleground	Moderate
Lost Horse Road (7600)	Views are open to partially to screened.	West to northwest	Immediate foreground/ Foreground/ Middleground	Moderate
Other Secondary Residential Roads	Views are open to partially to screened.	Generally west	Middleground	Moderate
Lost Horse Observation Point Road (496)	Views are open to partially screened.	Several	Immediate foreground/ Foreground	Moderate
Lost Horse Observation Point	Views are primarily screened by vegetation in to the analysis area.	Northeast and east	Immediate foreground/ Foreground	Moderate
Camas lake Trailhead	Views are limited to adjacent trees.	North to east	Immediate foreground	Moderate
Ward Mountain/ Sawtooth Trailhead	Views are open to partially screened.	South	Immediate foreground/ Foreground	Moderate
Trail #123	Views are partially screened to screened.	South	Immediate foreground/ Foreground	Moderate
Trail #125	Views are open to partially screened.	Several	Immediate foreground/ Foreground	Moderate
Trail #127	Views are open to partially screened.	Several	Immediate foreground/ Foreground	Moderate
Trail #208	Views are open to partially screened.	Several	Immediate foreground/ Foreground	Moderate
Trail #511	Views are open to partially screened.	Several	Immediate foreground/ Foreground	Moderate

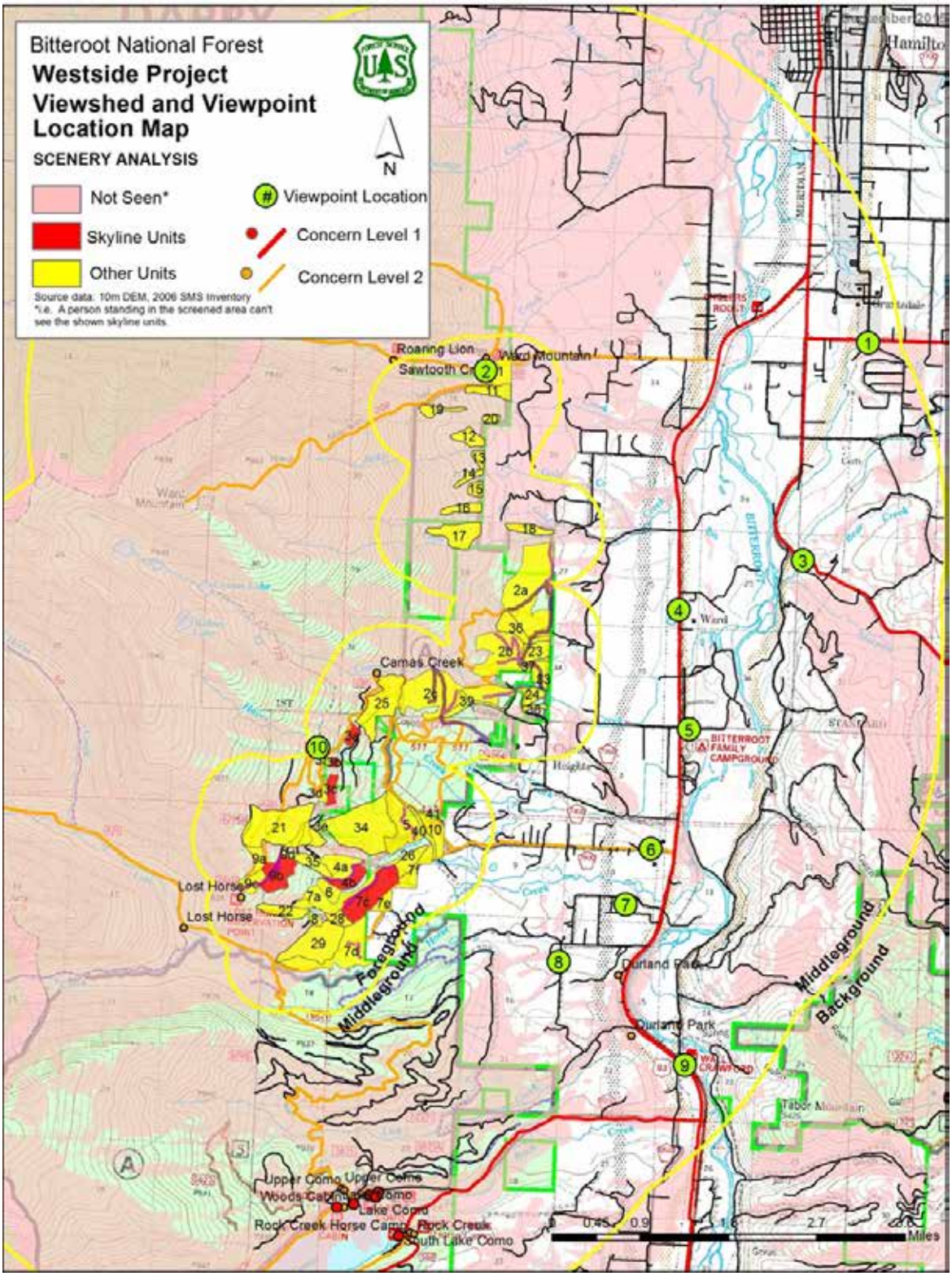

Figure 3-20 : Viewshed and Viewpoint Location Map for the Westside Project

residences, recreational facilities, and travelways. A selection of these typical viewpoints were documented and included as part of this inventory. Viewpoints were selected that best represent critical views of the proposed treatments from use areas and travelways (PF-SCENERY-003).

Scenic Attractiveness

Scenic Attractiveness is the primary indicator of the intrinsic beauty of a landscape. It determines the level of importance of scenic beauty based on commonly held perceptions of landform, vegetation patterns, compositions, water, and land use patterns and cultural features (see SMS Section 1-4 Landscape Character and Visual Management System (VMS), page 12). Higher levels occur in landscapes with positive combinations of variety, vividness, mystery, intactness, coherence, harmony, uniqueness, pattern, and balance. Landscape elements are rated at various levels of scenic values or attractiveness, and forest landscape character descriptions serve as the frame of reference for determining scenic attractiveness. The 2006 SMS forest-wide inventory shows the majority of the analysis area as Class B Typical defined by a mix of vegetation and rolling topography. Areas along Lost Horse drainage show Class A Distinctive due to increase riparian diversity and some of the less diverse areas are common (PF-SCENERY-002).

Scenic Class

Scenic Class combines the visibility and scenic attractiveness to identify areas of public scenic value. Scenic classes from the 2006 SMS inventory range from 1 (highest) to 5 (lowest). Most of the analysis area is Class 2 because of the high visibility and use associated with the Highway 93 corridor (PF-SCENERY-002).

Existing Scenic Integrity

The project area has moderate to high scenic integrity relative to the respective settings, with the exception of the gravel pit located off of Lost Horse Road, which has very low scenic integrity. The proposed treatment areas are largely intact, appear natural, and have high existing scenic integrity. Additional exceptions are areas where visible cut and fill areas along the roads in the project area decrease the intactness and appear unnatural on the landscape. At a landscape scale, the analysis area has high scenic integrity.

Environmental Consequences

Methodology

The scenery resources inventory consists of a detailed evaluation of the proposed project area. The project inventory and analysis is consistent with the principles of the Scenery Management System (SMS) (USDA Forest Service 1995, updated 2006) and the Visual Management System (VMS) (USDA Forest Service (1974).

Terminology used in this analysis follows the current SMS. However, because the Forest Plan has not been updated to follow this system, the Visual Quality Objectives are described using the previous VMS. The project inventory was conducted in 2014 and 2015. The purpose of the scenery resources inventory is to identify and document landscape scenery and views of the project area. Project effects on scenery resources were assessed by determining the potential to change landscape character relative to Forest Plan direction. Key components of the assessment included evaluating existing and desired landscape character, existing scenic integrity, scenic attractiveness, scenic class, visibility, visual absorption capacity, and visual quality objectives.

Measurable visual elements like dominance, degree of deviation, and intactness define the level of scenic integrity. Concern levels and distance zones relative to viewsheds define visibility. 3D modeling from viewpoints identified potential change.

The primary criterion for determining the project's effect is scenic integrity levels or Visual Quality Objectives (VQOs). To determine the project's effects, the potential change in landscape character was measured against the VQOs. Failure to achieve the VQO specified in the Forest Plan would be an "adverse" effect. Achievement of the specified VQO could be a "beneficial" effect. The level of effects are measured as negligible, minor, moderate, or major departures from the VQO (PF-SCENERY-001).

Spatial Context for Effects Analysis

The viewed proposed activities within the "seen" area as determined from the sensitive areas made up the spatial boundary for assessing direct and indirect effects. All viewed lands within the "seen" areas made up the spatial boundaries for assessing cumulative effects.

Temporal Context for Effects Analysis

The temporal boundary used to describe effects varied from "immediate upon project completion" to five years (short-term). Effects visible for more than five years after completion of management activities are defined as long-term. The criteria below were used to determine whether the "duration of impact" was met for each VQO upon implementation of a management activity.

Cumulative effects were analyzed for a 20-year period, which is the approximate time regrowth would need to occur before major impacts would appear negligible within the characteristic landscape. Past vegetation treatment and roads within the viewsheds that are still visible are relevant to this analysis. Also all current and planned harvesting and burning within the viewshed on public and private lands are relevant and described in each alternative section.

Alternative 1

Direct and Indirect Effects

As described in the Visibility section, Highway 93 is a major road with high concern levels. Other secondary roads and noted trails within the analysis areas are described as having moderate concern, primarily associated with the amount of use. Several past harvest units are located within the viewshed as well as several existing roads but because of sufficient time for vegetation regeneration none of the past harvest units or associated roads are evident to the casual observer from Highway 93, which is located in middleground views.

Most of the project area that was surveyed is consistent with the previously describe VQOs, which are generally Moderate to High. With current vegetation screening, the existing roads (ex. Lost Horse Observation Point Road) located on the mountain slopes remain concealed but would otherwise be contrasting liner elements that would lower the visual quality outside of Forest Plan parameters. The gravel pit located off of Lost Horse Road is the one major feature inconstant with the retention VQO but existing vegetation partially screens unnatural appearing elements.

In the event of a wildfire, the resultant fire scars would potentially have a long term major effect and be damaging to the scenic integrity, which would show barren ground compared to the surrounding landscape. These impacts would lower the intactness of the landscape and create a dominance of short term contrasting color or even long term burn contrast if the beetle infestation and fire occurred on a large scale because of past fire suppression efforts. However,

if wildfire and disease occurred within natural regimes the effects from disease and wildfire would be negligible on scenic integrity. There would be no change to the landscape character and therefore no change in future scenic integrity of the project area from existing conditions (Table 3-48).

Cumulative Effects

There would be no cumulative effects associated with Alternative 1.

Table 3-48: Visual Quality Impacts Summary from Representational Viewpoint Locations in the Westside Project

Viewpoint #	Viewpoint Name	Visibility [1]	VQO(s)	Alternative 1 No Action	Alternative 2 Proposed Action
1	Skalkaho Hwy (38)	Mg,Bg/1	Retention	Would meet VQO	Would meet VQO
2	Ward Mt. Trail (#208)	IFg/2	Retention	Would meet VQO	Would meet VQO
3	Sleeping Child Road	Mg,Bg/1	Partial Retention	Would meet VQO	Would meet VQO
4	Highway 93 (North)	Mg	Partial Retention/Retention	Would meet VQO	Would meet VQO
5	Russell Drive/Church	Mg/Bg/1	Partial Retention	Would meet VQO	Would not meet VQO
6	Lost Horse Road	Mg/1	Partial Retention/Retention	Would meet VQO	Would not meet VQO
7	Residence	Mg/1	Partial Retention/Retention	Would meet VQO	Would not meet VQO
8	Forest Hill Road/ Residence	Mg/1	Partial Retention/Retention	Would meet VQO	Would not meet VQO
9	Highway 93 (South)	Mg,Bg/1	Partial Retention	Would meet VQO	Would not meet VQO
10	Camus Lake Trailhead	IFg/2	Partial Retention	Would meet VQO	Would meet VQO

Alternative 2

Direct and Indirect Effects

Effects from prescribed burns would appear as mosaic of blackened areas and would contrast with adjacent non-burned areas but would appear as a natural occurrence. The visual contrast would have minor negative effects, being more prevalent in foreground views along roads and trails. Middleground views and background views from the Bitterroot Valley are mostly screened but where openings in the vegetation would expose burn area, a natural appearing disturbance would contrast in color and texture showing areas of brown or dead vegetation against greener areas. These short-term impacts would be evident for a few years but would appear natural. Additionally, according to research (USDA 2000), this low-intensity burn can actually improve scenic integrity of an area as an indirect effect. The prescribed burning would be short-term and improve the forest health of the treatment areas and the stability of the landscape character.

A limited number of units would show negative visual effects from immediate foreground views when adjacent to roadways and trails by showing contrast from unnatural appearing slash, hand slash piles, stumps, and felled trees. Minor impact from paint marking would also occur. These impacts would be temporary within a growing season and would not be dominant contrasting landscape features. Ground based mechanical units would show skid trails and contrast from soil disturbance. Additionally, Alternative 2 would cut down conifers adjacent or within aspen stands, which in the short term would have a moderate effect showing cut stumps and slash but would produce a long-term beneficial effect by increasing color and diversity in the landscape. Middleground and background change in landscape character from implementation of these units would be minor to negligible except where a proposed unit shows a strong unnatural contrast in line and texture next to untreated units (or heavily forested land). Design features would reduce the visual effects of existing and proposed roads in the proposed treatment units. Primarily, impacts seen from distant views would be texture change and contrast from untreated areas. These negative effects would have higher intensity in winter.

As viewed from the middleground, vegetation removal from the proposed units would create negative edge and silhouettes effects along ridgelines, these include Units 4a, 7c, 7a, 8, and 9c. The Units 2c, 3a, 3b, 3c, 3d, 4a, 4b, 5, 7c, 9c, 9b, and 9d would potentially expose roads that would be visible from the Highway 93 corridor but by implementing design features, impacts would be reduced by breaking up liner contrast associated with existing and proposed road. Skyline units and associated roads and landings would show greater contrast in color and form from cut and fill because they are located higher up on the slope. These features will appear unnatural, contrasting in shape, line, form, and texture within the characteristic landscape. Most of the units would have minor to moderate impacts, however, the skyline yarding units with high visibility would have major long-term impacts, primarily from contrasting line and texture associated with skyline corridors and associated roads and landings. These negative effects would have higher intensity in winter because of contrasting white snow (PF-SCENERY-001).

Units 2c, 4b, 7c, and 9b would create new permanent and temporary road that would not meet Forest Plan Forest-wide Desired Conditions (page II-13-15), being visible from the Highway 93 corridor. The liner elements would appear as unnatural horizontal features in the landscape and lower the scenic integrity.

Treatment units that would not meet the Forest Plan VQOs as proposed in Alternative 2 include: 3a, 3b, 3c, 4b, 7c, and 9b. Roads, landings, and skyline corridors would create dominant elements that would contrast shape, texture, and form with the natural appearing landscape. The intactness of the landscape would not meet the VQOs within a year after implementation.

Cumulative Effects

Timber harvests, prescribed burns, and fires have occurred, and are likely to continue on both private and public lands in the viewsheds of the Bitterroot Valley and Highway 93. Fuel reduction projects like the Como Hazardous Fuels Reduction Project and the Lost Moose Hazardous Fuels Reduction Project occur in portions of the viewshed, which would show impacts of cut stumps, paint marking (boundary or tree), and slash in addition to contrasting blackened burned boles, vegetation, and soil that would lower the intactness for a short term having minor effects. The present and reasonably foreseeable impacts of nearby blackened earth and patches of brown trees from prescribed burns and wildfires, and line and texture contrast associated with openings from harvest treatments on public and private lands may be evident in distant middle ground and background views. Because of the sloping terrain and intensity of tree reduction within Alternative 2, there would be negligible impacts that would contribute to

cumulative effects within the viewshed. The long-term effects of a healthier stand conditions have would have some beneficial impact to the collectively viewed landscape and the negative impacts associated with the proposed action alternative would not reach a threshold of lowering the overall landscape character of the defined cumulative effects analysis area.

Heritage Resources

Affected Environment

The gentle slopes of the eastern portion of the Westside project area ordinarily would be considered high probability terrain both pre- and post-settlement cultural site occurrence, as defined under the Forest's Site Identification Strategy (McLeod, Light & Williams, 2000). However, late 19th and early 20th century development (logging, homesteading, road/railroad construction, irrigation, and orchard planting) resulted in extensive ground disturbance, making survival of significant pre-settlement sites unlikely. However, those activities were in themselves culturally significant, creating a landscape of moderate-to-high probability for historic site occurrence. Between 1983 and 2014, at least eleven cultural resource inventories were conducted on lands within and adjacent to the proposed project area (PF-HERITAGE-001). During the 2014 and 2015 field seasons, Bitterroot National Forest Heritage specialists conducted extensive cultural resource survey specifically for the Westside project (2014-BR-2-6). The survey addressed all high probability terrain within the project area boundaries, and all proposed treatment units.

As of September 15, 2015, all high probability locations not previously surveyed, and a representative sample of low- and moderate-probability terrain (as described in the Forest's Site Identification Strategy) within the proposed treatment units were surveyed for cultural resources. Nine new sites were identified and recorded, and will be evaluated for National Register eligibility. These sites reflect homesteading activity under the Timber Homestead Act, logging activity during the 1890s, early 1900s, and 1930s, and orchard development during the early 1900s. Five previously recorded sites also lie within the project area. Of these, two have been determined 'Not Eligible' for the National Register of Historic Places and two are currently being evaluated to determine their eligibility. Unevaluated sites must be managed as though Eligible for the National Register until their status is determined. A fifth site, an historic logging railroad grade and orchard remnant, has been determined Eligible for the National Register of Historic Places.

Environmental Consequences

Methodology

The area analyzed for potential effects on cultural resources includes all National Forest System lands which may be impacted by the Westside project. This "area of potential effect" (APE) includes locations where direct effects would occur (tree falling, burning, skidding, road construction). It also includes areas where indirect effects (visual, auditory, or atmospheric) could influence heritage resources or their setting.

Within a project's area of potential effect, certain geographic areas are surveyed for cultural resources more intensively than others. Areas to be surveyed are selected by the Forest's cultural resource specialist based on knowledge of the area's history, previous ethnographic or archaeological work, and the topographic and environmental features of the area as related to known patterns of prehistoric and historic use. These factors are outlined in the "Site

Identification Strategy Prepared for Bitterroot, Flathead, and Lolo National Forests" (McLeod, Light & Williams, 2000). Cultural information is drawn from prehistoric and historic overviews, the Forest's cultural resource files, local histories, the National Register of Historic Places, ethnographic literature, and historic and topographic maps. With this data, the Heritage specialist is able to predict prehistoric and historic site distribution. Moderate-to-high probability areas are most intensively examined; low probability areas receive less intensive scrutiny.

The scope of a project's impacts is also considered in determining survey strategy. For example, an area proposed for tractor logging or road construction may receive more intensive archaeological inventory than an area proposed for hand-thinning or planting. Such intensive inventories may include on-the-ground survey coverage of a larger percentage of the analysis area, clearing away of duff layers, and shovel testing high probability locations.

All inventories conducted in the Westside project area have complied with all applicable federal requirements. They were performed by and under the supervision of the cultural resource specialist who met or exceeded federal professional standards for their positions. During implementation, any necessary cultural resource monitoring will be performed by the same qualified personnel.

Based on information from cultural resource surveys, and due to visible evidence of logging, construction of roads, railroads, and ditches, and agricultural land clearance, most of the Westside project area is considered low probability for pre-settlement cultural site occurrence, and moderate-to-high probability for post-settlement site occurrence under the Forest's Site Identification Strategy (McLeod, Light & Williams, 2000). 100% of the medium-to-high probability zones within the analysis area have been surveyed for cultural resources. Compliance with Section 106 of the National Historic Preservation Act (NHPA) was fulfilled under terms of 36CFR800. A cultural resource inventory report was submitted to the Montana State Historic Preservation Office (SHPO), and SHPO concurrence on determinations of National Register eligibility and project effect on significant cultural resources was received on Dec. 24, 2015. Consultation with the Confederated Salish and Kootenai Tribes was completed on March 5, 2015 with no tribal cultural concerns identified.

Direct, Indirect, and Cumulative Effects

The project area has received repeated and extensive survey for cultural resources. Significant sites are present. If the No Action alternative is selected, the risk of cultural resource loss to wildfire is particularly high for historic remnants of early 20th century apple orchards, and for vegetation associated with old homestead sites (lilac bushes, etc.), as well as for other combustible components of those sites.

Design features (Table 2-4) would be applied under Alternative 2 to avoid and protect historic logging railroad grades, orchard remnants, and homestead sites during implementation. Equipment operation, tree falling, skidding, or burning activities could adversely affect historic sites if design features are not properly applied.

Air Quality

Affected Environment

The Westside project area is in Montana/Idaho Airshed 4, which includes the Bitterroot National Forest and the western boundary of the Selway-Bitterroot Wilderness, and all of Ravalli County.

The Montana/Idaho Airshed Group (Airshed Group), as authorized by the Montana Department of Environmental Quality (MDEQ), implements the Smoke Management Program in Montana and Idaho by making recommendations as to whether or not a burn can occur, given forecasted meteorological conditions, burn type, burn location, and other surrounding proposed burns. The burner uses the recommendations of the Airshed Group, "Best Available Control Technology" (BACT), and site-specific conditions to determine whether to burn on a particular day.

Existing emission sources in the project area include vehicles, road dust, agriculture burning, residential wood burning, wood fires, and smoke from forest fires. Emissions are limited with no local visible sources of impairment. Wind dispersion throughout the project area is robust, with usually no visible inversions or localized concentrations of emissions. The entire project area is considered to be in attainment (meeting the standards for emissions) by the MDEQ.

The nearest non-attainment area is Missoula (47 miles to the north/northeast). The nearest class I areas are the Selway-Bitterroot Wilderness, 2 miles west of Unit 2a. Missoula is both a non-attainment area for PM10 and an impact zone. Smoke produced within the analysis area would most likely be carried in a north, northwest, or northeast direction.

Air Quality in the Westside project area is generally good to excellent most times of the year. Local adverse effects result from native-surfaced roads and fires. If management activities, which require prescribed burning of logging and natural fuels are initiated in the area, then air quality would also be affected.

Smoke from wildfires and prescribed burns usually drift north and eastward and eventually settle into the western Montana valleys. Restrictions on prescribed burning on the Bitterroot National Forest usually occur during fall burning season because of temperature inversions, which pool smoke in the drainage bottoms. Temperature inversions can occur at any time of the year, but they are most common in the fall.

On the Bitterroot National Forest, broadcast and underburning are generally done during the early to mid-spring, and late fall. Pile burning of logging and thinning slash or underburning is often continued into late fall. The USFS cannot apply for winter burn permits, which are required if burning occurs from Dec 1 – March 1 (Montana/Idaho Airshed Group) on a case-by-case basis.

Environmental Consequences

Methodology

The two main issues related to air quality are:

- Smoke emissions from understory and pile burning associated with the Westside Collaborative Vegetation Management Project may adversely affect residents in Charlos Heights, Hamilton, Lost Horse, and Gold Creek areas.
- Smoke emissions from understory and pile burning associated with the Westside Collaborative Vegetation Management Project could temporarily (1 day – 2 weeks) affect the Selway-Bitterroot Wilderness Class 1 Airshed and Selway Bitterroot Inventoried Roadless Expanse Area(s).

Potential air quality impacts from the Westside Collaborative Vegetation Management project were determined using the Smoke Impact Spreadsheet (SIS) model (Air Sciences, 2003) V11-30-2004. The SIS model uses an Excel spreadsheet to link to the First Order Fire Effects Model (FOFEM59) for broadcast burning, pile burning and wildfire fuel emissions, the Consume 2.1

model for pile burn emissions, and the CalPUFF model for dispersion modeling. The model predicts ambient particulate matter of 2.5 micrometers (PM2.5) concentrations from burning activities for up to 50 miles downwind of the burn (Dzomba and Story, 2005). Descriptions, use, assumptions, and limitations of the models are in the project file (PF-FIRE-013).

Spatial and Temporal Boundaries

A maximum perimeter distance of 50 miles is the effects area for the air quality analysis because that is the distance to the Class 1 airsheds. The time span of 1 to 2 days was chosen because unlike most industrial and urban sources, smoke from prescribed burning or wildland fire is usually transitory, lasting 1 or 2 days at a single location.

The risk to health and safety from dust is concentrated primarily along dirt roads where it is produced. Applying mitigation measures to reduce dust will reduce the potential to exceed Federal Ambient Air Quality Standards.

Since the potential effect on class 1 airsheds is minimal from the implementation of the proposed action, the additive cumulative effect from other present and reasonably foreseeable future actions would be minimal. The production of air pollutants associated with the implementation of this project would vary over time and would not be continuous. Impacts would be intermittent and the potential for occurrence would end when the project is complete.

Alternative 1

Direct and Indirect Effects

No smoke would be produced by management ignitions under Alternative 1, the No Action alternative. Previous NEPA decisions may have still have prescribed burning that may occur (i.e. Lost Moose CE or Hayes Creek CE). However, Alternative 1 would not reduce current heavy fuel loads and fuel continuity on the Westside project area. For this reason, it is the least effective of the three alternative in reducing potential smoke emissions and associated pollutants from future wildland fires.

In the absence of fuel reduction, and in the event of future wildland fire, varying levels of smoke could persist in the Bitterroot Valley for several weeks. Health and visibility could be adversely affected depending on local climatic conditions, level of smoke dispersion, and amount of smoke the fire produces.

To demonstrate the potential effects of the no action alternative, the SIS model was used to estimate the smoke impacts from the Sawtooth Wildfire (2012), a 5000 acre wildfire that burned in an area adjacent to the Westside project area. For this model analysis, the fuels were assumed to be predominantly Douglas-fir, and the fuel model was assumed to be dense conifer with a significant amount of litter and downed wood material (National Fire Danger Rating System (NFDRS) fuel model G) (Table 3-49). Terrain receptors were not used for this simulation.

Cumulative Effects

There would be no cumulative effects to air quality caused by management activities under Alternative 1 since no new burning activities would be proposed and effects to air quality are usually episodic and of short duration. A large wildfire in the area cannot be predicted so it would not be reasonably foreseeable. Fire suppression will continue to occur under both alternatives.

Table 3-49: Potential Particulate Matter 2.5 Emissions in the event of a Wildland Fire Similar to the 2012 Sawtooth Fire.

SCENARIO 1: NO ACTION ALTERNATIVE (2012 SAWTOOTH WILDFIRE) FUEL TYPE: DOUGLAS FIR; NFDRS FUEL MODEL G PM 2.5 EMISSION (FOFEM5): 522 LBS/ACRE								
Acres	**Total Emissions (Tons)**	**PM 2.5 Concentrations (µg/m^3)**						**Minimum Ambient Distance (miles)**
		0.1 mile	**1.0 mile**	**2.0 mile**	**4.0 mile**	**18.0 mile**	**47.0 mile**	
5000	1305	302.76	214.28	190.01	173.8	92.521	37.31	>50

If a wildfire occurred, there is a potential for the NAAQS to be exceeded depending on the size and duration of the wildfire. If a large wildfire were to occur, the Forest Service and the State of Montana Air Quality Bureau could, depending on the specific situation, restrict all regulated burning. However, effects of smoke from a large wildfire could become cumulative with present and foreseeable activities or combined with unregulated pollutants in the area, such as dust from roads.

Alternative 2

Direct and Indirect Effects

Under this alternative, two categories of activities may contribute to air quality impacts if implemented. Both categories of activities would result in temporary, transient impacts to local, and possibly regional, air quality. The first involves dust from ground disturbances that may be associated with thinning and biomass removal activities. The second activity is from prescribed pile burning and underburning. Under this alternative underburning of existing slash, activity generated slash, and slash piles at landing sites is proposed. It is estimated that there will be approximately 2,121 acres of underburning, up to 2,121 acres of hand piles (if all slash is piled) and 127 landing piles to burn.

For broadcast burn modeling, ponderosa pine and Douglas fir were assumed to be the dominant species since the FOFEM5 model predict this species will produce the most emissions under typical fuel loadings. Ignition rates were estimated at 80-100 ft/minute (for hand ignition). The SIS model was run at a variety of fire sizes (in acres) in order to estimate the maximum number of acres that could be ignited in a single burn without causing air quality impacts.

For piles, it was assumed that the maximum number of piles that could be burned in one day was 4000 of a standard hand pile size (5ft diameter by 8 feet high), with a packing ratio of 20%. Pile composition is estimated to be approximately 50% Douglas fir and 50% ponderosa pine. This represents a maximum of 50 acres of pile burning in one day, with approximately 80 piles per acre.

Terrain receptors were used for all broadcast burn and pile burn model runs. Terrain receptors were determined by using Google Earth to plot a direct line to areas of concern from the approximate center of Unit 2a, 2b, and 2c, the largest burn unit(s) proposed for Alternative 2 (539 acres). Elevations were estimated at various distances along the line and used in the model simulations. Specific model parameters are included with the project file.

Underburning would occur during an appropriate burning window, generally during the fall or spring. Burning landing piles generally occurs during late fall or early winter. Pile burning (particularly landing pile burning) typically occurs after an area has received significant rain or

snow to prevent the pile from spreading and reduce the risk of escape. All burning will occur over the life cycle of the project estimated at 3 to 5 years, and as units are completed. Implementation will include limiting the number of acres or piles ignited per day to assure air quality standards are met; and halting all pile burning if, through cumulative effects of other contributors, air quality standards are exceeded.

Tables 3-50, 3-51, and 3-52 show the estimated emissions and potential PM 2.5 produced by prescribed fire at several downwind distances: Selway Bitterroot Wilderness (2 air miles), private land (1 air miles), Hamilton, MT (4 miles) and HWY 93 (2 air miles). The minimum ambient distance – the distance downwind where PM 2.5 concentrations fall below the daily 35 (µg/m3) is noted. These figures represent the worst-case scenarios; actual values are likely to be less than those modeled. The emissions would be less at the minimum ambient distances because of operational limitations such as personnel availability or weather conditions.

The 24-hour maximum PM2.5 value would be below the 35 $\mu g/m^3$ threshold between 0.8 and 1.8 miles downwind of the burn (Tables 3-50, 3-51, and 3-52). For all runs, the PM2.5 concentrations drop off rapidly after 1.8 miles and never exceed the threshold thereafter. The Forest Service will use BACT when these units are burned to mitigate potential smoke impacts. Generally, impacts would be minimal and confined to the project area. However, though prescribed fires are scheduled to occur during favorable weather forecasts, unpredicted weather changes can keep smoke from dispersing as intended.

Cumulative Effects

Cumulative effects on air quality from prescribed fire in Alternative 2 incrementally decrease air quality as PM2.5 particles from fuel combustion combine with other particles produced by road dust and other local and regional sources located upwind. Prescribed burning of logging slash, on other Federal, state, or private lands, would also contribute particulates, as would agricultural burning and dust from tilled ground. Particulates from industrial and automotive sources also contribute to regional particulate loads. Other vehicle traffic, agricultural and industrial sources in the project area would also contribute to the cumulative particulate loads. It is not possible to predict the amount of particulates contributed by the other sources, nor is it necessary for this analysis.

There may be days when regional air quality does not meet the established standards but, because of the Montana/Idaho Smoke Monitoring Units effectiveness at limiting the amount of burning in any given day, there is reduced likelihood that any source associated with this project or any other present or reasonably foreseeable project, would be a significant contributor. Because the Forest Service complies with the Montana Smoke Management plan and will not initiate burning on days when air quality thresholds have been exceeded, this project will not contribute to cumulative air quality effects.

Since the potential effect on class 1 airsheds is minimal under Alternative 2, the additive cumulative effect from other present and reasonably foreseeable actions would be minimal. The production of air pollutants associated with the implementation of this project would vary over time and would not be continuous. Impacts would be intermittent in nature and the potential for occurrence would end when the project is completed.

Table 3-50: Potential Particulate Matter 2.5 Emissions from Broadcast Burning in the Westside Project Area Affecting Hamilton, Victor, and Missoula.

SCENARIO 2A: BROADCAST BURN, HAND IGNITION – PRIVATE LAND, HAMILTON, VICTOR, MISSOULA FUEL TYPE: DOUGLAS FIR PM 2.5 EMISSION (FOFEM5): 468 LBS./ACRE								
Acres	**Total Emissions (Tons)**	**PM 2.5 Concentrations (µg/m3)**						**Minimum Ambient Distance (miles)**
		0.1 mile	**1.0 mile**	**2.0 mile**	**4.0 mile**	**18.0 mile**	**47.0 mile**	
100	23.4	197.56	22.05	15.79	11.23	3.26	1.04	0.8
300	70	452.9	35.36	25.85	19.45	5.69	1.80	1.1
700	163	507.2	38.73	32.72	25.73	11.02	4.44	1.8

Table 3-51: Potential Particulate Matter 2.5 Emissions from Broadcast Burning in the Westside Project Area Affecting the Selway-Bitterroot Inventoried Roadless Area.

SCENARIO 2B: BROADCAST BURN – INVENTORIED ROADLESS AREA FUEL TYPE: DOUGLAS FIR PM 2.5 EMISSION (FOFEM5): 468 LBS./ACRE							
Total Emissions (Tons)	**PM 2.5 Concentrations (µg/m3)**						**Minimum Ambient Distance (miles)**
	0.1 mile	**1.0 mile**	**2.0 mile**	**4.0 mile**	**18.0 mile**	**47.0 mile**	
2.34	201.23	22.79	15.60	12.61	9.14	1.05	0.8
7.0	469.75	37.78	25.81	21.17	16.10	1.83	1.1

Table 3-52: Potential Particulate Matter 2.5 Emissions from Pile Burning in the Westside Project Area Affecting the Selway-Bitterroot Inventoried Roadless Area.

SCENARIO 2C: PILE BURNS 4000 PILES 100% DOUGLAS FIR							
Total Emissions (Tons)	**PM 2.5 Concentrations (µg/m3)**						**Minimum Ambient Distance (miles)**
	0.1 mile	**1.0 mile**	**2.0 mile**	**4.0 mile**	**18.0 mile**	**47.0 mile**	
NA	2460.7	50.87	25.41	24.81	23.90	23.64	1.3

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