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Forest
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# Final Environmental Assessment

## Beaver Creek Landscape Restoration Project

**Swan Lake Ranger District, Flathead National Forest, Missoula County, Montana**





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## INTRODUCTION

The Beaver Creek Landscape Restoration (Beaver Creek) Project was developed to reduce the risk of uncharacteristic wildfire and promote ecological restoration. The proposed project activities seek to reduce hazardous fuels, improve fish and wildlife habitat, improve forest health and watershed conditions, control invasive species, and contribute to the local economy.

An Interdisciplinary Team (ID Team) conducted field review of the project area in 2012 to determine the existing conditions and needs for National Forest System (NFS) lands in the Beaver Creek Project Area. Following field review and meetings with the public, the Swan Lake Ranger District developed a Proposed Action for the Beaver Creek Landscape Restoration Project.

## CHANGES TO THIS FINAL ENVIRONMENTAL ASSESSMENT

This document was prepared to clarify the cumulative effects analysis for grizzly bears, lynx, lynx critical habitat, and water howellia and their consideration of the Glacier Loon and Cold Jim projects, as instructed by the Objection Reviewing Officer. It provides clarification on the relationship between whitebark pine and grizzly bears in the Northern Continental Divide Ecosystem. It includes new information regarding the USFWS review of water howellia. This document has updated the project vicinity maps to better identify the location of the wildland urban interface (WUI). This document also supplements the fire/fuels report with literature citations that were inadvertently omitted from the previous versions. Appendix A was updated to identify which units are located above 5,500 ft elevation with a focus on whitebark pine restoration. Some definitions in the glossary have been corrected to better align with the 1986 Flathead National Forest Plan.

## DOCUMENT STRUCTURE

The Forest Service has prepared this Environmental Assessment (EA) in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This EA discloses the direct, indirect, and cumulative environmental impacts that would result from the Proposed Action and alternatives. The document is organized into four parts.

### CHAPTER 1. PURPOSE AND NEED FOR ACTION

This chapter details the information on the historical and existing resource conditions of the project area as well as the desired conditions of the project area. It describes the need for change on the landscape and the Purpose and Need developed for the project, both of which guided the development of the Proposed Action to achieve that purpose and need. This section also describes the decisions to be made.

# CHAPTER 2. ALTERNATIVES CONSIDERED

This chapter details how the Forest Service collaborated with the public to develop the Purpose and Need for the project. It explains how the public was informed of the Proposed Action and describes the public comments received in response to this proposed action. Alternative methods for achieving the Purpose and Need were developed and are described in this section. These alternatives were based on key issues raised by the public, members of the ID Team, and/or other agencies. This chapter also includes Design Criteria to reduce impacts to specified resources. Finally, this section provides summary tables of the environmental consequences associated with each alternative.

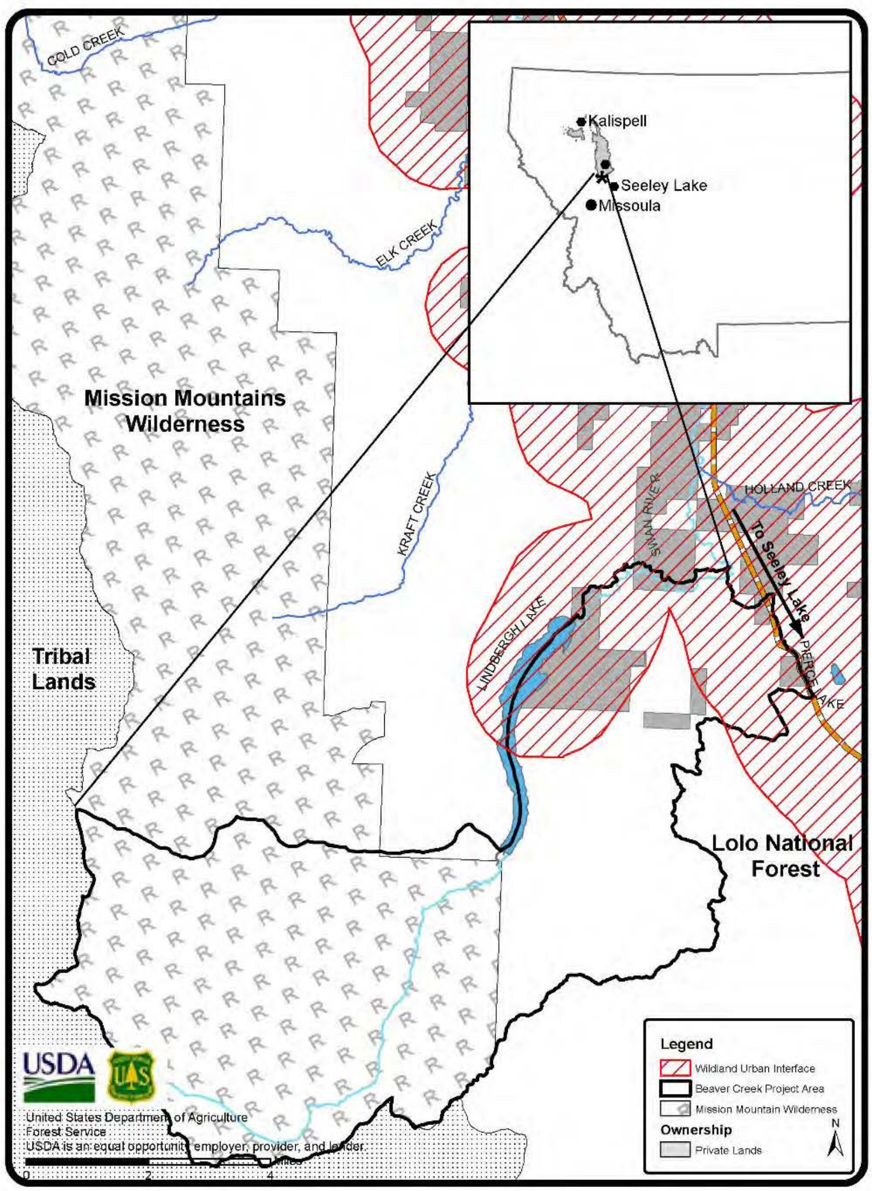



**FIGURE 1. BEAVER CREEK PROJECT AREA VICINITY MAP.**

# CHAPTER 3. AFFECTED ENVIRONMENT & ENVIRONMENTAL CONSEQUENCES

Chapter 3 describes the existing condition and potential environmental effects of implementing the Proposed Action or an alternative. This chapter is organized by resource area.

## APPENDICES

The appendices provide more detailed information to support the analyses presented in the updated EA. Included are a Treatment Summary Table, Monitoring Plan, Best Management Practices (BMP), List of Preparers, Bibliography, and a Glossary that defines abbreviations, acronyms, and terms used.

## PROJECT AREA

The Beaver Creek Landscape Restoration Project Area lies within the boundaries of the Beaver Creek Grizzly Bear Subunit. The project area is located approximately 9 miles south of the community of Condon and encompasses approximately 34,962 acres within the Flathead National Forest (including 1,810 acres of private lands), all in Missoula County, Montana. The project area also contains approximately 20,026 acres of the Mission Mountains Wilderness (57 percent of the project area). The legal description of the Beaver Creek Landscape Restoration Project includes: Sections 5, 6, 7, 8, and 18, T18N, R16W;, Sections 1-23, and 27-32, T18N, R17W; Sections 1-3, 10-16, 21-27, and 35-36, T18N, R18W;, Sections 7-9, 16-22, and 28-31, T19N, R16W; Sections 12-14, 23-26, 31, and 34-36, T19N, R17W; and Sections 34 and 36, T19N, R18W; P.M.M (Prime Meridian of Montana); Swan Lake Ranger District, Flathead National Forest (See Vicinity Map, Figure 1 ).

The Beaver Creek Project Area is adjacent to lands managed by the Seeley Lake Ranger District on the Lolo National Forest. The project area is also located within the boundaries of the Southwest Crown of the Continent Collaborative Forest Landscape Restoration Project identified as a priority landscape under the Collaborative Forest Landscape Restoration Program (CFLRP). The purpose of CFLRP is to encourage the collaborative, science-based ecosystem restoration of priority forest landscapes.

# HISTORIC CONDITIONS

Fire has been the most influential disturbance factor in the Upper Swan Valley since the end of the last glacial period (Arno et al. 1995; Ayres 1900; Barrett 1998, 2002; Freedman et al. 1985). Fires were frequent in the Upper Swan Valley until the early 1900s, with the earliest fire evidence dating from about 1241 A.D. Barrett (Barrett 1998) reported that 1768, 1814, 1850, 1889, 1919, 1929 were important fire years in the area. Fire occurred about every 20 years (range of 6 to 50 years) between 1687 and 1919, with the last major fire occurring in 1919. A fire in 1898 between Barber Creek and Cooney Creek converted a large area of western larch, ponderosa pine, and Douglas-fir to dense stands of lodgepole pine (Swan Ecosystem Center 2004). The 1919 fire(s) burned approximately 25,000 acres near Lindbergh Lake and to the north; with approximately 8,000 acres occurring in the Beaver Creek Project Area. These fires were mostly stand replacing and occurred during a regional drought (Barrett 2002). No other large fires have occurred in the project area since 1919. Recent wildfires have been managed for full suppression and have been kept to less than 100 acres, with the majority being less than 10 acres. Map 3-2 displays the approximate locations of some of the major fires in those years within the project area.

These past fires in the Upper Swan Valley were the result of natural causes (lightning) and traditional burning by Indians (Arno et al. 1997; Ayres 1900; Barrett 1998, 2002; Barrett et al. 1982). Most Indian fires occurred in the valley grasslands and lower-elevation forests dominated by ponderosa pine, Douglas-fir, and western larch. These fires were likely ignited to improve big game browse, berry production, food gathering and hunting, improved travel, communication and horse grazing (Barrett et al. 1982).

H. B. Ayres recorded observations of the Swan Valley in 1899 during his mission to survey the timber of the then Lewis and Clark Forest Reserve. His journals describe large expanses of the Swan Valley dominated by large trees of ponderosa pine, Douglas-fir, and western larch grown in an open canopy on the valley, benches and foothills, and denser stands of shade-tolerant species on the stream bottoms and high elevations.

"The lands of the upper valley, where the rather scant covering of larch and lodgepole pine at first gives the impression of very poor soil, but upon close examination it is found that the sparseness of tree growth is largely due to frequently occurring fires which have thinned the forest." (Ayres 1899)

Although no fires greater than 100 acres have occurred in the Beaver Creek Project Area since 1919, there have been several recent fires in the Upper Swan Valley. In 1953, 167 acres burned south of Lower Cold Lake followed in 1998 by the Cold Lake Fire (64 acres) and the Jim Lake #3 fire (64 acres). Other fires occurred to the south. The Herrick Run fire burned approximately 780 acres on the western shore of Lindberg Lake in 1953. This fire started near the shore, burned upslope, and was primarily a high-severity (stand replacing) fire. In the summer of 2003, the Crazy Horse Fire burned approximately 11,000 acres at the head of Kraft Creek, north of Lindbergh Lake. The Holland Peak Fire burned roughly 1,600 acres on the east side of the Swan Valley 10 miles northeast of the Beaver Creek Project Area in the summer of 2005. The Condon Mountain Fire burned 5,480 acres 13 miles northeast of the project area in 2013. These fires are the most recent large fires in the Upper Swan Valley. In 2008, a smaller Lindbergh Lake Fire burned upslope consuming 64 acres on the west side of the lake. These most recent fires had considerable areas of high severity, but also areas of low severity creating a mixed mosaic of burned areas and live forest stands (See Chapter 3 Fire/Fuels for more discussion).

Long-term fire exclusion and other factors have promoted a shift toward a stand-replacement fire regime across a broad area in the Upper Swan Valley (Arno et al. 1995; Barrett 1998; Hart et al. 1994).

"From at least 1600 to 1900, nonlethal and mixed severity fires were very frequent in relatively dry stands occupying the upper Swan Valley, including riparian zones. Fires were frequently caused by lightning and Indians. However, long-term fire exclusion during the past 100 years has substantially disrupted area fire cycles, producing fundamental changes in the valley's lower elevation forests. Whereas the pre-1900 stands were dominated by early seral species, shade tolerant species now dominate the understories of many fire-excluded sites. Stand structures have also often changed since 1900. Tree densities in the ponderosa pine-larch dominated stands have shifted from relatively light- to moderately heavy stocking, greatly increasing the level of tree competition and ladder fuels." (Barrett 1998)

Outbreaks of bark beetles have occurred in or near the project area in the past. Multiple outbreaks of mountain pine beetle (*Dendroctonous ponderosae*) attacking lodgepole, ponderosa and whitebark pines have been recorded, with the earliest written description provided by Ayres (Ayres 1898). Mountain pine beetle outbreaks occurred in the Swan Valley throughout the 1980s and more recently in 2010 to 2012, when aerial detection and field reconnaissance in the Swan Valley identified another mountain pine beetle outbreak was occurring (Chapter 3, Forest Vegetation provides more detailed discussion).

A well-documented spruce bark beetle (*Dendroctonus rufipennis)* epidemic occurred in the Swan Valley following a large-scale wind event in 1949 (Project File Exhibit U-1). Douglas-fir beetle (*Dendroctonus pseudotsugae)* populations are increasing in the vicinity of the project area. White pine blister rust *(Cronartium ribicola)* has been documented in the Swan Valley since its introduction in 1910 and has had a dramatic effect on forest composition. Proportions of western white pine in the mid-lower elevations and whitebark pine in the upper elevations have been significantly reduced by this disease and occurrence of these species is now much diminished compared to historical conditions.

Approximately 5,487 acres within the project area were formerly owned by the Plum Creek Timber Company (PCTC) and managed for commercial timber production. The Flathead National Forest began acquiring former PCTC lands starting in 1998 through the Land and Water Conservation Fund (LWCF), with the final acquisition in the project area occurring in 2012 with the Montana Legacy Lands donation. These acquired lands were managed for timber production on an industrial scale prior to acquisition by the Forest Service and are in various stages of regeneration. These parcels were largely naturally regenerated and are now stocked primarily with lodgepole pine and Douglas-fir, which are not favored for fire resiliency.

Other natural and human-induced disturbance factors have influenced forest vegetation in and around the project area, including wind, invasive species, residential development, transportation systems, grazing, and timber harvest across all ownerships (See Chapter 3 for a list of past, present, and reasonably foreseeable actions in the project area).

# EXISTING CONDITIONS

Existing conditions were compiled from findings of stand diagnoses, field assessments, and input received from the public including the Upper Swan Valley Landscape Assessment (Project File Exhibit U-1) and a 2012 landscape assessment prepared for the Southwestern Crown Collaborative (SWCC) Landscape (Project File Exhibit U-2) which includes the Beaver Creek Project Area.

## FOREST VEGETATION EXISTING CONDITIONS

Areas within the Beaver Creek Project Area have fuel accumulations that are conducive to creating high-severity wildfire. Surface fuels, standing dead, and standing live fuels (including ladder fuels) are moderate to high over much of the Beaver Creek Project Area. Under 97$^{th}$ percentile weather conditions (extreme fire danger conditions), models show the potential for an unplanned ignition to quickly transition to a passive or active crown fire, which would pose a significant risk to residences adjacent to Lindbergh Lake and surrounding area, as well as residences along Highway 83 on the northeast side of the project area.

Approximately 5,453 acres, or 15 percent, of the Beaver Creek Project Area was identified as part of the Wildland Urban Interface (WUI) by the 2013 Seeley-Swan Community Wildfire Protection Plan. Current fuel conditions within the project area threaten structures on private property, as well as large-diameter ponderosa pine, western larch, and Douglas-fir trees, referred to as legacy trees, that are found throughout the project area.

Fuel conditions within the Mission Mountains Wilderness (MMW) also show accumulations that would likely result in a high-severity wildfire with the potential to quickly burn into the WUI area. Fire suppression fire policy has created an unnatural fire regime within the MMW, which makes it difficult, if not impossible, for fire managers to consider allowing lightning-caused wildfires to burn in the MMW as wilderness administration direction recommends (FSM 2320.2).

Portions of the project area have high numbers of dead and dying trees, which are contributing to high fuel loadings and potential for high intensity, stand-replacing fires. Overstocking in other stands is causing low vigor and increased susceptibility to insect and disease. Areas containing large, older trees of late-seral species are overstocked with in-growth of late-seral, shade-tolerant species. This in-growth is creating significant ladder fuels that jeopardize the large-tree component on the landscape.

Invasive plant species are a concern throughout the project area, with roads serving as primary corridors for infestation. It is estimated that invasive plant species began their spread on forest lands around 1960 with an increase in timber harvest without mitigation measures in place. The lands that were acquired from private timber companies also show high levels of non-native plant infestations.

## WILDLIFE HABITAT EXISTING CONDITIONS

Reducing road densities can minimize grizzly bear displacement from motorized activity and decrease mortality risk from human conflict. Flathead National Forest Plan Amendment 19 sets road density and security objectives for the Beaver Creek Bear Subunit. Presently, values for grizzly bear security in the Beaver Creek Grizzly Bear Subunit are:

- 6 percent of subunit contains open route density (ORD) >1 mi/mi$^2$;
- 26 percent of the subunit contains total route density (TRD) >2 mi/mi$^2$;
- 66 percent of the subunit contains security core in blocks greater than 2,500 acres in size.

## AQUATIC EXISTING CONDITIONS

Fisheries surveys have found the majority of the Beaver Creek watershed is dominated by non-native fish. However, the outlet stream of Beaver Lake has a small population of 99 percent pure Westslope cutthroat trout that has not yet been invaded by non-native fish. The remainder of the project area (above Lindbergh Lake) offers bull trout critical habitat and also hosts a 99 percent pure cutthroat trout population.

Habitat surveys have found Beaver Creek has sufficient large woody debris, sufficient numbers of pools, and there is no indication of excessive sedimentation. However, trend data suggests the depths of the pools are decreasing and the channel is widening. Beaver Creek also has warmer temperatures than ideal, therefore, could become especially vulnerable to climate change.

## ACQUIRED LANDS EXISTING CONDITIONS

The Beaver Creek Project Area includes lands that were formerly owned by the Plum Creek Timber Company (PCTC). The Forest Service assumed ownership of these lands through two different processes. Between 1998 and 2006, the Forest Service acquired approximately 3,180 acres of land in the project area through the Land and Water Conservation Fund (LWCF). Starting in 2008, The Nature Conservancy (TNC) transferred approximately 2,331 acres in the project area to the Forest Service through the Montana Legacy Project (Project File Exhibit O-5). These lands were formerly managed for industrial timber production and the majority of these lands are extensively roaded with forest stands in various stages of reforestation. Although these lands are guided by forest-wide standards and guidelines under the 1986 Flathead Forest Plan, they currently do not have management areas assigned.

# DESIRED CONDITIONS

A desired condition is a description of specific social, economic, and/or ecological characteristics toward which management of the land and resources should be directed. The desired conditions are described by the Flathead National Forest Land and Resource Management Plan as amended (Forest Plan), national and regional direction, as well as public input, all of which provide the parameters for identifying and defining project-specific desired conditions.

The Forest Plan embodies the provisions of the National Forest Management Act (NFMA), its implementing regulations, and other guiding documents. The Forest Plan sets forth in detail the direction for managing the land and resources of the Flathead National Forest through forest-wide resource goals and objectives. The Forest Plan also establishes desired condition through the designation of management areas, which will be discussed in greater detail in Chapter 2.

## FOREST VEGETATION DESIRED CONDITIONS

The Flathead National Forest Plan includes the following goals for forest vegetation resources that are particularly relevant to the Beaver Creek Project Area (Forest Plan Amendment #21, pp. 9-15):

- Maintain or actively restore landscape composition, structure and patterns to a condition similar to that expected under natural disturbance and succession regimes. Manage landscape patterns to develop larger old growth patch sizes where needed to satisfy wildlife habitat requirements.
- Manage landscape composition and patterns to reduce the risk of undesirable fire, insect and pathogen disturbances.
- Where fuel conditions and potential fire regimes have been significantly affected by fire exclusion and timber management, manage landscape fuel conditions (amounts and spatial arrangement) to restore the historical fire regime and reduce the risk of undesirable fire events. Emphasize this objective in areas where wildland interface with urban and rural areas of private property.
- Restore fire dependent ecosystems to meet wilderness fire management objectives set forth in the Forest Service Manual (FSM) 2324.21. One of the wilderness fire management objectives is to reduce to an acceptable level, the risks and consequences of wildfire within the wilderness or escaping from the wilderness.
- Manage mid-seral stands to maintain the composition and structure expected under native succession and disturbance regimes. In all potential vegetation groups (PVGs are groupings of similar habitat types), maintain sufficient mid-seral stands to allow for recruitment of old-growth within the historical range of variability. Emphasize old growth development in stands that are most likely to persist under native disturbance regimes, and that provide a patch size and pattern most advantageous to old-growth associated wildlife species.
- In warm-moist, cool-moist, and cold-moist PVGs, manage mixed-confer stands to reduce tree density where needed, to increase the proportion of shade-intolerant species, such as western larch, western white pine, Douglas-fir, and ponderosa pine, and to promote development toward old growth. Manage mid-seral lodgepole pine dominated stands to reduce the risk of epidemic levels of mountain pine beetle and large-scale stand replacement fires, especially where wildlands interface with urban and rural areas.

Invasive plants are a problem throughout the Flathead National Forest as a consequence human activities. Desired conditions for noxious weeds in the Beaver Creek Project Area are for a net reduction of existing infestations and no new weed spread due to project activities.

## WILDLIFE HABITAT DESIRED CONDITIONS

The Northern Rockies Lynx Management Direction (NRLMD) provides parameters for conservation and recovery of Canada lynx. The Beaver Creek Project will be consistent with the NRLMD. Snowshoe hare select dense sapling or multistory stands for hiding cover. The NRLMD does not include any required direction for creating lynx multistory forage; however, reducing density in stands at the stem exclusion stage would promote dense understories that may increase lynx multistory forage over time. Multistory Canada lynx habitat is currently at 35 percent in the Lower Beaver Lynx Analysis Unit (LAU), while the desired condition of multistory lynx foraging habitat in the Lower Beaver LAU is 37 percent.

Grizzly bear populations are currently above the recovery goals and appear to be growing at an annual rate of 3 percent. However, reducing road densities can minimize grizzly bear displacement from motorized activity and decrease mortality risk from human conflict. Forest Plan Amendment 19 establishes numerical objectives for Open Motorized Route Density (OMRD), Total Motorized Route Density (TMRD), and Security Core. The Beaver Creek Project occurs on Grizzly Bear Management Situation (MS) 1 lands, which provide direction to favor the needs of the grizzly bear. Desired conditions for grizzly bear security in the Beaver Creek Project Area are:

- 19 percent or less of subunit contains OMRD >1 mi/mi$^2$;
- 19 percent or less of the subunit contains total motorized road density TMRD >2 mi/mi$^2$;
- 68 percent or more of the subunit contains security core in blocks at least 2500 acres in size.

### AQUATIC DESIRED CONDITIONS

The Forest Plan seeks to maintain the viability of native species (pp. II-5). Forest Plan Amendment No. 3 further seeks opportunities to recover Westslope cutthroat trout in streams without non-native trout. The Memorandum of Understanding (MOU) for cutthroat trout management in Montana also seeks to secure pure or nearly pure cutthroat trout populations from future invasions (the Northern Region signed this MOU). Providing adequate passage for all aquatic organisms (where desirable) is a regional standard.

The Inland Native Fish Strategy (INFISH) amendment to the Forest Plan seeks to maintain natural instream flows and habitat that supports native populations. The Inland Native Fish Strategy also provides riparian management goals for pool frequency, large woody debris frequency, stream channel shape, and water temperature.

### ACQUIRED LANDS DESIRED CONDITIONS

The Flathead National Forest is in the process of revising its Forest Plan to update management direction on NFS lands. The Forest Plan Revision process will propose updated management area designations for all lands on the Flathead National Forest, including those on the Swan Lake Ranger District. Interim management areas will be assigned to acquired lands to guide vegetation and aquatic restoration activities, including road management, as part of the Beaver Creek Project.

## ECOLOGICAL RESTORATION ON NATIONAL FOREST SYSTEM LANDS

Ecological restoration is the goal of the Beaver Creek Project. This is consistent with national and regional USDA Forest Service policy, recommending that ecological restoration will be the central driver of wildland and forest stewardship (USDA 2012b). This is of strategic importance because NFS lands are the backdrop and neighbor to many communities, providing a broad range of value and benefits, including clean drinking water, vital wildlife habitat, recreation opportunities, and other ecosystem services. Management activities proposed on NFS lands are intended to sustain the ability of these lands to deliver the full range of ecosystem services, or benefits people obtain from an ecosystem, for generations to come. This ability is increasingly at risk due to the effects of a potentially changing climate, invasive species, and other ecological stressors affecting national forests.

To address these needs, the Forest Service has adopted a series of actions allowing for increases in the pace of restoration efforts, including, but not limited to:

- Expanding collaborative landscape partnerships;
- Implementing a new forest planning rule;
- Implementing the Watershed Condition Framework;
- Implementing the Forest Service bark beetle strategy;
- Expanding stewardship contracting; and
- Expanding markets for forest products generated by restoration projects.

The Forest Service adopted the definition of restoration as follows:

*Restoration* is the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed (Society for Ecological Restoration International Science & Policy Working Group 2004).

Ecological restoration focuses on re-establishment of the composition, structure, pattern, and ecological process necessary to facilitate terrestrial and aquatic ecosystem sustainability, resilience, and health under current and future conditions (USDA 2012a). A restored ecosystem should be able to sustain itself indefinitely with minimal intervention when natural disturbance patterns are present. In some cases, active management may be required, such as prescribed burns, in fire-adapted ecosystems or treatment of invasive plant species to restore native plant species. Within normal ranges of environmental stress and disturbance, restored ecosystems should be inherently resilient, in that they have the ability to absorb disturbance and adapt to stress and change (USDA 2006b).

As stated in the Forest Service Manual (FSM):

“The aim is to re-establish and retain ecological resilience of National Forest System lands and associated resources to achieve sustainable management and provide a broad range of ecosystem services. Healthy, resilient landscapes will have greater capacity to survive natural disturbances and large scale threats to sustainability, especially under changing and uncertain future environmental conditions, such as those driven by climate change and increasing human uses” (FSM 2020.2).

Restoration of degraded lands means rebuilding functional ecosystems, but not necessarily restoring sites to resemble their historical condition at a single point in time. Management activities do not propose to return ecosystems to a specific historic condition, but to move them towards a historic range of variability and towards resiliency in the face of current and projected disturbance regimes.

## COLLABORATIVE FOREST LANDSCAPE RESTORATION PROGRAM

Congress established the Collaborative Forest Landscape Restoration Program (CFLRP) with Title IV of the Omnibus Public Land Management Act of 2009 (PDF, 40 KB). The purpose of the CFLRP is to encourage the collaborative, science-based ecosystem restoration of priority forest landscapes. Secretary of Agriculture Tom Vilsack has underscored the overriding importance of forest restoration by calling for “complete commitment to restoration” by pursuing an “all lands approach to forest restoration” and close coordination with other landowners to encourage collaborative solutions through landscape-scale operations. The CFLRP encourages land management activities that will:

- encourage ecological, economic, and social sustainability;
- leverage local resources with national and private resources;
- facilitate the reduction of wildfire management costs, including through re-establishing natural fire regimes and reducing the risk of uncharacteristic wildfire;

- demonstrate the degree to which various ecological restoration techniques achieve ecological and watershed health objectives; and,
- encourage utilization of forest restoration by-products to offset treatment costs, to benefit local rural economies, and improve forest health.

In 2010, SWCC was identified as a priority landscape and became eligible for funding through the CFLRP to fund activities on NFS lands within the target landscape that contribute to the Southwestern Crown of the Continent Landscape Restoration Strategy. Portions of the Swan Lake Ranger District on the Flathead National Forest are included in this targeted landscape. Members of the SWCC collaborative group have participated in public meetings and opportunities for public comment to express their desire to see management in the Beaver Creek Project Area consider the restoration objectives that they have identified across the SWCC landscape. The Beaver Creek Project considered these comments, as well as other public comment, as part of the NEPA process.

# NEED FOR CHANGE

The need for change derives from significant differences between the existing and desired conditions described above. The need for change in the Beaver Creek Project Area includes:

1) Fire regimes in the Beaver Creek Project Area have changed from historical conditions. In addition, the warming climate is causing the size and severity of wildfires to increase. Extensive areas of high surface fuel loading, in combination with overstocked stands, create fuel conditions that are favorable for high intensity, stand-replacing fires. There is a need to reduce hazardous fuel loading by treating NFS land within and adjacent to the WUI to reduce the potential for high-intensity fire, provide for a higher level of firefighter safety, and reduce risk to the public and adjacent private property. There is also a need to re-establish fuel conditions and fire regimes consistent with resilient landscapes.
2) Fish and wildlife habitat conditions need improvement in the Beaver Creek Project Area.
    a) Canada lynx foraging habitat could be increased and improved. Many acres in the project area exist in the stem exclusion condition and would likely not provide for multi-story forage habitat for the foreseeable future without treatment.
    b) Opportunities exist for reducing motorized access density and increasing grizzly bear security core habitat, which would also benefit Canada lynx, big game, and other wildlife species.
    c) Changes in fire regimes have decreased the frequency of disturbances that create a mosaic of forage and cover to benefit wildlife. Within the Beaver Creek Project Area, there is a need to create a mosaic of habitats that can provide hiding cover and enhance shrub and huckleberry production to improve habitat for big game and grizzly bear.
    d) In a recent, nation-wide Watershed Condition Framework evaluation, the Beaver Creek Watershed was identified as “Functioning, at Risk.” This watershed has good water quality, but restoration is needed to reduce road density, restore wetlands, address forest health concerns, and reduce terrestrial weed infestation.
    e) Fisheries surveys have found the majority of the Beaver Creek Watershed is dominated by non-native fish. However, the outlet stream of Beaver Lake has a small population of 99 percent pure Westslope cutthroat trout that has not yet been invaded by non-native fish. A small debris jam seems to have stymied invasion for now. This small population needs a barrier to prevent a future invasion when the debris jam collapses.

f) Habitat surveys show that Beaver Creek has sufficient large woody debris. Most locations also have sufficient numbers of pools, and there is no indication of excessive sedimentation, but trend data suggests the depths of the pools are decreasing and the channel is widening. Beaver Creek also has a warmer than ideal temperature and, thus, will become especially vulnerable to climate change. It would be desirable if Beaver Creek trends towards deeper pools and narrow channels, allowing fish to escape thermal stress.

g) The culvert on NFS road #9658 at the outlet of Beaver Lake provides only marginal fish passage. It blocks all fish at high flows and blocks juvenile fish the rest of the year. Fish passage is desirable in this location.

3) Many stands in the Beaver Creek Project Area are overstocked causing low vigor, increased susceptibility to insect and disease, and in some cases significant mortality. There is a need for vegetation treatments that would reduce stand densities, alter species composition, reduce high fuel loadings, modify fuel arrangements, and thereby reduce potential for high intensity, stand-replacing fires.

   a) Extensive areas containing large, older trees of late-seral species, legacy trees, are in a condition of overstocking with in-growth of late-seral, shade-tolerant species. These latter are creating significant ladder fuels that jeopardize the large-tree component on the landscape. Ladder fuels need to be reduced in order to reduce potential loss of the legacy tree component across the landscape.

   b) Whitebark pine and western white pine in the project area are being negatively impacted by a combination of white pine blister rust (an introduced disease) and mountain pine beetle, and have been substantially reduced over their native range. There is need and opportunity to restore both species in the Beaver Creek Project Area.

4) Areas of wetlands and riparian zones within the Beaver Creek Project Area have been negatively impacted by human activities and need remediation or restoration.

   a) Some roads are contributing undesirable runoff and sedimentation into stream channels and wetland areas. These conditions need to be remediated through a combination of road decommissioning, reclamation, and implementation of BMPs

5) Invasive plants exist in the project area from past management activities and may be transported into new areas due to public use and/or management activities. There is a need to reduce existing infestations and prevent the spread of new weeds into the area as a result of project activities.

6) Former PCTC lands have been acquired in the Beaver Creek Project Area. There is a need to assign interim management area direction to acquired lands in the Beaver Creek Project Area until the revised Flathead Forest Plan takes effect, which is expected to occur sometime in the next 2 years.

## PURPOSE AND NEED

The purpose and need of this project was designed to address the need for change identified above by proposing management activities to accomplish the following:

1) Reduce the risk of uncharacteristic wildfire[1] by:

    a. Reducing stocking in forest stands within the WUI and along strategic fuel breaks to protect private property and provide for firefighter safety

    b. Modifying fire behavior by promoting fire resistant stands appropriate for the fire regimes found in the Beaver Creek Project Area.

    c. Maximizing retention of large fire resistant and legacy trees, as appropriate to the forest type, to promote fire resilient stands.

    d. Implementing some recommendations of the Seeley-Swan Community Wildfire Protection Plan to reduce fuels near and adjacent to private land and residences within the WUI.

2) Improve fish and wildlife habitat, including that for endangered, threatened, and sensitive species by:

    a. Protecting and creating lynx habitat by treating stem exclusion stands to recruit dense patches of understory vegetation;

    b. Protecting and enhancing wildlife connectivity along ridges, waterways, and other appropriate geologic features across the watershed;

    c. Enhancing or restoring whitebark pine stands;

    d. Managing the transportation system in order to reduce Total Road Density and increase the percentage of the area in Grizzly Bear Core Habitat;

    e. Designing management activities, such as thinning or burning to increase shrub and huckleberry production;

    f. Protecting a westslope cutthroat trout population in the outlet stream of Beaver Lake, by preventing non-native species invasion.

3) Improve forest health, forest composition, spatial arrangement, structure, and ecological resilience by:

    a. Maintaining and enhancing biodiversity in the project area by employing prescriptions that enhance or maintain spatial heterogeneity, or the uneven distribution of species and size classes, within individual stands and across the landscape;

    b. Reducing understory in-growth in stands containing large, healthy legacy trees, especially western larch and to a lesser extent, ponderosa pine;

    c. Reducing stocking in stands where densities are high to promote tree vigor, alter species composition, and to reduce stand susceptibility of loss due to insect attack and disease;

    d. Regenerating stands heavily affected by current and past mountain pine beetle infestations with fire adapted early seral species;

[1] Uncharacteristic wildfire is extreme fire behavior resulting from the product of effective fire suppression during the last century, ingrowth of trees, and accumulation of dead woody fuels. Exclusion of fire and disruption of native fire regimes has caused dramatic changes in vegetation structure and fuels compared to conditions in the 19th century. These changes contribute to larger and more extreme fires and reduce the effectiveness of fire suppression efforts (Finney et al. 2003).

   e. Restoring health and vigor of western white pine and whitebark pine through daylighting; re-establishing both species on suitable sites using rust-resistant planting stock.

4) Maintain or improve water quality and watershed hydrologic function by:
   a. Decommissioning, rehabilitating, or maintaining roads with BMPs consistent with management needs;
   b. Addressing forest health, road densities and invasive plant species sufficiently to improve the Watershed Condition Framework rating for Beaver Creek.
5) Prevent and/or control invasions of non-native plants by:
   a. Treating along roads where invasive plants are present;
   b. Preventing new infestations of invasive plants;
   c. Preventing aquatic invasive species.
6) Benefit the local economy by:
   a. Providing local employment or training opportunities through contracts, grants, or agreements;
   b. Utilizing local contractors to support economic sustainability;
   c. Utilizing woody biomass and small-diameter trees produced from the project;
   d. Capturing the value of convertible products resulting from forest health and fuels treatments, especially those declining in value due to forest health issues.
7) Provide clear direction the for the interim management of former PCTC lands acquired in the Beaver Creek Project Area (to accomplish the restoration needs on the landscape) until the revised Flathead Forest Plan takes effect, anticipated within the next 2 years.

# PROPOSED ACTION

The Swan Lake ID Team has identified the following management activities to move toward desired conditions in the Beaver Creek Project Area (See Maps 2-1, 2-2, 2-3, 2-4, and 2-5).

- Silvicultural treatment on 3,644 acres. Approximately 2,351 acres of silvicultural treatments have a commercial component and 1,293 acres of silvicultural treatments without a commercial component. An estimated 2,783 acres of fuels reduction are within the WUI.
- Harvest activities implemented using tractor and cable logging systems. Pre-commercial thinning and daylighting activities will be conducted using mechanical and hand treatments.
- Slash treated through a combination of the following: whole tree yarding, mechanical, piling, and lop and scatter. Fuel accumulations at landings addressed through burning, chipping/masticating, and/or removal from NFS lands. Opportunities for utilization of residual slash will be considered where feasible.
- Approximately 1,104 acres of prescribed burning in the Mission Mountains Wilderness and an estimated 679 acres of prescribed burning within the WUI. Prescribed fire treatments include broadcast burning and aerial ignition.

- Four fish barriers designed to protect 99 percent genetically pure westslope cutthroat trout populations in the project area.
- Treatment units accessed through an estimated 7.5 miles of temporary road construction. National Forest System roads used for road haul.
- Road reclamation on 17.08 miles of road, with decommissioning proposed on an estimated 4.5 miles of road and intermitted stored service on 12.58 miles of road.
- An estimated 49.69 miles of road will be evaluated for BMPs and applied as necessary.
- All activities comply with the SVGBCA and Flathead National Forest Plan Amendment 19: Objectives and Standards for Grizzly Bear Habitat Management.
- Approximately 110 acres of silvicultural treatments are proposed within Riparian Habitat Conservation Areas (RHCAs) to reduce ingrowth and ladder fuels adjacent to large legacy trees.
- No road construction or harvest activities to occur within water howellia occupied or unoccupied (300 feet) pond buffers.
- Assign management areas to lands acquired by the USDA Forest Service.

# PROJECT SCOPE

## SCOPE OF THE PROPOSED ACTION

The Proposed Action would result in stewardship or timber sales that are expected to be sold in 2017. Harvest activities are anticipated to be completed within a 3-year time frame. The Beaver Creek Grizzly Bear Subunit, where the Beaver Creek Project is proposed, is “Active” from 2015 through 2017, and becomes “Inactive” again in 2018. If contract extensions result in sale activities extending beyond 2017 in the Beaver Creek Grizzly Bear Subunit, into the time period when the grizzly bear subunit is “Inactive,” then standards and guidelines for an “Inactive” grizzly bear subunit would be followed, as per the SVGBCA. All roads used would be managed consistent with the requirements of the SVGBCA.

Post-harvest activities, such as burning, should be completed 1 year following harvest activities. Reforestation activities would be completed no more than 5 years after logging is completed in each unit. Other non-ground disturbing management activities would be completed by 2027.

## SCOPE OF THE ANALYSIS

The Council on Environmental Quality (CEQ) regulations implementing the NEPA require that all Federal agencies consider the following three types of actions to determine the scope of the analysis (40 CFR 1508.25).

### CONNECTED ACTIONS

Connected actions include closely-related actions that automatically trigger other actions that may require NEPA analysis; cannot or would not proceed unless other actions taken previously or simultaneously, or are interdependent parts of a larger action and depend on the larger action for their justification. These actions are part of the Proposed Action and include all activities needed to complete the proposed project and provide for resource protection during and after project completion. Connected actions contained in the proposed action include, but are not limited to the following:

- Temporary road construction and rehabilitation;

- Non-native invasive plant species control;
- Post timber sale activities (e.g., burning, piling, etc.);
- Tree planting and monitoring of reforestation success;
- Best Management Practices;
- Design Criteria (Table 16);
- Monitoring of activities and the results of treatments (e.g., Soils impacts, weeds, etc.).

### SIMILAR ACTIONS

Similar actions are actions with similarities to other actions that provide a basis for evaluating their environmental consequences, such as similar timing or geography. A number of these actions have been identified and evaluated in the analysis of environmental consequences (EA, Chapter 3). These are current and reasonably foreseeable actions described in the following section on cumulative actions.

### CUMULATIVE ACTIONS

Cumulative actions are past, present, and reasonably foreseeable actions that may have cumulatively significant impacts when considered with the Proposed Action. The effects of these actions on NFS lands have been evaluated in the environmental analysis of the Proposed Action and its alternatives. Actions considered in the cumulative effects analysis are presented in more detail in Chapter 3.

## PERMITS

The following permits may be required prior to project implementation in order to ensure Federal and State laws are met:

- **Montana Streamside Protection Act (SPA 124 PERMIT)** - Any project including the construction of new facilities or the modification, operation, and maintenance of an existing facility that may affect the natural existing shape and form of any stream or its banks or tributaries (Montana Department of Fish, Wildlife, and Parks).
- **Federal Clean Water Act (SECTION 404 PERMIT)** – Any activity that will result in the discharge or placement of dredged or fill material into waters of the United States, including wetlands (U.S. Army Corp of Engineers).
- **Short-term Water Quality Standard for Turbidity (318 AUTHORIZATION)** – Any activity in any State water that will cause unavoidable short-term violations of water quality standards. "State water" includes any body of water, irrigation system, or drainage system, either surface or underground, including wetlands, except for irrigation water where the water is used up within the irrigation system and the water is not returned to other state water (Montana Department of Environmental Quality).
- **Storm Water Discharge General Permits**– Any person, agency, or entity, either public or private, proposing a construction, industrial, mining, or other defined activity that has a discharge of storm water into surface waters. Under the authority of the Montana Water Quality Act, permit authorization is typically obtained under a Montana Pollutant Discharge Elimination System (MPDES) "General Permit" (Montana Department of Environmental Quality).

# APPLICABLE LAWS AND EXECUTIVE ORDERS

A partial list of Federal laws and Executive Orders (EO) pertaining to project specific planning and environmental analysis on Federal lands follows. While most pertain to all Federal lands, some of the laws are specific to Montana. Disclosures and findings required by these laws and orders are contained in Chapter 3 of the EA.

- Multiple-Use Sustained Yield Act of 1960.
- National Historic Preservation Act of 1966 (as amended).
- National Environmental Policy Act of 1969 (as amended).
- Clean Air Act of 1970 (as amended).
- Endangered Species Act of 1973 (as amended).
- Forest and Rangeland Renewable Resources Planning Act of 1974 (as amended).
- National Forest Management Act of 1976 (as amended).
- Clean Water Act of 1977 (as amended).
- American Indian Religious Freedom Act of 1980.
- Archeological Resource Protection Act of 1980.
- Cave Resource Protection Act of 1988.
- Executive Order 11593 (cultural resources).
- Executive Order 11988 (floodplains).
- Executive Order 11990 (wetlands).
- Executive Order 12898 (environmental justice).
- Executive Order 12962 (aquatic systems and recreational fisheries).
- Omnibus Public Land Management Act of 2009 (Collaborative Forest Landscape Restoration Act)

# INFORMATION SOURCES

The analysis and decision processes for this project are based on the consideration of the best available science. The manner in which best available science is addressed can be found within the disclosure rationale throughout the EA, biological assessments (BA), and the project file.

# DECISION FRAMEWORK

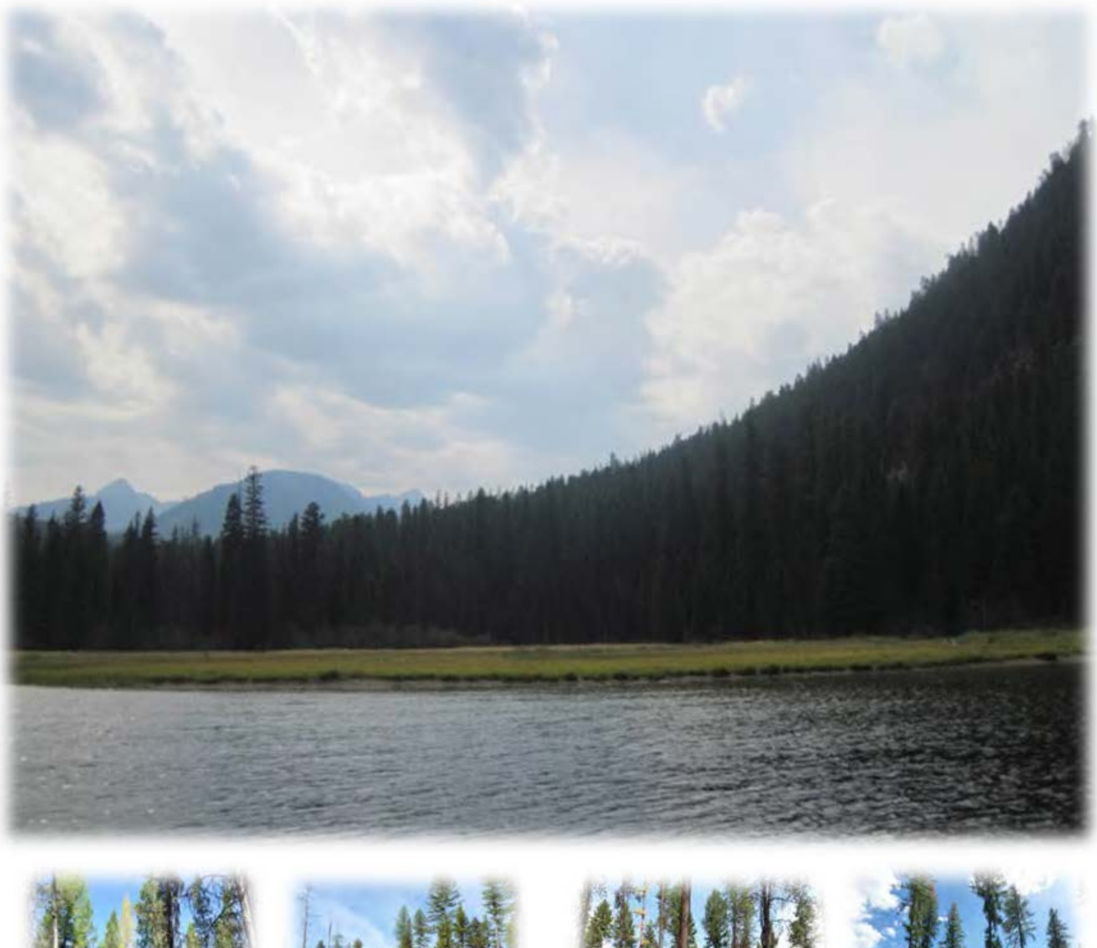
This EA is not a decision document. The EA discloses the environmental consequences of implementing the different alternatives, including the no action alternative. The Flathead National Forest Supervisor, responsible official for this project, will select an alternative based on information in this document, on public comments, and on how well the alternative meets the purpose and need for the project and complies with applicable state and federal laws, agency policy, and Forest Plan direction. This decision and its rationale will be documented in the Decision Notice. Decisions to be made include:

- The extent and timing, if any, of forest management activities;
- Resource protection measures;
- Appropriate monitoring requirements to evaluate project implementation.

# Final Environmental Assessment - Beaver Creek Landscape Restoration Project

## Chapter 2 – Alternatives Considered

**Swan Lake Ranger District, Flathead National Forest, Missoula County, Montana**



# Chapter 2
# Alternatives Considered

## INTRODUCTION

This chapter describes the public involvement process for the development of the proposed action. It describes the “key issues” that were identified by the public and the ID Team during the scoping process and used to develop alternatives. This chapter compares the alternatives considered for the Beaver Creek Landscape Restoration Project. The ID Team grouped the alternatives into one of two categories depending upon how they met the purpose and need for the project:

1. Alternatives considered in detail.
2. Alternatives not considered in detail.

Rationale is provided for those alternatives not studied in detail.

This chapter also includes a description and maps of the alternatives considered and a comparison of these alternatives focusing on the key issues. This comparison of alternatives provides a basis for the decision maker to make a choice among the options and to inform the public (40 CFR 1502.14).

## PUBLIC INVOLVEMENT

The CEQ defines scoping as:

> “… an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action.” (40 CFR 1501.7)

Among other things, the scoping process is used to invite public participation, to help identify public issues, and to obtain public comment during the EA process. Scoping should begin early and continue until a decision is made. To date, the public has been invited to participate in the following ways.

### PUBLIC INPUT INTO THE DEVELOPMENT OF THE PROPOSED ACTION

The Swan Lake Ranger District invited the public to collaborate with the ID Team in the development of the Beaver Creek Landscape Restoration Project (Beaver Creek Project). The Beaver Creek Project is also located within a landscape designated under the Collaborative Forest Landscape Restoration Program (CFLRP) as part of the Southwest Crown of the Continent (SWCC). The ID Team worked with the public, including members of the SWCC, through public meetings, written comment, and conversation with specialists to identify restoration opportunities and the need for change in the project area.

On May 2, 2012, at the Swan Valley Community Hall, the Forest Service invited property owners within a mile of the Beaver Creek Project boundary and other interested members of the public to provide input that would guide project development and potential management activities on NFS lands in the project area.

On December 4, 2013, the Forest Service held another meeting at the Swan Valley Community Hall to discuss the collaborative assessment that the Swan Lake Ranger District was conducting to identify restoration opportunities in the Beaver Creek Project Area. At this meeting, District representatives presented the need for action and asked the public to help them prioritize need for change statements that would help drive the purpose and need for a project.

At the December 4, 2013, meeting, the District also invited participants to take part in a Talking Points Collaborative Mapping exercise to provide site-specific comments on an interactive web-based map of the project area. The District sought to use the Talking Points Collaborative Mapping tool to enhance collaboration with the public by sharing resource information with the public to increase the public's understanding of the complexity of resource management and gather site-specific or area-specific comments through the use of maps. The Talking Points Collaborative Mapping tool was available on the Flathead National Forest, Swan Lake Ranger District website and accepted public comments from December 2013 through January 2014.

During the development of the proposed action, ID Team members talked with members of the public about the project area via phone calls, field visits, and on occasion, joined members of the public on field trips into the project area at their request.

The ID Team used the information gathered during their field review and the public input they received from meetings, online comments, written comments, and personal conversations with the public to develop a Proposed Action for the Beaver Creek Landscape Restoration Project. The activities shown in this Proposed Action serve as a potential starting point to address the need for change that was identified and prioritized in collaboration with the public.

## MAILING OF THE PROPOSED ACTION

On March 15, 2014, a packet of information containing maps, the Proposed Action, and a request for comments for the Beaver Creek Landscape Restoration Project was mailed to approximately 191 individuals, agencies, and groups (Project File Exhibit B-1).

## PUBLIC NOTICE OF THE PROPOSED ACTION

A "Request for Comments" on the Beaver Creek Landscape Restoration Project was published in *The Daily Inter Lake*, the newspaper of record, on March 17, 2014 (Project File Exhibit B-3).

Notification of this project proposal appeared in the USDA Forest Service's Schedule of Proposed Actions (SOPA) on April 1, 2014, and quarterly since that time (Project File Exhibit B-4).

The Swan Lake Ranger District received 38 responses on the Beaver Creek Proposed Action, either in the form of letters, e-mails, telephone contacts, or personal communication.

## PUBLIC INVOLVEMENT IN THE ALTERNATIVE DEVELOPMENT PROCESS

During the summer of 2014, ID Team members responded to requests from the SWCC Collaborative to participate in a meeting/field trip to review portions of the Beaver Creek Project, as well as a request from members of the Lindbergh Lake Homeowner's Association to join them at Lindbergh Lake to discuss some of the proposed treatments.

On October 14, 2014, the ID Team invited the public to a working meeting at the Swan Lake Ranger Station in Bigfork, Montana; 14 people attended the afternoon meeting. The purpose of this meeting was to identify the key issues that could drive the development of alternatives to the Proposed Action and to explore some of these potential alternatives as a group. The group discussed the development of the Proposed Action, shared the comments received on the Proposed Action, and identified some of the key issues that the group felt could be considered as an alternative either to be studied in detail or not studied in detail. The group also reviewed working drafts of potential alternatives to discuss and provide input.

## ISSUES

The ID Team reviewed and compiled a list of potential issues based upon comments from the public, organizations, and government agencies. These issues were then evaluated against the following criteria to determine the appropriate method for resolution:

- Is the issue already decided by law, regulation, or existing plans? Is it supported by scientific or factual evidence?
- Could the issue be resolved through design and location of activities in the Proposed Action or addressed through the application of Design Criteria to minimize or reduce the impact to resources?
- Could the issue be addressed by measuring the effects of different alternatives and comparing or contrasting differences between alternatives?

If none of the above criteria applied and the issue was determined to be within the scope of the decisions being made, then the issue was identified as a "key issue" and an alternative to the Proposed Action can be considered to address the issue.

## KEY ISSUES USED FOR ALTERNATIVE DEVELOPMENT

The ID Team identified the following key issues, for which an action alternative was developed:

- Wildlife habitat connectivity.
- Visual effects of vegetation treatments to the users of Lindbergh Lake.
- Vegetation management within Riparian Habitat Conservation Areas (RHCAs).

These issues were used to develop Alternative 3, which makes modifications to address each issue as is described below.

### WILDLIFE HABITAT CONNECTIVITY

The ID Team and members of the public expressed an interest in developing an alternative that would prioritize management activities that improve wildlife habitat connectivity over those that address fire behavior. Public comments asked if management activities could serve to reduce fragmentation and edge effects caused by past management activities and increase patch size and core areas to benefit bird and wildlife species. Although the Proposed Action is in compliance with Forest Plan wildlife habitat requirements, ID Team members identified opportunities to maintain and promote wildlife habitat for American marten and other mid-size carnivores within the project area and connect this habitat across the landscape.

The ID Team addressed this key issue about wildlife habitat connectivity by developing Alternative 3, which drops some proposed vegetation treatments and modifies other vegetation treatments to increase habitat connectivity for the American marten and maintain a diversity of seral stages across adjacent 4 $mi^2$ quadrants in the Beaver Creek Project Area. The goal of providing a diversity of seral stage habitats well distributed throughout the project area included providing present and future habitat for the American marten and a diversity of habitats for other wildlife species as well.

#### MEASUREMENT INDICATORS FOR WILDLIFE HABITAT CONNECTIVITY

1. **Total Habitat Area** – Proportions of the project area that provide contiguous high, medium, and low quality marten habitat.
2. **Radius of Habitat** – Average distance a marten can move from a random starting point within high quality habitat before encountering a habitat of lesser quality. This is a measure of the shape and size of high quality habitats.

3. **Nearest Neighbor Distance** – Average and range of distances from one patch of quality habitat to the next nearest patch of similar quality habitat. This is a measure of how isolated a type of habitat is across the landscape.

### Visual Effects of Proposed Treatments to Users of Lindbergh Lake

Some of the public comments received expressed concern about the potential effects to the Lindbergh Lake viewshed from the proposed vegetation treatments. Specifically, residents were concerned that activities taking place in Sections 26 and 35 would be visible from the lake and affect the character and visual quality of the landscape.

Members of the ID Team met with some concerned members of the public to discuss this key issue and consulted the Landscape Architect assigned to the team. The ID Team determined that Units 81 and 83 were the vegetation management units that were most visible from Lindbergh Lake and had the potential to affect the viewshed to users of Lindbergh Lake. It was decided that Unit 81 would be eliminated from all alternatives because of public concern about logging activities occurring upslope of residences on Lindbergh Lake. In Alternative 3, Unit 83 has been dropped from proposed activities to address the public concern for visual impacts to the viewshed from Lindbergh Lake.

#### Measurement Indicators for Visual Effects

- Inclusion of Unit 83, which could affect the viewshed from Lindbergh Lake.

### Vegetation Management within Riparian Habitat Conservation Areas

The Proposed Action proposes some management activities within RHCAs to reduce vegetative competition around "legacy" trees, a tree [usually mature or old-growth, that is retained on a site after harvesting or natural disturbance to provide a biological legacy (Helms 1998)], that are located within the RHCA buffer (See Table 16 – Design Criteria for RHCA width). The public expressed concern about activities occurring within these riparian buffers and the potential effects to native fish and the attainment of Riparian Management Objectives (RMO). Public comments also requested that an alternative be developed that would not have logging or road building within any RHCAs in the project area.

Alternative 3 drops all vegetation management and prescribed burning within the RHCAs, except for Units 460 and 491. These two units have existing roads located within the RHCA buffer. These roads have already affected the function of the RHCA, and it was determined that the activities proposed between the road and the edge of the RHCA buffer would not have any additional effects to the function of the RHCA. Unit 4222 is a fill planting unit that remains in both alternatives because of its potential benefits to the RHCA.

#### Measurement Indicators for Vegetation Management within Riparian Habitat Conservation Areas

- Acres of treatment proposed within RHCA buffers.

## Key Issues Used for Alternatives Considered but Not Studied in Detail

This section identifies several key issues that were identified from public comment, but were ultimately determined not to be studied in detail.

- No Temporary Road Construction.
- No Management Activities within the Lindbergh Lake Watershed.

- Increased Acreage of Hazardous Fuels Reduction Activities on the East Shore of Lindbergh Lake.
- Cohen Alternative.
- Fully Analyze the Proposed Action as presented to the public March 2014.

The rationale for why these key issues were not studied in detail is provided in the Range of Alternatives Section below.

## OTHER CONCERNS EVALUATED

The District Ranger evaluated other concerns that helped frame the scope of the analysis during the scoping process. These concerns were not considered key issues because they were resolved through project design and, therefore, were not used to develop alternatives analyzed in detail. These concerns are also addressed within the effects analysis by resource in Chapter 3 of this document.

### EFFECTS TO THE JOCKO TRAIL

Members of the public expressed concern that the Proposed Management Activities could have an effect to NFS trail #34, known locally as either the Jocko Trail or the Gray Wolf Trail. Comments received on the proposed action showed that local residents value the cultural and recreational character of this trail (Project File Exhibits C-10, C-13, C-16, and C-32). The ID Team looked for opportunities to minimize the effects of management activities on NFS trail #34 and other trails in the project area, by implementing Design Criteria that would protect the cultural and recreational values of the trail, while meeting the Purpose and Need for the project. Design Criteria were developed to buffer the trail from activities and minimize the effects that temporary roads might have on the trail, including temporary closures, signing for public safety during activities, and measures to protect trail integrity. Please see Table 16 at the end of Chapter 2 for Design Criteria specific to NFS trail #34 and other trails in the Beaver Creek Project Area.

### WHITEBARK PINE RESTORATION ON SUNSET RIDGE

Comments received during the development of the Proposed Action suggested that the ID Team identify opportunities to conduct whitebark pine restoration (Project File Exhibits C-22 and C-36). Field review in the project area identified opportunities to conduct whitebark pine restoration in the form of group selection cuts and daylighting, especially along Sunset Ridge on the southern boundary of the project area. The ID Team explored these opportunities for whitebark pine restoration, but found that the area along Sunset Ridge also provided valuable foraging habitat for Canada lynx. As the team weighed the potential benefits and effects to each resource, the ID Team decided that they would propose to treat some stands that did not currently contain suitable habitat for lynx foraging to promote whitebark pine restoration, and that treatment in other stands would be deferred to reduce the potential effects to lynx foraging habitat. Only 11 acres (Unit 269) of lynx stand initiation habitat would be daylighted for restoration of whitebark pine in accordance with the NRLMD in Alternatives 2 and 3. The remainder of whitebark pine treatments would not occur in lynx foraging habitat.

### OLD GROWTH FOREST AND LEGACY TREES

Commenters expressed concern over how proposed activities would affect old growth stands and old growth dependent wildlife species (Project File Exhibits C-9 and C-30). No activities would occur in old growth stands with this project. This EA describes habitat conditions for old growth associated species and snag dependent species in the analysis area Chapter 3 – Old Growth Associated Species section. The Beaver Creek Landscape Restoration Project is consistent with the NFMA and with Forest Plan Amendment 21 – Management Direction Related to Old Growth Management.

Comments were also received that expressed a desire to see management activities occur in forest stands that contained legacy trees and that these treatments should emphasize the retention of large trees while reducing the risk of stand replacing fires (Project Exhibit C-30). Activities have been proposed in stands where legacy trees have been identified and emphasize the retention of these large trees and fuels reduction in the surrounding forest stand to reduce the risk of a stand replacing fire. The stands proposed for treatment do not meet the Green et al. (Green et al. 1995, updated 2005) definition of old growth, but the prescriptions would emphasize the retention of old growth characteristics, where they exist, in these stands (Chapter 3 – Forest Vegetation and Old Growth Associated Wildlife Species).

## Range of Alternatives

The range of alternatives presented in this chapter was determined by evaluating public and internal comments, key issues, and the purpose and need for the project. This project is intended to meet the purpose and need of the project area. Other influences include the existing and desired conditions for the project area; Forest Plan goals, objectives, standards and guidelines; Federal laws, regulations, and policies; and economic viability. Within these parameters, the alternatives developed by the ID Team display a range of reasonable and feasible treatments, management requirements, Design Criteria, and effects to resources.

## Alternatives Not Considered in Detail

This section discusses alternatives that were considered, but not given detailed study. These alternatives were initially proposed to address issues identified during the public scoping and the ID Team process, but were not considered in further detail for the reasons explained in the following narratives.

### No Temporary Road Construction

Some public comments received asked that no temporary roads be constructed to conduct management activities. These commenters felt that temporary roads could have long-term effects to watersheds and aquatic resources (Project File Exhibits C-9, C-13, and C-15). They were also concerned that temporary roads would contribute to soil erosion and compaction and felt that the impacts of building temporary roads are the same as building permanent roads. These commenters asked that an alternative be developed that would not construct any temporary roads.

The ID Team developed a potential alternative that would not construct any temporary roads or use existing templates as temporary roads (Project File Exhibit A-34). This alternative would significantly reduce the management activities that could be conducted and would reduce the alternative's ability to respond to the purpose and need identified for the project. The inability of this alternative to meet the purpose and need for the project made it unlikely that this alternative would be implemented, and the ID Team looked for other opportunities to address the concerns about soil compaction and aquatic resources.

The ID Team realizes that forest vegetation treatments and road building have the potential to affect water and soil resources. Effects to water resources can be minimized with appropriate, site-specific application of project Design Criteria and Best Management Practices (BMPs). To address the concerns that the commenters expressed about the effects of temporary roads, the ID Team developed Design Criteria to rehabilitate all temporary roads that are constructed for management activities. These rehabilitation activities for temporary roads, in combination with BMPs, would minimize sediment-producing disturbance and minimize the potential for sediment to reach a water body. These rehabilitation activities would also reduce soil compaction in areas where temporary roads are constructed and assist in the restoration of soil productivity on these sites.

By implementing rehabilitation activities on all temporary roads as a Design Criteria for both Alternative 2 and 3, the ID Team was able to address the public comments received regarding the effects of temporary roads and decided that it was not necessary to study this alternative in detail. Alternative 3 also reduces the miles of temporary road proposed to conduct project activities.

### No Management Activities within the Lindbergh Lake Watershed

Some property owners expressed concerns that the management activities proposed within the Lindbergh Lake watershed could have potential impacts on the water quality of Lindbergh Lake where many residents get their drinking water (Project File Exhibits C-13, C-16, and C-18). The ID Team discussed this at great length and drafted a potential alternative to address this issue (Project File Exhibit A-43). The ID Team determined that the environmental analysis found in the Chapter 3 – Aquatics Resources adequately displayed that the proposed activities would not have potential effects to water quality in Lindbergh Lake watershed and that another alternative did not need to be studied in detail. Public concerns about the viewshed of Lindbergh Lake were addressed in Alternative 3 and have been described above.

### Increased Acreage of Hazardous Fuels Reduction Activities on the East Shore of Lindbergh Lake

Based on both public and internal input, an alternative was considered that would increase the acres treated for hazardous fuels reduction along the east side of Lindbergh Lake to modify fire behavior and potentially reduce the risk that a wildfire would pose to residences on the lake. Fire managers and some Lindbergh Lake property owners expressed concern that the management activities in the Proposed Action would not adequately reduce the risk of wildfire and that additional management was needed on the east side of the lake to create a more effective fuel break (Project File Exhibits C-19 and C-29).

The ID Team considered additional treatments in a number of forest stands above the lake that could modify fire behavior and potentially reduce the intensity and severity of a wildfire in this area. Additional management activities in this area were limited by access and public concerns regarding the visual impacts of management on a slope within the Lindbergh Lake viewshed. Management activities would have required the use of helicopters for timber harvest, which would not be economically feasible at this time. The conversations that ID Team members had with residents of the Lindbergh Lake area also indicated that some members of the public were very concerned about visual impacts to the viewshed from the lake and indicated that additional activities would be concerning to them. The ID Team determined that the activities put forth in the Proposed Action would modify fire behavior and would have less visual impact to users of Lindbergh Lake and decided that an alternative that would increase the acres of fuels reduction activities did not need to be studied in detail.

### Cohen Alternative

One member of the public suggested that the ID Team develop and consider an alternative based upon research conducted by Jack D. Cohen that asserts that effective residential fire loss mitigation must focus on the home and its immediate surroundings (Project File Exhibit C-1).

Dr. Cohen's methods of fine fuel reduction are to be applied on private property immediately adjacent to structures and we are only authorized to analyze and treat National Forest System lands. Some landowners in the project area have participated in the National Fire Protection Association's Firewise communities program. This program was co-sponsored by the USDA Forest Service, the US Department of the Interior, and the National Association of State Foresters to educate homeowners on how to protect their home and property from the risks of wildland fire. The district has encouraged landowners near Lindbergh Lake and in other parts of the project area to participate in the program or otherwise address hazardous fuel conditions on their private land.

Vegetation treatments within the Wildland Urban Interface (WUI) are designed to increase the likelihood of success for initial attack by providing a safe, defensible environment for firefighters. Fuel treatments in and near the WUI also serve to protect National Forest System lands from the risk of wildland fire spreading from private property. When fire enters the WUI, there remains the potential for loss of life, property, and other values even if homes have been made fire safe. Many homeowners would likely find it undesirable to live in an intensely or severely burned-over forest, even if their home has survived the passage of fire. Not only are aesthetic values decreased for most people, but the risk of flooding and land-slides can put homes, lives, and water quality at risk during subsequent precipitation events.

Highly ignitable homes can ignite during a wildland fire without the fire spreading near the structure. This occurs when firebrands are lofted downwind from fires. The firebrands subsequently settle on and ignite flammable home materials (such as roofs) and adjacent flammables (such as woodpiles, decking, or landscaped vegetation). Firebrands that result in ignitions can originate from wildland fires that are a distance of one mile or more (Cohen 2000a).

A method based solely on Dr. Cohen's fine fuel reduction method would also not reduce ladder fuels and open up crown spacing, reduce the threat of beetle killed and diseased trees, or break up fuel continuity in a way that would reduce the risk of high-severity stand-replacement wildland fire. Therefore, an alternative based on Dr. Jack Cohen's method of fine fuel reduction would not meet the purpose and need to reduce the risk of uncharacteristic wildfire, improve fish and wildlife habitat, improve forest health and resiliency, and maintain water quality. Therefore, the team decided to not analyze this alternative in detail.

### Analyze the Proposed Action as scoped with the public in March 2014.

As the ID team reviewed public comment and completed additional field reconnaissance, the team identified modifications to the Proposed Action that would better achieve the purpose and need for the project and improve the economic feasibility of vegetation restoration treatments. These modifications include dropping prescribed burn and vegetation treatment units, modifying unit boundaries and changing prescriptions to better address stand conditions. Therefore, the original proposed action was dropped from detailed analysis and Alternative 2 was analyzed in detail. Specific changes to the Proposed Action are detailed below in the description of Alternative 2.

# Alternatives Considered in Detail

## Alternative 1

This alternative represents the existing condition in the Beaver Creek Project Area. Under this alternative, none of the activities proposed for the Beaver Creek Project would occur and management direction for acquired lands would not be assigned. No fuels reduction or forest health activities would occur under this alternative. No access management activities would occur to reclaim roads in the project area. This alternative does not include thinning or planting activities to aid in vegetation recovery on lands acquired from Plum Creek Timber Company (PCTC). This alternative also does not propose a forest plan amendment to assign management areas to acquired lands in the project area.

Ongoing activities, such as recreation, public firewood gathering, fire suppression, and normal road maintenance would continue in this alternative. Ongoing processes, such as the spread of invasive species, fire, and forest insect and disease pathogens would continue to impact the project area over time. Activities identified in Chapter 3 as current and foreseeable actions would continue to occur.

## ALTERNATIVE 2

Alternative 2 was designed to meet the purpose and need for the project and is similar to the proposed action that was scoped with the public in March 2014. As is described in Chapter 1, this alternative proposes several different types of restoration activities, including vegetation restoration, aquatic restoration activities, and road management. This alternative was modified based on public comment and additional field review by specialists, these modifications include the following:

- Additional field reconnaissance has led to a change in the proposed activities in units dominated by small diameter, lodgepole pine averaging 90-100 years old. The effects of mountain pine beetle in these stands led to concerns that the commercial thin and improvement cuts proposed during public scoping could lead to excessive blowdown and limit the Forest Service's ability to plant species that are more resilient to insect, disease, and fire. As a result, approximately 502 acres of proposed treatments were changed from intermediate type treatments to seed tree and group selection prescriptions in Alternative 2 to better achieve the purpose and needs for the project. The Chapter 3 – Forest Vegetation Section of this EA provides an analysis of the potential effects to the forest vegetation resource between a regeneration type prescription and an intermediate type prescription in lodgepole dominated stands.
- Field reconnaissance also lead to the modification of unit boundaries to better reflect the existing conditions on the ground and improve the feasibility of prescribed treatments. These modifications resulted in a decrease in proposed temporary roads.
- Changes to prescriptions and modification of unit boundaries has created six openings larger than 40 acres in size that will require Regional Forester approval.
- Prescribed burn Unit 312, located in the Mission Mountains Wilderness, was dropped to remain in compliance with the vegetation standards found in the Northern Rockies Lynx Management Direction (NRLMD) and to reduce potential effects to water quality in the Lindbergh Lake watershed.
- All of the four drained wetland restoration proposals were cancelled. Two of them were not needed at this time and two required access across private land.
- An additional culvert replacement/fish barrier was identified along NFS road #906 in order to prevent non-native species from spreading into the Clearwater River and to reduce the potential for road damage as a result of beaver activity. A more detailed description of culvert replacements and installation of fish barriers is provided in the Aquatic Restoration section.
- Unit 81 was dropped in response to public concern that the unit was located upslope of private residences and could create a potential risk of falling debris.
- National Forest System road #91204 was identified as an unneeded road and would be decommissioned.

Alternative 2 proposes several different types of vegetation restoration activities to achieve the purpose and need. These treatments include: silvicultural treatments with and without commercial products, prescribed burning within the WUI, and prescribed burning within the Mission Mountains Wilderness. Alternative 2 also proposes a forest plan amendment to assign management areas to acquired lands in the project area as displayed in the Proposed Action scoped to the public in March 2014. The vegetation restoration activities are described in greater detail below, followed by a description of the aquatic restoration activities proposed, and finally the road management activities proposed in Alternative 2. Information about the proposed forest plan amendment can be found near the end of Chapter 2 in the Forest Plan amendment section.

## VEGETATION RESTORATION ACTIVITIES

Alternative 2 proposes approximately 5,286 acres of vegetation restoration activities that include silvicultural treatments, prescribed burning within the WUI, and prescribed burning within the Mission Mountains Wilderness. All of these activities have been designed to reduce the risk of uncharacteristic wildfire, improve forest health, and improve wildlife habitat as described in Chapter 1 as part of the project's Purpose and need. The following sections describe these vegetation restoration activities and how they will be applied to the landscape.

### SILVICULTURAL TREATMENTS

Alternative 2 proposes approximately 3,644 acres of silvicultural treatments. Approximately 2,351 acres of these proposed silvicultural treatments have potential to produce a commercial product through 1,574 acres of intermediate treatments and 777 acres of regeneration treatments. Alternative 2 proposes 1,293 acres of silvicultural treatments that are not expected to produce commercial products and include daylighting, fill planting, and pre-commercial thinning on lands formerly owned by PCTC. These treatments are estimated to produce approximately 14,296 CCF of saw timber and 6,147 CCF of non-saw timber. If residual slash can be utilized by the purchaser for higher value products, this will be considered.

Table 1 and 2 below displays the different types of silvicultural treatments proposed in Alternative 2.

**TABLE 1. ALTERNATIVE 2 SILVICULTURE TREATMENTS WITH COMMERCIAL COMPONENT.**

| SILVICULTURE TREATMENTS WITH COMMERCIAL COMPONENT | ALTERNATIVE 2 (ACRES) |
|---|---|
| **Intermediate Treatments** | |
| Commercial Thin | 1,015 |
| Improvement Cut | 559 |
| Total Acres of Intermediate Treatments | 1,574 |
| **Regeneration Treatments** | |
| Seed Tree with Reserves | 428 |
| Clearcut with Reserves | 16 |
| Group Selection | 333 |
| Total Acres of Regeneration Treatments | 777 |
| **Total Acres of Silviculture Treatments with Commercial Component** | **2,351** |

**TABLE 2. ALTERNATIVE 2 SILVICULTURE TREATMENTS WITHOUT COMMERCIAL COMPONENT.**

| SILVICULTURE TREATMENTS WITHOUT COMMERCIAL COMPONENT | ALTERNATIVE 2 (ACRES) |
|---|---|
| Pre-Commercial Thinning | 882 |
| Daylighting | 82 |
| Fill Planting | 329 |
| **Total Acres of Silviculture Treatments without Commercial Component** | **1,293** |
| Reforestation to occur following regeneration treatments | 777 |

### SILVICULTURE TREATMENTS WITH COMMERCIAL COMPONENT

#### INTERMEDIATE TREATMENTS

Intermediate treatments are designed to enhance growth, quality, vigor, and composition of the stand after establishment or regeneration and prior to final harvest. Alternative 2 proposes 1,574 acres of intermediate treatments to meet the purpose and need.

*Commercial Thin*

The purpose of a commercial thin treatment is to enlarge the growing space for desirable trees and reduce tree competition for limited site resources, thus promoting improved tree growth, vigor, and resilience to insect and disease. This treatment is also targeted to reduce fuel quantities and disrupt fuel continuity. Existing tree density would be reduced from current levels to a target residual density ranging from 60 to 120 square feet of basal area per acre. This equates to approximately 50 to 150 trees per acre depending on tree species and site variables. Long-lived, fire-resistant, shade-intolerant species (typically western larch, ponderosa pine, western white pine, and occasionally Douglas-fir) would be favored for retention. Mechanical treatments and/or prescribed fire would be used in some units to treat fuel loading and arrangement and recycle nutrients. Alternative 2 proposes 1,015 acres of commercial thin treatments.

Treatments can recover potential mortality in stands with lodgepole pine trees affected by mountain pine beetle and areas of significant root disease, especially in Douglas-fir. This would improve stand health, recover economic value, and manipulate fuel loadings and continuity.

Treatments would focus on preserving large, old legacy trees of the early-seral, fire-resistant species where they are present. In these areas, smaller, younger trees are removed in a 20- to 30-foot radius surrounding large trees designated for retention in order to improve vigor, remove ladder fuels, and increase resistance to insect attack (e.g., bark beetles).

Commercial thinning treatments would also remove noncommercial (less than sawlog-size 7-inches DBH) trees from the understory in areas where stand densities exceed those desirable for optimal tree growth, vigor, and resilience to insect and disease. Target densities in these areas generally range from 150 to 300 trees per acre.

The following photos show examples of stands before and after commercial thinning has occurred. Figure 2 shows Unit 16 in Beaver Creek - Alternative 2, a stand where commercial thinning is the proposed silvicultural treatment. Figure 3 shows Unit 15 from the Cooney McKay Project, a past project in the Swan Valley, where a commercial thin treatment and fuels activities have already occurred. It is important to remember that these photos are intended to be representative of these types of treatments and cannot show precisely what would occur in the units proposed for treatment in the Beaver Creek Project.

**FIGURE 2. BEFORE: UNIT 16 IN ALTERNATIVE 2 PROPOSED FOR COMMERCIAL THINNING.**

**FIGURE 3. AFTER: UNIT 15 IN THE COONEY MCKAY PROJECT.**

*Improvement Cut*

Improvement cut treatments are intended to remove trees of undesirable species, form, age, or condition from the main canopy in a stand of poles or larger trees. Treatments remove the less desirable trees of any species with the primary purpose of improving composition and quality of the remaining stand. Stands subject to prior cutting, which retained poor phenotypes or trees injured by insect and disease, but which still have promising trees of desired species, are the main target of this treatment. The purpose is to find and release the best trees. Ponderosa pine, western white pine, western larch, and Douglas-fir would be favored for retention. Mechanical treatments would be used to reduce fuel loading and arrangement and recycle nutrients. Dead trees and pine trees currently infested with mountain pine beetle would be salvaged from these areas if encountered. Trees with significant dwarf mistletoe and apparent root disease would also be targeted for removal, as would late-seral, shade-tolerant species and poor phenotypes of any species. Alternative 2 proposes 559 acres of improvement cut some of which would produce a commercial product and other areas may not have a commercial component. The commercial value of these stands would be determined during implementation; and for the purposes of this analysis, all improvement cuts are assumed to contain some commercial sized trees to be removed.

Treatments can capture the value of recent tree mortality, including but not limited to lodgepole pine trees affected by mountain pine beetle and areas of significant root disease, especially in Douglas-fir. This would improve stand health, recover economic value, and manipulate fuel loadings and continuity. A secondary purpose is to prevent spread of damage agents within the stand and to adjacent healthy stands.

Treatments would focus on preserving large, old legacy trees of the early-seral, fire-resistant species where they are present. In these areas, smaller, younger trees are removed in a 20- to 30-foot radius surrounding large trees designated for retention in order to improve vigor, remove ladder fuels, and increase resistance to insect attack (e.g., bark beetles).

Improvement cuts will also remove noncommercial (less than sawlog-size 7 inches DBH) trees from the understory in areas where stand densities exceed those desirable for optimal tree growth, vigor, and resilience to insect and disease. Target densities in these areas generally range from 150 to 300 trees per acre.

The following photos show examples of stands before and after an improvement cut has occurred. Figure 5 shows Unit 5 in Beaver Creek - Alternative 2, a stand where improvement is the proposed silvicultural treatment. Figure 5 shows Unit 7 from the Meadow Smith Project, a past project in the Swan Valley, where an improvement cut and fuels activities have already occurred. It is important to remember that these photos are intended to be representative of these types of treatments and cannot show precisely what would occur in the units proposed for treatment in the Beaver Creek Project.

**FIGURE 4. BEFORE: UNIT 5 IN ALTERNATIVE 2 PROPOSED FOR IMPROVEMENT CUT.**

**FIGURE 5. AFTER: MEADOW SMITH UNIT 7.**

*Regeneration Treatments*

Regeneration treatments are proposed in forest stands where recent inventory data (2011, 2012, and 2013) and stand diagnoses indicate substantial current or potential mortality from insects and/or disease, or to create uneven-aged stands and promote the establishment and growth of desirable species. In the Beaver Creek Project, the regeneration treatments being proposed include seed tree with reserves, clearcut with reserves, and group selection. Sites where these treatments occur must be regenerated, either through natural regeneration or by planting seedlings. Alternative 2 proposes 777 acres of regeneration treatments.

*Regional Forester Approval for an Opening greater than 40 acres in size*

Alternative 2 would require Regional Forester approval to create an opening that exceeds 40 acres in size. Alternative 2 proposes six openings over 40 acres in size. In some cases these openings are created as a result of the proposed treatment occurring in one unit and in other cases the openings are a result of several regeneration units located adjacent to each other. All of these units have been designed to meet the Flathead National Forest standards for hiding cover such that no point in the proposed activities is more than 600 feet to hiding cover.

Regional Forester policy (FSM 2471.1) directs the size of harvest openings created by even-aged silvicultural practices would be normally 40 acres or less, to support NFMAs general intent to limit the size of harvest openings. Creation of larger openings requires 60-day public review and Regional Forester approval. The public is being given 60 days notification of the potential for an opening over 40 acres with this EA. More information about the stand conditions and the proposed treatments are provided in Chapter 3 – Forest Vegetation.

*Seed Tree with Reserves*

Under a two-aged stand seed tree with reserves treatment, a portion of the existing overstory long-lived, fire-resistant, shade-intolerant species (western larch, ponderosa pine, western white pine, and occasionally Douglas-fir) would be retained and reserved at a density sufficient to facilitate regeneration of these desired species and create a two-aged stand structure (e.g. 5 to 15 trees per acre). This density is designed to provide seed sources and long term structural diversity, while not interfering with the successful regeneration of desired species. The majority of these areas are dominated by lodgepole pine infested with mountain pine beetle or at risk. In addition, some proposed areas are affected by dwarf mistletoe and/or root diseases. Regeneration of trees would result from natural seeding, planted seedlings, or a combination of both. Mechanical treatments and/or prescribed fire could be used to reduce fuels, recycle nutrients and prepare the site for regeneration. Scarification may be used to provide a favorable mineral seedbed for early seral species such as western larch and ponderosa pine. Alternative 2 proposes 428 acres of seed tree with reserves.

The following photos show examples of stands before and after a seed tree with reserves treatment has occurred. Figure 6 shows Unit 21 in Beaver Creek - Alternative 2, a stand where seed tree is the proposed silvicultural treatment. Figure 7 shows Unit 11 from the Hemlock Elk Project, a past project in the Swan Valley, where seed tree, fuels activities, and reforestation have already occurred. It is important to remember that these photos are intended to be representative of these types of treatments and cannot show precisely what would occur in the units proposed for treatment in the Beaver Creek Project.

**FIGURE 6. BEFORE: UNIT 21 IN BEAVER CREEK - ALTERNATIVE 2 PROPOSED FOR SEED TREE.**

**FIGURE 7. AFTER: UNIT 11 FROM HEMLOCK ELK PROJECT.**

*Clearcut with Reserves*

A clearcut with reserves will remove nearly all trees from the site to facilitate regeneration of a new age class and increase species diversity. Although limited, all long-lived, fire-resistant, shade-intolerant species (western larch, ponderosa pine, western white pine, and occasionally Douglas-fir) will be retained, where feasible and where not acting as an insect or disease vector. Reserve trees will be retained to provide long term structural diversity. These treatment areas consist of even-aged lodgepole pine with little species or structural diversity and are either experiencing mountain pine beetle mortality or are at risk of being affected; stands substantially infected by dwarf mistletoe; and/or stands with significant root disease attack needing replacement with disease-resistant species. Regeneration of trees would result from natural seeding, planted seedlings, or a combination of both. Mechanical treatments and/or prescribed fire could be used to reduce fuels, recycle nutrients and prepare the site for regeneration. Alternative 2 proposes 16 acres of clearcut with reserves treatments.

The following photos show examples of stands before and after a clearcut with reserves has occurred. Figure 8 shows Unit 45 in Beaver Creek - Alternative 2, a stand where a clearcut with reserves is the proposed silvicultural treatment. Figure 9 shows Unit 9 from the Meadow Smith Project, a past project in the Swan Valley, where a clearcut with reserves treatment, fuels activities, and reforestation have already occurred. It is important to remember that these photos are intended to be representative of these types of treatments and cannot show precisely what would occur in the units proposed for treatment in the Beaver Creek Project.

**FIGURE 8. BEFORE: UNIT 45 IN BEAVER CREEK - ALTERNATIVE 2 PROPOSED FOR CLEARCUT WITH RESERVES.**

**FIGURE 9. AFTER: UNIT 9 IN MEADOW SMITH PROJECT.**

*Group Selection*

The principle purpose of the group selection treatments being proposed in the Beaver Creek Project is to create openings for establishment and/or increased stocking and vigor of whitebark pine seedlings using planted white pine blister rust-resistant stock, natural regeneration, or a combination of both. These treatments would generally be applied to stands at elevations greater than 5,500 feet, which is about the elevation above which whitebark pine naturally occurs. Some treatments would be conducted in stands that contain older, more mature whitebark pine with the primary purpose of freeing growing space in the vicinity of these trees to improve growth and vigor. Alternative 2 proposes approximately 333 acres of group selection treatment.

This treatment would establish small openings (typically a few acres) in stands with the primary purpose of establishing new cohorts of trees, it is estimated that approximately 20 percent of the unit will have small openings. Uneven-aged stands result from this treatment and add structural and spatial heterogeneity to the existing stand. They typically result in increased biological diversity. Thinning from below, would be conducted concurrently in the remaining matrix of the stand (the portion not designated for a group opening) to remove trees of undesirable species, form, age, or condition from the main canopy and is estimated to occur on approximately 80 percent of the unit. Treatments remove the less desirable trees of any species with a secondary purpose of improving composition and quality of the remaining stand, ideally increasing the vigor of present whitebark pine.

Treatments would focus on preserving large, old legacy trees of the early-seral, fire-resistant species. In these areas, smaller, younger trees are removed in a 20- to 30-foot radius surrounding large trees designated for retention in order to improve vigor, remove ladder fuels, and increase resistance to insect attack (e.g., bark beetles or MBP). Other sites would remove noncommercial trees (less than sawlog-size 7 inches DBH) in areas where stand densities exceed those desirable for optimal tree growth, vigor, and resilience to insect and disease. Target densities in these areas generally range from 150 to 300 trees per acre.

The following photos show examples of stands before and after a group selection type treatment has occurred. Figure 2-9 shows Unit 116 in Beaver Creek - Alternative 2, a stand where a group selection is the proposed silvicultural treatment. Figure 11 shows an aerial view of Unit 25 and 25A from the Hemlock Elk Project. Unit 25A (shown in Figure 11 as the upper unit) is a 3 acre patch clearcut and Unit 25 (lower) is a 2.6 acre patch clearcut, which are very similar to the group selection cuts that are proposed in Beaver Creek. It is important to remember that these photos are intended to be representative of these types of treatments and cannot show precisely what would occur in the units proposed for treatment in the Beaver Creek Project.

**FIGURE 10. BEFORE: UNIT 116 IN BEAVER CREEK ALTERNATIVE 2 PROPOSED FOR GROUP SELECTION.**

**FIGURE 11. AFTER: AERIAL IMAGE OF UNITS 25A (UPPER) AND 25 (LOWER) IN HEMLOCK ELK.**

#### *Reforestation following Regeneration Treatment*

Reforestation would occur following regeneration treatments, such as clearcut with reserves, seed tree with reserves, and group selection where the silviculture prescription determines that reforestation is necessary to accomplish objectives. Alternative 2 proposes approximately 777 acres of reforestation to occur following regeneration treatment.

#### *Site Preparation*

Depending on existing vegetation and ground conditions, site preparation could be prescribed as part of other silvicultural treatments to create favorable conditions to help ensure adequate regeneration. These treatments are often prescribed in both artificial and natural regeneration situations and typically address competing vegetation, seed bed preparation, fuel accumulations, and duff reduction. Site preparation can be accomplished through hand, mechanical, or prescribed fire methods. Hand methods would usually involve scalping with a hoedad or mattock to create favorable conditions at the time of planting. Mechanical treatments would often be accomplished during harvest operations or shortly afterwards and involve scarification, using excavators or other mechanized equipment. Prescribed fire could also be used to recycle nutrients, consume excess fuels, reduce competing vegetation, and create a favorable seedbed.

### SILVICULTURE TREATMENTS WITHOUT COMMERCIAL COMPONENT

These are treatments made to improve the composition, structure, condition, health, and growth of even- or uneven-aged stands. Although these treatments are currently not expected to produce a commercial product, it is possible that the residual slash generated from both commercial and non-commercial harvest could be utilized for higher value products.

#### *Pre-commercial Thin*

This treatment would be applied to young stands generally not past the sapling stage with the objective of accelerating growth, reducing densities, and/or improving species composition. Residual tree density would be reduced to a target of 150 to 300 trees per acre. The primary purpose is to adjust species composition and concentrate growth on the most desirable trees while reducing fuel continuity and modifying fuel arrangement. This treatment would focus on the removal of young trees generally less than 5 inches DBH. Mechanical treatments and/or pile burning would be used to reduce fuels and recycle nutrients. This treatment is typically accomplished by hand or by mechanized methods, such as chipping or mastication. Some stands have understocked areas that would be planted with desirable species to meet target stocking levels for the stand. Alternative 2 proposes approximately 882 acres of pre-commercial thinning.

The following photos show examples of stands before and after pre-commercial thinning has occurred. Figure 12 shows Unit 201 in Beaver Creek - Alternative 2, a stand where pre-commercial thinning is the proposed silvicultural treatment. Figure 13 shows Unit 1 from the Cooney McKay Project, a past project in the Swan Valley, where pre-commercial thinning has already occurred. It is important to remember that these photos are intended to be representative of these types of treatments and cannot show precisely what would occur in the units proposed for treatment in the Beaver Creek Project.

**FIGURE 12. BEFORE: UNIT 214 IN BEAVER CREEK - ALTERNATIVE 2 PROPOSED FOR PRE-COMMERCIAL THINNING.**

**FIGURE 13. AFTER: UNIT 1 FROM COONEY MCKAY PROJECT.**

*Daylighting*

Daylighting treatments are applied on an individual tree basis and involve removing smaller-diameter trees within a specified distance (approximately 20 to 30 feet) of a target tree. This treatment would be applied to:

- Release whitebark pine and improve microclimate with the objective of discouraging attack by mountain pine beetle;
- Reduce competition for water and nutrients for large, old legacy trees and change the microclimate surrounding these trees (especially important for ponderosa pine and Douglas-fir where bark beetle attack is encouraged by shaded boles); and

- Release western white pine and discourage attack by both mountain pine beetle and white pine blister rust.

Daylighting would also remove hazardous ladder fuels from beneath the target trees. Ponderosa pine, western white pine, western larch, and Douglas-fir would be favored for this treatment. Alternative 2 proposes approximately 82 acres of daylighting, which is typically accomplished by hand or by mechanized methods such as chipping or mastication.

*Fill Plant*

Trees would be planted in areas previously subject to regeneration harvest where regeneration was not completely successful or to improve the diversity of tree species growing on the landscape to favor more fire resilient species, such as western larch and ponderosa pine, as well as restoration of species such as western white pine and whitebark pine. Alternative 2 proposes approximately 329 acres of fill planting.

### SLASH TREATMENT ACTIVITIES

To reduce hazardous fuel conditions that are created by harvest activity, slash reduction treatments would be implemented. Some tree boles, limbs, and foliage would have been deposited in the forest floor through both natural and harvest related actions, adding to both fine and coarse down wood material fuel loadings. In some areas, this material is scattered and in other areas it is concentrated in large amounts. These slash treatments would include the following types of activities applied in combination where appropriate to reduce fuel loading and achieve site preparation:

- Lop and scatter,
- Mechanical treatments (including chipping or mastication),
- Piling, and
- Whole tree yarding (see Chapter 3 –Fire/Fuels Section for discussion about slash treatment and fire behavior).

If residual slash can be utilized by the purchaser for higher value products, this will be considered.

### PRESCRIBED FIRE ACTIVITIES

Prescribed fire activities have been proposed in Alternative 2 of the Beaver Creek Project to reduce the risk of uncharacteristic wildfire through the reduction of hazardous fuels within the wildland urban interface (WUI) and within the Mission Mountains Wilderness.

Table 3 shows the prescribed burning activities proposed in Alternative 2.

**TABLE 3. ALTERNATIVE 2 PRESCRIBED BURNING ACTIVITIES.**

| PRESCRIBED BURNING AND FUELS TREATMENT | ALTERNATIVE 2 (ACRES) |
|---|---|
| Prescribed Burning Acres following harvest | 166 |
| Prescribed Burning Acres without other treatments in the WUI | 538 |
| Prescribed Burns Acres within Mission Mountains Wilderness | 1,104 |
| **Total Acres of Prescribed Burning** | **1,808** |
| **Total Acres of Prescribed Burning without other treatments** | **1,642** |

### BROADCAST BURNING IN THE WILDLAND URBAN INTERFACE AND FOLLOWING HARVEST ACTIVITIES

Prescribed fire would be used to achieve restoration objectives and to allow fire to return to the landscape in a controlled manner on a total of 704 acres within the WUI and following harvest activities.

Approximately 166 acres would be broadcast burned to address natural fuels following harvest activities and would serve as a component of vegetation restoration in conjunction with the silvicultural prescription.

On approximately 538 acres, prescribed fire would be used within the WUI where no harvest is proposed to reduce dead and down fuels, as well as cause mortality in understory grass, trees, and shrubs. Due to the lighter fuels in the area, combined with previous fuels treatments, overstory and large tree mortality would be held to a minimum and would be expected to be less than 20 percent. Hand ignition would occur over most of the area. Aerial ignition could be used in areas that are favorable and would provide desirable results. Within these prescribed burns, areas have been identified as having potential for quaking aspen restoration, and where suitable habitat is identified, prescribed burning may be followed by planting aspen on up to 50 acres. Other areas within the prescribed burns that have been identified as being understocked with desirable tree species may have fill planting take place on 152 acres.

The use of fire in combination with other silvicultural activities is displayed in Table 4.

### BROADCAST BURNING IN THE MISSION MOUNTAINS WILDERNESS

The use of prescribed fire in the Mission Mountains Wilderness (MMW) is being proposed to target and reduce dead and down fuels, as well as cause mortality in understory trees and patches of overstory trees. It would also kill the above-ground portion of shrubs and forbs. The resulting vegetation in the timber-dominated areas should be in a more open condition with fewer ladder fuels and surface fuels. While some scorching and mortality of larger trees could occur, large tree mortality would be minimized and would be expected to be between 20 and 30 percent. Mortality would vary due to the mosaic and variable nature typical of this type of vegetation. Ignition would be completed when conditions are favorable (likely late fall). Alternatives 2 and 3 both propose approximately 1,104 acres of prescribed burning in the Mission Mountains Wilderness.

The proposed wilderness burns would be mostly conducted using aerial ignition methods, which would consist of a helicopter equipped with a heli-torch or plastic sphere dispenser (PSD) machine (dispenses plastic spheres containing potassium permanganate for remote ignition). Portions of the burn could be conducted by hand-ignition methods where deemed necessary. These areas would mostly consist of holding areas outside of the wilderness boundaries.

Associated with the wilderness burn area boundary is an area designated as the maximum management area (MMA). The MMA is not proposed for treatment; however, suppression actions would normally not be taken to keep prescribed fire from spreading into it from the burn area. The MMA is designated as an area bounded by topographic or fuel conditions that make fire leaving the MMA unlikely. The purpose of this is to allow for incidental fire spread outside the target burn unit without being required to take suppression actions (generally ground-disturbing actions, such as fire line, etc.). The MMA allows for flexibility to continue meeting the objectives of the prescribed burn in the project boundary area without placing firefighters at risk or causing impacts from suppression actions. The Fire/Fuels Section in Chapter 3 provides a more detailed description of the MMA, and a map displaying the acceptable boundary for fire to spread before suppression action would be taken.

Figure 14 is a photo of the Mission Upland Burn that was implemented in October 2014 and produced the type of results that are anticipated to occur in the Beaver Creek Burn Units 308 and 309 within the Mission Mountains Wilderness.

**FIGURE 14. AFTER: MISSION UPLAND BURN (OCTOBER 2014).**

Table 4 displays the unit number, acres proposed for treatment, silvicultural prescriptions, logging systems, slash treatment, prescribed fire activity, and MA for each vegetation restoration activity proposed in Alternative 2.

**TABLE 4. ALTERNATIVE 2 - VEGETATION RESTORATION ACTIVITIES BY UNIT.**

| UNIT | ACRES | ALT. 2 PRESCRIPTION | TREATMENT METHODS | PRESCRIBED FIRE ACTIVITY | SLASH TREATMENT | ALT. 2 PROPOSED MA |
|---|---|---|---|---|---|---|
| 1 | 4 | Commercial Thin | Ground Based, Mechanized | --- | Whole Tree Yarding/Mechanical | 5 |
| 3 | 24 | Commercial Thin | Ground Based, Mechanized | Broadcast Burn | Whole Tree Yarding/Mechanical | 5 |
| 4 | 19 | Commercial Thin | Ground Based, Mechanized | --- | Whole Tree Yarding/Mechanical | 5 |
| 5 | 47 | Improvement Cut | Ground Based, Mechanized | --- | WTY/Pile/Mechanical | 11C |
| 6 | 5 | Improvement Cut | Ground Based, Mechanized | Broadcast Burn | Whole Tree Yarding | 5 |
| 7 | 3 | Pre-Commercial Thin | Ground Based, Mechanized | --- | Whole Tree Yarding | 5 |
| 12 | 55 | Improvement Cut | Ground Based, Mechanized | --- | Whole Tree Yarding/Mechanical | 11C |
| 16 | 163 | Commercial Thin | Ground Based, Mechanized | --- | WTY/Pile/Mechanical | 11C |
| 19 | 48 | Improvement Cut | Ground Based, Mechanized | Broadcast Burn | WTY/Pile/Mechanical | 15C |
| 21 | 103 | Seed Tree with Reserve | Ground Based, Mechanized | --- | Whole Tree Yarding | 15C |
| 23 | 10 | Commercial Thin | Ground Based, Mechanized | --- | Whole Tree Yarding/Mechanical | 15 |
| 25 | 38 | Commercial Thin | Ground Based, Mechanized | Broadcast Burn | Whole Tree Yarding/Pile | 15C |
| 28 | 140 | Commercial Thin | Ground Based, Mechanized | --- | WTY/Pile/Mechanical | 15C |

**TABLE 4. ALTERNATIVE 2 - VEGETATION RESTORATION ACTIVITIES BY UNIT.**

| UNIT | ACRES | ALT. 2 PRESCRIPTION | TREATMENT METHODS | PRESCRIBED FIRE ACTIVITY | SLASH TREATMENT | ALT. 2 PROPOSED MA |
|---|---|---|---|---|---|---|
| 31 | 1 | Commercial Thin | Ground Based, Mechanized | --- | Whole Tree Yarding/Mechanical | 15C |
| 32 | 12 | Commercial Thin | Ground Based, Mechanized | --- | Whole Tree Yarding/Mechanical | 15C |
| 34 | 10 | Commercial Thin | Ground Based, Mechanized | --- | Whole Tree Yarding | 15C |
| 36 | 29 | Commercial Thin | Ground Based, Mechanized | --- | Whole Tree Yarding/Mechanical | 15C |
| 37 | 5 | Commercial Thin | Ground Based, Mechanized | Broadcast Burn | Whole Tree Yarding | 15C |
| 39 | 45 | Commercial Thin | Ground Based, Mechanized | --- | Whole Tree Yarding | 11C |
| 40 | 9 | Commercial Thin | Ground Based, Mechanized | Broadcast Burn | Whole Tree Yarding/Pile | 11C |
| 42 | 11 | Commercial Thin | Ground Based, Mechanized | Broadcast Burn | Whole Tree Yarding | 11C |
| 44 | 35 | Commercial Thin | Ground Based, Mechanized | --- | WTY/Pile/Mechanical | 11C |
| 45 | 10 | Clearcut with Reserves | Ground Based, Mechanized | --- | Whole Tree Yarding/Pile | 15C |
| 51 | 68 | Improvement Cut | Ground Based, Mechanized | --- | Whole Tree Yarding | 11C |
| 54 | 8 | Improvement Cut | Ground Based, Mechanized | --- | Whole Tree Yarding/Mechanical | 11C |
| 55 | 82 | Commercial Thin | Ground Based, Mechanized | --- | Whole Tree Yarding/Pile | 11C |
| 57 | 3 | Seed Tree with Reserves | Ground Based, Mechanized | --- | Whole Tree Yarding/Mechanical | 15C |
| 59 | 10 | Commercial Thin | Ground Based, Mechanized | --- | Whole Tree Yarding | 11C |
| 62 | 44 | Seed Tree with Reserves | Ground Based, Mechanized | --- | Whole Tree Yarding/Pile | 15C |
| 72 | 4 | Commercial Thin | Ground Based, Mechanized | --- | Whole Tree Yarding | 15 |
| 73 | 4 | Commercial Thin | Ground Based, Mechanized | --- | Whole Tree Yarding | 15 |
| 74 | 1 | Commercial Thin | Ground Based, Mechanized | Broadcast Burn | Whole Tree Yarding/Mechanical | 15 |
| 76 | 69 | Commercial Thin | Ground Based, Mechanized | --- | Mechanical | 15 |
| 79 | 10 | Commercial Thin | Ground Based, Mechanized | --- | Whole Tree Yarding/Mechanical | 15 |
| 83 | 34 | Commercial Thin | Skyline | --- | Whole Tree Yarding/Pile | 15 |
| 84 | 6 | Clearcut with Reserves | Ground Based, Mechanized | --- | Mechanical/Pile | 15 |
| 86 | 10 | Improvement Cut | Ground Based, Mechanized | --- | Whole Tree Yarding/Mechanical | 11C |
| 87 | 4 | Commercial Thin | Ground Based, Mechanized | --- | Whole Tree Yarding/Mechanical | 11C |
| 89 | 41 | Seed Tree with Reserves | Ground Based, Mechanized | --- | Whole Tree Yarding/Pile | 11C |
| 90 | 8 | Commercial Thin | Ground Based, Mechanized | --- | Whole Tree Yarding | 11C |
| 91 | 16 | Commercial Thin | Skyline | --- | Whole Tree Yarding | 11C |
| 93 | 13 | Improvement Cut | Ground Based, Mechanized | --- | Whole Tree Yarding/Pile | 11C |
| 94 | 12 | Improvement Cut | Skyline | --- | Whole Tree Yarding/Pile | 11C |
| 95 | 1 | Improvement Cut | Ground Based, Mechanized | --- | Whole Tree Yarding/Pile | 11C |

**TABLE 4. ALTERNATIVE 2 - VEGETATION RESTORATION ACTIVITIES BY UNIT.**

| UNIT | ACRES | ALT. 2 PRESCRIPTION | TREATMENT METHODS | PRESCRIBED FIRE ACTIVITY | SLASH TREATMENT | ALT. 2 PROPOSED MA |
|---|---|---|---|---|---|---|
| 96 | 10 | Commercial Thin | Ground Based, Mechanized | --- | Whole Tree Yarding | 11C |
| 97 | 6 | Commercial Thin | Skyline | --- | Whole Tree Yarding | 11C |
| 98 | 3 | Commercial Thin | Ground Based, Mechanized | --- | Whole Tree Yarding | 11C |
| 99 | 26 | Seed Tree with Reserves | Ground Based, Mechanized | --- | Whole Tree Yarding | 15 |
| 100 | 14 | Seed Tree with Reserves | Skyline | --- | Whole Tree Yarding | 15 |
| 102 | 95 | Commercial Thin | Ground Based, Mechanized | --- | Whole Tree Yarding/Pile | 15 |
| 105 | 27 | Seed Tree with Reserve | Skyline | --- | Whole Tree Yarding/Pile | 15 |
| 109 | 7 | Commercial Thin | Ground Based, Mechanized | Broadcast Burn | Whole Tree Yarding | 11C |
| 110 | 4 | Commercial Thin | Skyline | Broadcast Burn | Whole Tree Yarding | 11C |
| 113 | 8 | Improvement Cut | Skyline | --- | Whole Tree Yarding | 11C |
| 114 | 74 | Group Selection | Ground Based, Mechanized | --- | Whole Tree Yarding/Pile | 11C |
| 116 | 124 | Group Selection | Ground Based, Mechanized | --- | Whole Tree Yarding/Pile | 11C |
| 118 | 17 | Improvement Cut | Ground Based, Mechanized | --- | Whole Tree Yarding/Pile | 11C |
| 119 | 26 | Commercial Thin | Ground Based, Mechanized | --- | Whole Tree Yarding | 11C |
| 120 | 14 | Improvement Cut | Skyline | --- | Whole Tree Yarding | 11C |
| 200 | 7 | Pre-Commercial Thin | Hand | --- | Lop and Scatter | 15C |
| 201 | 4 | Pre-Commercial Thin | Ground Based, Mechanized | --- | Mechanical/Pile | 15C |
| 202 | 7 | Pre-Commercial Thin | Hand | --- | Lop and Scatter | 15C |
| 203 | 11 | Improvement Cut | Ground Based, Mechanized | --- | Mechanical/Pile | 15C |
| 204 | 83 | Improvement Cut | Ground Based, Mechanized | --- | Mechanical/Pile | 11C |
| 208 | 4 | Pre-Commercial Thin | Hand | --- | Lop and Scatter | 11C |
| 209 | 13 | Pre-Commercial Thin | Ground Based, Mechanized | --- | Mechanical/Pile | 11C |
| 210 | 36 | Pre-Commercial Thin | Ground Based, Mechanized | --- | Mechanical/Pile | 15C |
| 211 | 26 | Pre-Commercial Thin | Hand | --- | Lop and Scatter | 15C |
| 212 | 40 | Pre-Commercial Thin | Ground Based, Mechanized | --- | Mechanical/Pile | 15C |
| 214 | 17 | Pre-Commercial Thin | Ground Based, Mechanized | --- | Mechanical | 15C |
| 216 | 36 | Pre-Commercial Thin | Ground Based, Mechanized | --- | Mechanical/Pile | 15C |
| 217 | 168 | Pre-Commercial Thin | Hand | --- | Lop and Scatter | 15C |
| 219 | 7 | Daylighting | Hand | --- | Lop and Scatter | 12 |
| 220 | 10 | Pre-Commercial Thin | Ground Based, Mechanized | --- | Mechanical/Pile | 11C |
| 221 | 24 | Improvement Cut | Ground Based, Mechanized | --- | Mechanical | 11C |
| 222 | 1 | Fill Plant | Hand | --- | --- | 11C |

**TABLE 4. ALTERNATIVE 2 - VEGETATION RESTORATION ACTIVITIES BY UNIT.**

| UNIT | ACRES | ALT. 2 PRESCRIPTION | TREATMENT METHODS | PRESCRIBED FIRE ACTIVITY | SLASH TREATMENT | ALT. 2 PROPOSED MA |
|---|---|---|---|---|---|---|
| 224 | 18 | Pre-Commercial Thin | Ground Based, Mechanized | --- | Whole Tree Yarding | 11C |
| 226 | 10 | Pre-Commercial Thin | Ground Based, Mechanized | --- | Mechanical | 11C |
| 229 | 32 | Pre-Commercial Thin | Ground Based, Mechanized | --- | Mechanical | 11C |
| 230 | 10 | Pre-Commercial Thin | Hand | --- | Lop and Scatter | 15C |
| 231 | 221 | Pre-Commercial Thin, Fill Plan | Ground Based, Mechanized | --- | Mechanical | 15 |
| 232 | 13 | Pre-Commercial Thin | Ground Based, Mechanized | --- | Mechanical | 15 |
| 233 | 24 | Fill Plant | Hand | Broadcast Burn | --- | 15 |
| 235 | 26 | Improvement Cut | Ground Based, Mechanized | --- | Whole Tree Yarding | 15 |
| 236 | 52 | Pre-Commercial Thin | Ground Based, Mechanized | --- | Mechanical | 15 |
| 237 | 10 | Improvement Cut | Ground Based, Mechanized | --- | Mechanical | 15 |
| 238 | 18 | Pre-Commercial Thin | Ground Based, Mechanized | --- | Mechanical/Pile | 15 |
| 241 | 30 | Fill Plant | Hand | Broadcast Burn | --- | 15 |
| 242 | 10 | Fill Plant | Hand | Broadcast Burn | --- | 15 |
| 243 | 38 | Fill Plant | Hand | Broadcast Burn | --- | 15 |
| 244 | 58 | Fill Plant | Hand | Broadcast Burn | --- | 15 |
| 245 | 60 | Pre-Commercial Thin | Ground Based, Mechanized | --- | Mechanical | 11C |
| 251 | 37 | Pre-Commercial Thin | Ground Based, Mechanized | --- | Mechanical | 15 |
| 252 | 100 | Seed Tree with Reserves | Ground Based, Mechanized | --- | Whole Tree Yarding/Pile | 15 |
| 256 | 11 | Improvement Cut | Ground Based, Mechanized | --- | Whole Tree Yarding | 11C |
| 257 | 11 | Improvement Cut | Skyline | --- | Whole Tree Yarding | 11C |
| 258 | 33 | Pre-Commercial Thin | Hand | --- | Lop and Scatter | 11C |
| 259 | 22 | Seed Tree with Reserves | Skyline | --- | Whole Tree Yarding/Pile | 11C |
| 260 | 48 | Seed Tree with Reserves | Ground Based, Mechanized | --- | Whole Tree Yarding/Pile | 11C |
| 262 | 20 | Daylighting | Hand | --- | Lop and Scatter | 11C |
| 263 | 117 | Group Select | Ground Based, Mechanized | --- | WTY/Pile/Mechanical | 11C |
| 264 | 32 | Improvement Cut | Hand | --- | Lop and Scatter | 11C |
| 265 | 20 | Daylighting | Ground Based, Mechanized | --- | Mechanical | 11C |
| 266 | 18 | Group Select | Ground Based, Mechanized | --- | Mechanical/Pile | 11C |
| 267 | 19 | Daylighting | Hand | --- | Lop and Scatter | 1 |
| 268 | 20 | Improvement Cut | Hand | --- | Lop and Scatter | 11C |
| 269 | 11 | Daylighting | Hand | --- | Lop and Scatter | 11C |
| 270 | 25 | Fill Plant | Hand | --- | --- | 11C |
| 271 | 39 | Fill Plant | Hand | --- | --- | 11C |

**TABLE 4. ALTERNATIVE 2 - VEGETATION RESTORATION ACTIVITIES BY UNIT.**

| UNIT | ACRES | ALT. 2 PRESCRIPTION | TREATMENT METHODS | PRESCRIBED FIRE ACTIVITY | SLASH TREATMENT | ALT. 2 PROPOSED MA |
|---|---|---|---|---|---|---|
| 272 | 103 | Fill Plant | Hand | --- | --- | 11C |
| 300 | 233 | Prescribed Fire | Hand/Helicopter | Broadcast Burn | --- | 11C |
| 308 | 520 | Prescribed Fire | Helicopter | Broadcast Burn (Wilderness) | --- | 22 |
| 309 | 584 | Prescribed Fire | Helicopter | Broadcast Burn (Wilderness) | --- | 22 |
| 313 | 125 | Prescribed Fire | Hand/Helicopter | Broadcast Burn | --- | 11C |
| 314 | 180 | Prescribed Fire | Hand/Helicopter | Broadcast Burn | --- | 11C |
| 412 | 14 | Improvement Cut | Ground Based, Mechanized | --- | WTY/Pile/Mechanical | 11C |
| 419 | 4 | Improvement Cut | Ground Based, Mechanized | --- | WTY/Pile/Mechanical | 15C |
| 429 | 11 | Commercial Thin | Ground Based, Mechanized | --- | WTY/Pile/Mechanical | 15C |
| 430 | 4 | Commercial Thin | Ground Based, Mechanized | --- | Whole Tree Yarding/Pile | 15C |
| 431 | 1 | Commercial Thin | Ground Based, Mechanized | --- | Whole Tree Yarding/Mechanical | 15C |
| 432 | 7 | Commercial Thin | Ground Based, Mechanized | --- | Whole Tree Yarding/Mechanical | 15C |
| 449 | 2 | Commercial Thin | Ground Based, Mechanized | --- | Whole Tree Yarding/Pile | 11C |
| 459 | 5 | Commercial Thin | Ground Based, Mechanized | --- | Whole Tree Yarding | 11C |
| 491 | 4 | Commercial Thin | Skyline | --- | Whole Tree Yarding | 11C |
| 494 | 3 | Improvement Cut | Skyline | --- | Whole Tree Yarding/Pile | 11C |
| 495 | 1 | Improvement Cut | Ground Based, Mechanized | --- | Whole Tree Yarding/Pile | 11C |
| 498 | 3 | Commercial Thin | Ground Based, Mechanized | --- | Whole Tree Yarding | 11C |
| 4108 | 16 | Commercial Thin | Ground Based, Mechanized | --- | Whole Tree Yarding | 11C |
| 4110 | 14 | Commercial Thin | Skyline | Broadcast Burn | Whole Tree Yarding | 11C |
| 4208 | 1 | Pre-Commercial Thin | Hand | --- | Lop and Scatter | 11C |
| 4209 | 3 | Pre-Commercial Thin | Ground Based, Mechanized | --- | Mechanical | 11C |
| 4222 | 1 | Fill Plant | Hand | --- | --- | 11C |
| 4225 | 3 | Improvement Cut | Hand | --- | Lop and Scatter | 11C |
| 4226 | 3 | Pre-Commercial Thin | Hand | --- | Lop and Scatter | 11C |
| 4262 | 5 | Daylighting | Hand | --- | Lop and Scatter | 11C |

## AQUATIC RESTORATION ACTIVITIES

Alternative 2 proposes four aquatic restoration activities to improve fish habitat and to protect genetically pure westslope cutthroat trout populations in the project area. The Aquatics Section in Chapter 3 provides details about the existing condition of fisheries populations in the project area, and the potential effects and benefits that these aquatic restoration activities could have.

#### FISH BARRIER ON SUNSET CREEK

Alternative 2 proposes to construct a fish barrier on an unnamed perennial stream (informally named “Sunset Creek”) of Beaver Creek off of NFS road #91202 at mile post (MP) 0.67. The barrier would consist of a concrete dam approximately 3.5 to 6.5 feet in height (as seen from the ground) and 16 to 24 feet in length. Water would flow through a notch onto a concrete splash pad and, then, drop again to the natural stream channel. This double-drop structure would block upstream passage for fish at all flow levels. Construction of the barrier would require an access route to be established for equipment and vehicles to reach the barrier site. The disturbed area would be approximately 0.5 acres in size, including the barrier and the access route, and would be designated as an administrative site. The access route would be rehabilitated shortly after construction is complete by ripping the compacted soils, seeding and mulching, and placing slash and woody debris over the disturbed surface. This work would take 4 to 8 weeks to complete.

#### REMOVAL OF UNDESIRABLE FISH BARRIER ON SUNSET CREEK

Concurrent with the new barrier described above, Alternative 2 also proposes to remove and replace an unintentional barrier approximately 0.7 miles upstream on NFS road #9658 at MP 1.12. This culvert unintentionally blocks upstream fish passage but it is a less desirable location than the proposed off NFS road #91202. The new Aquatic Organism Passage (AOP) structure would be designed to allow unhindered upstream fish passage and also withstand a 100-year flood event. The AOP structure would be either an oversized squash pipe with stream simulation material placed inside or a bottomless arch structure.

#### FISH BARRIERS TO PREVENT NON-NATIVE FISH FROM ENTERING WETLANDS

Another culvert replacement is proposed for Alternative 2 on NFS road #906 at MP 1.15. The existing crossing has had ongoing maintenance problems with debris clogging the culvert inlet and has backed up the upstream wetland. Currently, the roadway is acting as a dam that has created voids in the road fill over time. Large cracks have been observed in the roadway within the past 10 years. The new culvert would be designed to pass the 100-year flood event, and the inlet elevation lowered to its natural elevation. This would prevent the roadway from acting as a dam by lowering the water elevation and, therefore, alleviate the water pressure on the roadway fill. This culvert would also be designed to act as a barrier to prevent non-native fish from entering the inter-basin wetland, which is connected to the Clearwater drainage. The barrier would be shot-gunned with a drop of about 4 inches.

In addition, Alternative 2 proposes to install a culvert on NFS road #11636 at MP 1.66 as a fish barrier. Currently, the culvert at this location has been removed. The barrier would be provided by installing a new culvert with a drop of about 4 inches at the outlet to prevent non-native fish from passing further upstream into a wetland that has not yet been invaded.

A more detailed analysis of these restoration activities can be found in the Chapter 3 - Aquatic Resources Section.

### ROAD MANAGEMENT ACTIVITIES

Alternative 2 proposes several different types of road management activities. Temporary road construction is required to conduct the proposed vegetation restoration activities. System roads within the project area will be evaluated for BMPs. Roads not needed for future management would be decommissioned and removed from the system. Some roads not needed for management in the short term would be placed into intermittent stored service. More details about road management activities can be found in Chapter 3 – Transportation and discussion about roads and the affects to wildlife can be found in Chapter 3 – Threatened and Endangered Wildlife Species.

### TEMPORARY ROAD CONSTRUCTION

Temporary road construction is required to conduct the proposed vegetation restoration activities. Temporary roads would be constructed to the minimum standards necessary for log hauling on NFS roads. Temporary road surface width would be limited to truck bunk width plus 4 feet. Alternative 2 proposes a total of 7.5 miles of temporary road construction to conduct proposed activities, approximately 2.8 miles of temporary road construction would be located on existing templates, while approximately 4.7 miles would require new construction. Some existing templates are from former PCTC roads that were decommissioned, but not re-contoured and still useable with little investment. Others are discovered old roads with no records.

All temporary roads constructed for this project would be rehabilitated by any site-appropriate combination of the following:

- Removing any installed culverts or temporary bridges.
- Recontouring the entire template to natural ground contour.
- Where recontouring is unnecessary, scarify with excavator teeth to a depth equally sufficient to ameliorate the presence of detrimental soil compaction (usually between 2 and 12 inches).
- Seeding with the native plant mix as specified by the Forest Botanist.
- Placing woody material on the template.
- Planting native shrubs/trees to augment natural vegetation.

Following rehabilitation activities these areas will cease to function as roads.

### ROAD MAINTENANCE THROUGH BEST MANAGEMENT PRACTICES (BMPS)

The objectives of road maintenance would be to reduce the concentration of subsurface and surface water runoff, minimize road surface erosion, filter ditch water before entering streams, and decrease the risk of culvert failures during peak runoff events. Maintenance work could include culvert installation, replacement of existing culverts with larger culverts, installation of drainage dips and surface water deflectors, placement of rip-rap to armor drainage structures, aggregate surface replacement, aggregate placement to reinforce wet surface areas, ditch construction and cleaning where needed, and surface blading to restore drainage efficiency of the road surface. These actions would bring the roads up to current BMP standards, better accommodate traffic, and reduce deferred maintenance. Best Management Practice activities are typically completed prior to use or required in timber sale contracts prior to hauling of timber over these roads. Approximately 49.7 miles of road would have BMPs applied under Alternative 2, 48.2 miles of haul route would be evaluated for BMPs and approximately 1.5 miles of other roads would be evaluated for BMPs.

**TABLE 5. ROAD MAINTENANCE BEST MANAGEMENT PRACTICES FOR ALTERNATIVE 2.**

| TYPE OF ROAD MAINTENANCE | ALTERNATIVE 2 (MILES) |
|---|---|
| Haul Routes to Receive BMPs | 48.2 |
| Other Proposed Road BMPs | 1.5 |
| **Total Best Management Practices** | **49.7** |

### REALIGNMENT OF ROAD SYSTEM

Both Alternative 2 and 3 propose to realign the road system by constructing approximately 0.15 miles of road to connect NFS roads #90191 and #91160. This would allow 0.38 miles of NFS road #91160 to be decommissioned.

#### INTERMITTENT STORED SERVICE

Intermittent stored service (ISS) roads are Maintenance Level (ML) 1 roads closed to motorized traffic that are placed in a self-maintaining condition. Hence, they are in a condition that there is little resource risk if maintenance is not performed. Treatment activities can include recontouring the road entrance, removing culverts, restoring stream crossings and natural drainage patterns, out-sloping the road surface, installing water bars, and seeding and fertilizing the roadbed. The road prism remains on the landscape and on the National Forest Road System for future use. Both Alternatives 2 and 3 propose to place approximately 12.6 miles of road into ISS.

The resulting long-term reduction in the impacts produced by these roads would benefit streams and wildlife habitat security in the project area. The Transportation Section of Chapter 3 provides greater detail about the activities that would occur to store each road and the Aquatics Section describes the benefits that this work would provide to aquatic species and hydrology. The stored roads in the Beaver Creek Project Area would be treated to meet the Flathead National Forest Plan's definition of reclaimed as defined in Amendment 19 of the Forest Plan, please refer to Chapter 3 - Threatened and Endangered Wildlife Species Section for more information about Amendment 19 and the definition of a reclaimed road.

#### ROAD DECOMMISSIONING

Decommissioning would remove NFS roads from the landscape that are no longer needed for current or future resource management, which pose a threat to water quality, or reduce wildlife security. Methods for decommissioning include partial or full re-contouring, passive decommissioning and active decommissioning. Full re-contouring would restore the original ground slope and partial re-contouring would fill ditches or remove unstable road shoulders. Passive treatment would not involve any ground disturbing work.

Approximately 4.5 miles of National Forest System road are proposed for decommissioning in Alternatives 2 and 3. The methods that would be used for active decommissioning could include:

- Full recontouring,
- Partial recontouring,
- Removing culverts and other drainage structures,
- Ripping the roadbed to reduce compaction,
- Installing water bars and out-sloping the road prism,
- Seeding and fertilizing disturbed soil, and/or
- Blocking the entrance and abandoning the road to allow re-vegetation.

The resulting long-term reduction in the impacts produced by these roads would benefit streams and wildlife habitat security in the project area. The Transportation Section of Chapter 3 provides greater detail about the activities that would occur to decommission each road.

### DESIGN CRITERIA

Table 16 located at the end of this chapter describes the Design Criteria applied to this project to protect resources.

### MONITORING

Monitoring and evaluation compared the results being achieved to those projected in the Forest Plan. Monitoring is conducted on a sample basis to evaluate the overall progress in implementing the Forest Plan, the assumptions on which the Forest Plan is based, and to provide a feedback loop for determining effectiveness of project and mitigation implementation (USDA Forest Service 1987). For this project, monitoring and evaluation would be conducted as described in

Appendix B of this document. Those monitoring components not specifically discussed in this appendix tier to the monitoring described in the Forest Plan.

# ALTERNATIVE 3

Alternative 3 was developed to address the key issues of wildlife habitat connectivity, visual effects of vegetation treatments to the users of Lindbergh Lake, and proposed vegetation management within RHCAs. Alternative 3 responds to the wildlife connectivity issue by removing vegetation treatments that reduce hiding cover. Alternative 3 also addresses the concerns about visual effects by dropping Unit 83, which would be visible to users of Lindbergh Lake. Alternative 3 responds to the issue of vegetation management in RHCAs by eliminating proposed vegetation removal from most RHCA buffers, see the Chapter 3 – Aquatics Section for a discussion of potential effects to RHCAs. Alternative 3 proposes a different type of fish barrier on Beaver Creek than the one proposed in Alternative 2. Alternative 3 also proposes different management areas assignment on acquired lands in the project area.

## VEGETATION RESTORATION ACTIVITIES

Alternative 3 proposes approximately 4,180 acres of vegetation restoration activities that include silvicultural treatments, prescribed burning within the WUI, and prescribed burning within the Mission Mountains Wilderness. The following sections describe these vegetation restoration activities and how they will be applied to the landscape.

### SILVICULTURAL TREATMENTS

Alternative 3 proposes approximately 2,538 acres of silvicultural treatments. Approximately 1,586 acres of these proposed silvicultural treatments have potential to produce a commercial product through 1,366 acres of intermediate treatments and 220 acres of regeneration treatments. Alternative 3 proposes 952 acres of silvicultural treatments that are not expected to produce commercial products and include daylighting, fill planting, and pre-commercial thinning on lands formerly owned by PCTC. These treatments are estimated to produce approximately 9,099 CCF in saw timber and approximately 3,912 CCF in non-saw timber. If residual slash can be utilized by the purchaser for higher value products, this will be considered.

Table 6 and Table 7 below displays the different types of silvicultural treatments proposed in Alternative 3.

**TABLE 6. ALTERNATIVE 3 SILVICULTURE TREATMENTS WITH COMMERCIAL COMPONENT.**

| SILVICULTURE TREATMENTS WITH COMMERCIAL COMPONENT | ALTERNATIVE 3 (ACRES) |
|---|---|
| **Intermediate Treatments** | |
| Commercial Thin | 801 |
| Improvement Cut | 565 |
| Total Acres of Intermediate Treatments | 1,366 |
| **Regeneration Treatments** | |
| Seed Tree with Reserves | 94 |
| Clearcut with Reserves | 16 |
| Group Selection | 110 |
| Total Acres of Regeneration Treatments | 220 |
| **Total Acres of Silviculture Treatments with Commercial Component** | **1,586** |

**TABLE 7. ALTERNATIVE 3 SILVICULTURE TREATMENTS WITHOUT COMMERCIAL COMPONENT.**

| SILVICULTURE TREATMENTS WITHOUT COMMERCIAL COMPONENT | ALTERNATIVE 3 (ACRES) |
|---|---|
| Pre-Commercial Thinning | 552 |
| Daylighting | 70 |
| Fill Planting | 339 |
| **Total Acres of Silviculture Treatments without Commercial Component** | **952 acres** |
| Reforestation to Occur Following Clearcut, Seed Tree, and Group Selection Treatments | 220 |

Alternative 3 proposes the same types of silvicultural treatments as for Alternative 2, these treatments are described and illustrated with representative photos in the Alternative 2 – Vegetation Restoration Activities and will not be repeated here. The Forest Vegetation Section of Chapter 3 contains additional information about silvicultural treatments.

### SILVICULTURE TREATMENTS WITH COMMERCIAL COMPONENT

*Intermediate Treatments*

Intermediate treatments are designed to enhance growth, quality, vigor, and composition of the stand after establishment or regeneration and prior to final harvest. Alternative 3 proposes 1,366 acres of intermediate treatments to meet the purpose and need.

*Commercial Thin*

The purpose of a commercial thin treatment is to enlarge the growing space for desirable trees and reduce tree competition for limited site resources thus promoting improved tree growth, vigor, and resilience to insect and disease. Alternative 3 proposes 801 acres of commercial thin treatments.

*Improvement Cut*

Improvement cut treatments are intended to remove trees of undesirable species, form, age, or condition from the main canopy in a stand of poles or larger trees. Alternative 3 proposes 565 acres of improvement cut some of which would produce a commercial product and other areas would not have a commercial component.

*Regeneration Treatments*

Regeneration treatments are proposed in forest stands where recent inventory data and stand diagnoses indicate substantial current or potential mortality from insects and/or disease, or to create uneven-aged stands and promote the establishment and growth of desirable species. Regeneration treatments include prescriptions for seed tree, clearcut, and group selection. Sites where these treatments occur must be regenerated, either through natural regeneration or by planting seedlings. Alternative 3 proposes 220 acres of regeneration treatments.

*Regional Forester Approval for an Opening greater than 40 acres in size*

Alternative 3 would require Regional Forester approval to create an opening that exceeds 40 acres in size. Unit 21 is a seed tree with leave treatment, which is approximate 67 acres in size. Regional Forester policy (FSM 2471.1) directs the size of harvest openings created by even-aged silvicultural practices would be normally 40 acres or less, to support NFMAs general intent to limit the size of harvest openings. Creation of larger openings requires 60-day public review and Regional Forester approval. The public is being given 60 days notification of the potential for an opening over 40 acres with this EA. More information about the stand and the treatment objectives can be found in Chapter 3 - Forest Vegetation

*Seed Tree with Reserves*

This treatment would remove many of the trees from the unit to encourage regeneration of a new age class and potentially increase the species diversity of the site. Species preferred for retention are western larch, ponderosa pine, western white pine (where present), and Douglas-fir. Alternative 2 proposes 94 acres of seed tree with leave.

*Clearcut with Reserves*

A clearcut with reserves would remove enough of the trees from the site to facilitate regeneration of a new age class and provide some species diversity. Alternative 3 proposes 16 acres of two-aged stand clearcut with reserves.

*Group Selection*

The principle purpose of group selection treatments being proposed in the Beaver Creek Project is to create openings for establishment and/or increased stocking and vigor of whitebark pine seedlings using planted white pine blister rust-resistant stock, natural regeneration, or a combination of both. Alternative 3 proposes approximately 110 acres of group selection treatment.

*Reforestation Following Regeneration treatment*

Reforestation would occur following regeneration treatments, such as clearcut with reserves, seed tree with leave and in group selection where the silviculture prescriptions determine that reforestation is necessary to accomplish objectives. Alternative 3 proposes approximately 220 acres of reforestation to occur following regeneration treatment.

### SILVICULTURE TREATMENTS WITHOUT COMMERCIAL COMPONENT

These treatments would improve the composition, structure, condition, health, and growth of even- or uneven-aged stands.

*Pre-commercial Thin*

This treatment would be applied to young stands generally not past the sapling stage with the objective of accelerating growth, reducing densities, and/or improving species composition. Alternative 3 proposes 552 acres of pre-commercial thinning.

*Daylighting*

Daylighting treatments are applied on an individual tree basis and involve removing smaller-diameter trees within a specified distance (approximately 20 to 30 feet) of a target tree. Alternative 3 proposes approximately 70 acres of daylighting, which is typically accomplished by hand or by mechanized methods such as chipping or mastication.

*Fill Plant*

Trees are planted in areas previous subject to regeneration harvest where regeneration was not completely successful or to improve the diversity of tree species growing on the landscape to favor more fire resilient species, such as western larch and ponderosa pine, as well as restoration of species such as western white pine. Alternative 3 proposes approximately 329 acres of fill planting.

### SLASH TREATMENT ACTIVITIES

To reduce hazardous fuel conditions that are created by harvest activity, slash reduction treatments would be implemented. These slash treatments would include the following types of activities applied in combination where appropriate to reduce fuel loading and achieve site preparation:

- Lop and scatter, mechanical removal (including mastication),

- Mechanical treatment, and
- Piling and whole tree yarding (see Chapter 3 –Fire/Fuels for discussion about slash treatment and fire behavior).

If residual slash can be utilized by the purchaser for higher value products, this will be considered.

## PRESCRIBED FIRE ACTIVITIES

Similar to Alternative 2, Alternative 3 proposes prescribed fire to reduce the risk of uncharacteristic wildfire through the reduction of hazardous fuels within the WUI and Mission Mountains Wilderness.

Table 8 shows the prescribed burning activities proposed in Alternative 3.

**TABLE 8. ALTERNATIVE 3 PRESCRIBED BURNING ACTIVITIES.**

| PRESCRIBED BURNING AND FUELS TREATMENT | ALTERNATIVE 3 (ACRES) |
|---|---|
| Prescribed Burning Acres following harvest | 130 |
| Prescribed Burning Acres without other treatments in the WUI | 538 |
| Prescribed Burns Acres within Mission Mountains Wilderness | 1,104 |
| **Total Acres of Prescribed Burning** | **1,772** |
| **Total Acres of Prescribed Burning without other treatments** | **1,642** |

The types of proposed burning activities proposed in Alternative 3 are the same as those proposed in Alternative 2 and are described in greater detail above.

### BROADCAST BURNING IN THE WILDLAND URBAN INTERFACE AND FOLLOWING HARVEST ACTIVITIES

In both Alternative 2 and 3, prescribed fire would be used to achieve restoration objectives and to allow fire to return to the landscape in a controlled manner on a total of 668 acres within the WUI and following harvest activities.

Approximately 130 acres would be broadcast burned to address natural fuels following harvest activities and would serve as a component of vegetation restoration in conjunction with the silvicultural prescription. Alternative 3 also proposes to use prescribed fire on 538 acres in the WUI where no other harvest activities are proposed. Within these prescribed burns, areas have been identified as having potential for quaking aspen restoration, and where suitable habitat is identified, prescribed burning may be followed by planting aspen on up to 50 acres. Other areas within the prescribed burns that have been identified as being understocked with desirable tree species may have fill planting take place on 152 acres.

The use of fire in combination with other silvicultural activities is displayed in Table 9.

### BROADCAST BURNING (MISSION MOUNTAINS WILDERNESS)

The use of prescribed fire in the Mission Mountains Wilderness on 1,104 acres is being proposed in both Alternative 2 and 3 to target and reduce dead and down fuels, as well as cause mortality in understory trees and patches of overstory trees. Greater detail is provided in the Alternative 2 description of Broadcast Burning (Mission Mountains Wilderness).

Table 9 displays the unit number, acres proposed for treatment, silvicultural prescriptions, logging systems, slash treatment, prescribed fire activity, and management area for each vegetation restoration activity proposed in Alternative 3.

**TABLE 9. ALTERNATIVE 3 VEGETATION RESTORATION ACTIVITIES BY UNIT.**

| UNIT | ACRES | ALT. 3 PRESCRIPTION | TREATMENT METHODS | PRESCRIBED FIRE ACTIVITY | SLASH TREATMENT | ALT. 3 PROPOSED MA |
|---|---|---|---|---|---|---|
| 1 | 4 | Commercial Thin | Ground Based, Mechanized | -- | Whole Tree Yarding/Mechanical | 5 |
| 3 | 24 | Commercial Thin | Ground Based, Mechanized | Broadcast Burn | Whole Tree Yarding/Mechanical | 5 |
| 4 | 19 | Commercial Thin | Ground Based, Mechanized | -- | Whole Tree Yarding/Mechanical | 5 |
| 5 | 47 | Improvement Cut | Ground Based, Mechanized | -- | Whole Tree Yarding | 11C |
| 6 | 5 | Improvement Cut | Ground Based, Mechanized | Broadcast Burn | Whole Tree Yarding | 5 |
| 7 | 3 | Pre-Commercial Thin | Ground Based, Mechanized | -- | Whole Tree Yarding | 5 |
| 12 | 55 | Improvement Cut | Ground Based, Mechanized | -- | WTY/Pile/Mechanical | 11C |
| 16 | 141 | Commercial Thin | Ground Based, Mechanized | -- | WTY/Pile/Mechanical | 11C |
| 19 | 48 | Improvement Cut | Ground Based, Mechanized | Broadcast Burn | WTY/Pile/Mechanical | 15C |
| 21 | 67 | Seed Tree with Leave | Ground Based, Mechanized | -- | Whole Tree Yarding | 15C |
| 25 | 27 | Commercial Thin | Ground Based, Mechanized | Broadcast Burn | Whole Tree Yarding | 15C |
| 28 | 110 | Commercial Thin | Ground Based, Mechanized | -- | WTY/Pile/Mechanical | 15C |
| 31 | 1 | Commercial Thin | Ground Based, Mechanized | -- | Whole Tree Yarding/Mechanical | 15C |
| 32 | 12 | Commercial Thin | Ground Based, Mechanized | -- | Whole Tree Yarding/Mechanical | 15C |
| 34 | 10 | Commercial Thin | Ground Based, Mechanized | -- | Whole Tree Yarding | 15C |
| 36 | 29 | Commercial Thin | Ground Based, Mechanized | -- | Whole Tree Yarding/Mechanical | 15C |
| 37 | 5 | Commercial Thin | Ground Based, Mechanized | Broadcast Burn | Whole Tree Yarding | 15C |
| 39 | 45 | Commercial Thin | Ground Based, Mechanized | -- | Whole Tree Yarding | 11C |
| 40 | 9 | Commercial Thin | Ground Based, Mechanized | Broadcast Burn | Whole Tree Yarding/Pile | 11C |
| 42 | 11 | Commercial Thin | Ground Based, Mechanized | Broadcast Burn | Whole Tree Yarding | 11C |
| 43 | 4 | Commercial Thin | Ground Based, Mechanized | -- | Whole Tree Yarding | 11C |
| 45 | 10 | Clearcut with Reserves | Ground Based, Mechanized | -- | Whole Tree Yarding/Pile | 15C |
| 51 | 45 | Improvement Cut | Ground Based, Mechanized | -- | Whole Tree Yarding | 11C |
| 54 | 8 | Improvement Cut | Ground Based, Mechanized | -- | Whole Tree Yarding/Mechanical | 11C |
| 55 | 82 | Commercial Thin | Ground Based, Mechanized | -- | Whole Tree Yarding/Pile | 11C |
| 57 | 3 | Commercial Thin | Ground Based, Mechanized | -- | Whole Tree Yarding/Mechanical | 15C |
| 60 | 3 | Improvement Cut | Ground Based, Mechanized | -- | Whole Tree Yarding | 11C |
| 62 | 31 | Commercial Thin | Ground Based, Mechanized | -- | Whole Tree Yarding/Pile | 15C |
| 74 | 1 | Commercial Thin | Ground Based, Mechanized | Broadcast Burn | Whole Tree Yarding/Mechanical | 15 |
| 76 | 43 | Commercial Thin | Ground Based, Mechanized | -- | Mechanical | 15 |

**TABLE 9. ALTERNATIVE 3 VEGETATION RESTORATION ACTIVITIES BY UNIT.**

| UNIT | ACRES | ALT. 3 PRESCRIPTION | TREATMENT METHODS | PRESCRIBED FIRE ACTIVITY | SLASH TREATMENT | ALT. 3 PROPOSED MA |
|---|---|---|---|---|---|---|
| 84 | 6 | Clearcut with Reserves | Ground Based, Mechanized | -- | Mechanical/Pile | 15 |
| 89 | 41 | Improvement Cut | Ground Based, Mechanized | -- | Whole Tree Yarding/Pile | 11C |
| 90 | 8 | Commercial Thin | Ground Based, Mechanized | -- | Whole Tree Yarding | 11C |
| 91 | 16 | Commercial Thin | Skyline | -- | Whole Tree Yarding | 11C |
| 99 | 26 | Commercial Thin | Ground Based, Mechanized | -- | Whole Tree Yarding | 15 |
| 100 | 14 | Commercial Thin | Skyline | -- | Whole Tree Yarding | 15 |
| 102 | 95 | Commercial Thin | Ground Based, Mechanized | -- | Whole Tree Yarding/Pile | 15 |
| 105 | 27 | Seed Tree with Leave | Skyline | -- | Whole Tree Yarding/Pile | 15 |
| 114 | 46 | Improvement Cut | Ground Based, Mechanized | -- | Whole Tree Yarding/Pile | 11C |
| 116 | 92 | Group Select | Ground Based, Mechanized | -- | Whole Tree Yarding/Pile | 11C |
| 118 | 17 | Improvement Cut | Ground Based, Mechanized | -- | Whole Tree Yarding/Pile | 11C |
| 119 | 26 | Commercial Thin | Ground Based, Mechanized | -- | Whole Tree Yarding | 11C |
| 200 | 7 | Pre-Commercial Thin | Hand | -- | Lop and Scatter | 15C |
| 201 | 4 | Pre-Commercial Thin | Ground Based, Mechanized | -- | Whole Tree Yarding | 15C |
| 203 | 11 | Improvement Cut | Ground Based, Mechanized | -- | Mechanical/Pile | 15C |
| 204 | 83 | Improvement Cut | Ground Based, Mechanized | -- | Mechanical/Pile | 11C |
| 210 | 36 | Pre-Commercial Thin | Ground Based, Mechanized | -- | Mechanical/Pile | 15C |
| 211 | 26 | Pre-Commercial Thin | Hand | -- | Lop and Scatter | 15C |
| 212 | 40 | Pre-Commercial Thin | Ground Based, Mechanized | -- | Mechanical/Pile | 15C |
| 214 | 17 | Pre-Commercial Thin | Ground Based, Mechanized | -- | WTY/Pile/Mechanical | 15C |
| 220 | 10 | Pre-Commercial Thin | Ground Based, Mechanized | -- | Mechanical/Pile | 11C |
| 221 | 24 | Improvement Cut | Ground Based, Mechanized | -- | Mechanical | 11C |
| 222 | 1 | Fill Plant | Hand | -- | --- | 11C |
| 224 | 18 | Pre-Commercial Thin | Ground Based, Mechanized | -- | Whole Tree Yarding | 11C |
| 226 | 10 | Pre-Commercial Thin | Ground Based, Mechanized | -- | Mechanical | 11C |
| 230 | 10 | Pre-Commercial Thin | Hand | -- | Lop and Scatter | 15C |
| 231 | 221 | Pre-Commercial Thin | Ground Based, Mechanized | -- | Mechanical | 15 |
| 232 | 13 | Pre-Commercial Thin | Ground Based, Mechanized | -- | Mechanical | 15 |
| 233 | 24 | Fill Plant | Hand | Broadcast Burn | --- | 15 |
| 235 | 26 | Improvement Cut | Ground Based, Mechanized | -- | Whole Tree Yarding | 15 |
| 236 | 52 | Pre-Commercial Thin | Ground Based, Mechanized | -- | Whole Tree Yarding/Mechanical | 15 |

**TABLE 9. ALTERNATIVE 3 VEGETATION RESTORATION ACTIVITIES BY UNIT.**

| UNIT | ACRES | ALT. 3 PRESCRIPTION | TREATMENT METHODS | PRESCRIBED FIRE ACTIVITY | SLASH TREATMENT | ALT. 3 PROPOSED MA |
|---|---|---|---|---|---|---|
| 238 | 18 | Pre-Commercial Thin | Ground Based, Mechanized | -- | Mechanical/Pile | 15 |
| 241 | 30 | Fill Plant | Hand | Broadcast Burn | --- | 15 |
| 242 | 10 | Fill Plant | Hand | Broadcast Burn | --- | 15 |
| 243 | 38 | Fill Plant | Hand | Broadcast Burn | --- | 15 |
| 244 | 58 | Fill Plant | Hand | Broadcast Burn | --- | 15 |
| 245 | 33 | Pre-Commercial Thin | Ground Based, Mechanized | -- | Mechanical | 11C |
| 251 | 37 | Pre-Commercial Thin | Ground Based, Mechanized | -- | Mechanical | 15 |
| 252 | 29 | Improvement Cut | Ground Based, Mechanized | -- | Whole Tree Yarding/Lop_Scatter | 15 |
| 254 | 25 | Improvement Cut | Ground Based, Mechanized | -- | Whole Tree Yarding/Lop_Scatter | 15 |
| 262 | 20 | Daylighting | Hand | -- | Lop and Scatter | 11C |
| 264 | 32 | Improvement Cut | Hand | -- | Lop and Scatter | 11C |
| 265 | 20 | Daylighting | Ground Based, Mechanized | -- | Mechanical | 11C |
| 266 | 18 | Group Select | Ground Based, Mechanized | -- | Mechanical/Pile | 11C |
| 267 | 19 | Daylighting | Hand | -- | Lop and Scatter | 1 |
| 268 | 20 | Improvement Cut | Hand | -- | Lop and Scatter | 11C |
| 269 | 11 | Daylighting | Hand | -- | Lop and Scatter | 11C |
| 270 | 25 | Fill Plant | Hand | -- | --- | 11C |
| 271 | 39 | Fill Plant | Hand | -- | --- | 11C |
| 272 | 103 | Fill Plant | Hand | -- | --- | 11C |
| 300 | 233 | Prescribed Fire | Hand/Helicopter | Broadcast Burn | --- | 11C |
| 308 | 520 | Prescribed Fire | Helicopter | Broadcast Burn (Wilderness) | --- | 22 |
| 309 | 584 | Prescribed Fire | Helicopter | Broadcast Burn (Wilderness) | --- | 22 |
| 313 | 125 | Prescribed Fire | Hand/Helicopter | Broadcast Burn | --- | 11C |
| 314 | 180 | Prescribed Fire | Hand/Helicopter | Broadcast Burn | --- | 11C |
| 460 | 1 | Commercial Thin | Ground Based, Mechanized | -- | Whole Tree Yarding | 11C |
| 491 | 4 | Commercial Thin | Skyline | -- | Whole Tree Yarding | 11C |
| 4222 | 1 | Fill Plant | Hand | -- | --- | 11C |

## AQUATIC RESTORATION ACTIVITIES

Alternative 3 proposes three aquatic restoration activities to improve fish habitat and to protect genetically pure westslope cutthroat trout populations in the project area. The Aquatics Section in Chapter 3 provides details about the existing condition of fisheries populations in the project area, and the potential effects and benefits that these aquatic restoration activities could have.

### Fish Barrier on Sunset Creek

Instead of the concrete fish barrier proposed in Alternative 2, Alternative 3 proposes to replace a culvert at MP 1.12 on NFS road #9658 that would also serve as a fish barrier. The barrier would be a shot-gunned culvert with a drop of about 36 inches at the outlet onto a small splash pad to prevent non-native brook trout from passing further upstream.

### Fish Barriers to Prevent Non-native Fish from Entering Wetlands

A culvert replacement is proposed for both Alternative 2 and 3 on NFS road #906 at MP 1.15. A more detailed analysis of these restoration activities can be found in the Aquatic Resources Section of this EA.

Both Alternative 2 and 3 propose to install a culvert on NFS road #11636 at MP 1.66 as a fish barrier.

## Road Management Activities

Much like Alternative 2, Alternative 3 proposes several different types of road management activities, including: temporary roads, BMPs, road realignment, intermittent stored service, and road decommissioning. The types of road management are the same for Alternative 2 and 3 and are described in greater detail above, and more details about road management activities can be found in Chapter 3 – Transportation.

### Temporary Road Construction

Alternative 3 would require temporary road construction totaling 5 miles to conduct vegetative restoration activities. All temporary roads would be constructed and rehabilitated using the same methods described in Alternative 2, and following project activities would cease to function as roads. See Chapter 3 – Transportation section for more information about temporary roads proposed to conduct activities in Alternative 3.

### Road Maintenance through Best Management Practices (BMPs)

The objectives of road maintenance would be to reduce the concentration of subsurface and surface water runoff, minimize road surface erosion, filter ditch water before entering streams, and decrease the risk of culvert failures during peak runoff events. Approximately 42.5 miles of road would have BMPs applied under Alternative 3, 41.0 miles of haul route would be evaluated for BMPs and approximately 1.5 miles of other roads would be evaluated for BMPs.

**Table 10. Road Maintenance Best Management Practices for Alternative 3.**

| Type of Road Maintenance | Alternative 3 (Miles) |
|---|---|
| Haul Routes to Receive BMPs | 41.0 |
| Other Proposed Road BMPs | 1.5 |
| **Total Best Management Practices** | **42.4** |

### Realignment of Road System

In both Alternative 2 and 3, one segment of system road construction is proposed to realign the road system. A total of approximately 0.15 miles of road is proposed for construction to allow for decommissioning of 0.38 miles of NFS road.

### Intermittent Stored Service

Intermittent stored service roads are ML 1 roads closed to motorized traffic that are placed in a self-maintaining condition; approximately 12.6 miles of NFS road is proposed for ISS in Alternatives 2 and 3 of the Beaver Creek Project.

### ROAD DECOMMISSIONING

Decommissioning would remove NFS roads from the landscape that are no longer needed for current or future resource management. Approximately 4.5 miles of road are proposed for decommissioning in both Alternative 2 and 3.

## FOREST PLAN AMENDMENT TO ASSIGN MANAGEMENT AREA DIRECTION TO ACQUIRED LANDS

The Flathead Forest Plan sets management direction for this project area. The Forest Plan provides forest-wide goals and objectives (pages II-1 through II-57) that provide direction to the management of National Forest System lands managed by the Flathead National Forest. The Flathead Forest Plan also includes several amendments which provide resource specific management direction for resources including, but not limited to: old growth forests, water howellia, invasive plant species, Canada lynx, over the snow use, and motorized route management among others. The activities proposed in the Beaver Creek Project are compliant with the 1986 Flathead National Forest Plan. In keeping with Forest Service policy on multiple use, the Forest Plan established goals to strike a balance among different resources (Forest Plan, page II-5).

The Forest Plan also divides the Flathead National Forest into subunits called management areas (MAs). Each of these MAs has resource or activity goals and management standards (Forest Plan, pages III-1 through III-126).

Within the Beaver Creek Project Area, there are lands that the Flathead National Forest has acquired from the Plum Creek Timber Company. Approximately 3,101 acres of land in the project area was acquired through the Land and Water Conservation Fund (LWCF) between the years of1998 through 2006. An additional 2,331 acres were acquired between 2010 and 2014 through the Montana Legacy Lands Project (See the Chapter 3 – Recreation, Wilderness, Lands and Range section for a breakdown of which parcels were acquired through which program).

As the ID Team developed a purpose and need for the Beaver Creek Project Area and proposed activities that would meet this purpose and need, the ID Team proposed management area assignments for acquired lands based on management direction of surrounding lands and the characteristics of the parcel. These MA recommendations were shared with the public in the March 2014 Proposed Action and several comments were received from the public requesting that the MA designations be changed on acquired lands (Project File Exhibit C-5,C-8, C-14, C-16, C-18, C-23, and C-24).

The Management Areas proposed in Alternative 2 are the same as those presented in the March 2014 Proposed Action. The Management Areas proposed in Alternative 3 reflect the public comment received regarding MAs on acquired land within the Lindbergh Lake viewshed. Public comment expressed concern that MA 15, as proposed in Alternative 2 on the east shore of Lindbergh Lake, would not adequately reflect the scenic integrity of these lands. In response to public comment received, Alternative 3 proposes to assign 502 acres of land on the east shore of Lindbergh Lake as MA5 to reflect the high scenic value of these lands.

The Flathead National Forest is currently undergoing a Forest Plan Revision process to provide direction for National Forest System land, which will include assigning management areas to NFS lands across the forest. When a decision has been made for the revised Flathead National Forest Plan, it will replace the 1986 Flathead National Forest Plan and provide new management area direction for the forest (including the Beaver Creek project area), and supersede this amendment which was intended to designate Management Areas to acquired lands on an interim basis.

Table 11 provides an overview of the current MAs in the Beaver Creek Project that were assigned by the 1986 Forest Plan, displayed as Alternative 1 – Existing Condition. Table 11 also displays the proposed management area assignments on acquired lands for Alternative 2 and Alternative 3 and Maps 2-6 and 2-7 show the proposed MA assignments in the project area. Table 12 shows the activities proposed on acquired lands for each alternative.

**TABLE 11. MANAGEMENT AREA DESCRIPTIONS AND PROPOSED MANAGEMENT AREAS.[2]**

| MA | DESCRIPTION | MANAGEMENT EMPHASIS | ALT. 1 EXISTING CONDITION | ALTERNATIVE 2 PROPOSED MANAGEMENT AREAS | | ALTERNATIVE 3 PROPOSED MANAGEMENT AREAS | |
|---|---|---|---|---|---|---|---|
| | | | (ACRES) | TOTAL (ACRES) | ACQUIRED LANDS (ACRES) | TOTAL (ACRES) | ACQUIRED LANDS (ACRES) |
| **1** | Consists of non-forest lands and timberlands where timber management is uneconomical or currently technologically infeasible due to topographic features. | Maintain the present condition with minimal investment for resource activities, while protecting the basic soils, water, and wildlife resources. Generally, these areas will retain a natural appearance. | 515 | 515 | - | 515 | - |
| **2** | Consists of unroaded lands that offer a variety of dispersed recreation opportunities. | Provide a variety of primitive and semi-primitive recreation opportunities. | 802 | 857 | 55 | 857 | 55 |
| **5** | Roaded timberlands in areas of high scenic value. | Maintain a pleasing, natural appearing landscape in which management activities are not evident. | 73 | 81 | 8 | 583 | 510 |
| **11C** | Timberlands capable of providing grizzly bear habitat located on the southern portion of the Swan Lake Ranger District. | Manage the Swan/Clearwater Divide as an area that provides a security grizzly bear travel route between the Mission and Swan Mountain Ranges. Desired cover relationship is provided through vegetative manipulation including timber harvest and prescribed burning. | 4,111 | 6,423 | 2,312 | 6,423 | 2,312 |

[2] Management area boundaries are not firm lines. The boundaries represent a transition from one set of opportunities and constraints to another with management direction established for each. The boundaries are flexible to assure that the values identified are protected. As such, these acres displayed in this table and in Maps 2-6 and Maps 2-7 should be considered approximations due to GIS discrepancies and rounding error. This table displays the acres as determined by GIS for ease of analysis. The recorded acres for each parcel are displayed in Chapter 3 – Recreation, Wilderness, Lands, and Range section.

**TABLE 11. MANAGEMENT AREA DESCRIPTIONS AND PROPOSED MANAGEMENT AREAS.[2]**

| MA | Description | Management Emphasis | Alt. 1 Existing Condition (Acres) | Alternative 2 Proposed Management Areas Total (Acres) | Alternative 2 Proposed Management Areas Acquired Lands (Acres) | Alternative 3 Proposed Management Areas Total (Acres) | Alternative 3 Proposed Management Areas Acquired Lands (Acres) |
|---|---|---|---|---|---|---|---|
| **12** | Includes riparian areas consisting of aquatic, riparian, and a portion of terrestrial ecosystems along most perennial streams, lakes, ponds, marshlands, bogs, and some important seasonal flow streams. | Manage riparian areas throughout the Forest to enhance vegetation and wildlife diversity and maintain or enhance water quality and fisheries. Emphasize water and soil protection and old growth habitat. Management of other resources must be compatible with the riparian habitat management standards. | 302 | 622 | 320 | 622 | 320 |
| **15** | Timberlands where timber management with roads is economical and feasible. | Emphasize cost-efficient production of timber while protecting the productive capacity of the land and timber resource. | 636 | 2,669 | 2,033 | 2,167 | 1,531 |
| **15C** | Consists of timberlands where timber management with roads is economical and feasible, and is key white-tailed deer summer range. | Special consideration will be given to white-tailed deer summer range within this MA. | 767 | 1,479 | 712 | 1,479 | 712 |
| **17** | Includes riparian areas consisting of aquatic, riparian, and a portion of terrestrial ecosystems along perennial stream reaches, and some important streams with typically a seasonal flow. | Protect and maintain this riparian zone throughout the Forest, including fish and wildlife habitat, while maintaining a sustained yield of timber. | 48 | 65 | 17 | 65 | 17 |
| **22** | Mission Mountains Wilderness classified wilderness designated in 1975 by the US Congress. | Manage this area in accordance with the Wilderness Act of 1964 to maintain an enduring system of high quality wilderness representative of all National Forest ecotypes. | 20,026 | 20,026 | - | 20,026 | - |
| - | Former PCTC acquired by USFS | Management Area Unassigned, Forest-wide Standards and Guidelines apply | 5,457 | - | - | | - |
| **Non-NFS lands in the Beaver Creek Project Area** | | | **1,810** | | | | |
| **NFS Lands in Beaver Creek Project Area** | | | **32,737** | | | | |
| **Acres covered by Lindbergh Lake in Project Area** | | | **415** | | | | |
| **Total Lands in Beaver Creek Project Area** | | | **34,962** | | | | |

**TABLE 12. PROPOSED ACTIVITIES ON ACQUIRED LANDS.**

| PROPOSED MA | PROPOSED ACTIVITY | ALT 2 (ACRES) | ALT 3 (ACRES) |
|---|---|---|---|
| 5 | Improvement Cut | .2 | .2 |
| 11C | Seed Tree | 2 | 0 |
| | Improvement Cut | 116 | 103 |
| | Commercial Thin | 14 | 7 |
| | Pre-commercial Thinning | 102 | 53 |
| | Fill Planting | 137 | 137 |
| | Prescribed Burning | 234 | 234 |
| 12 | Pre-commercial thinning | 6 | 0 |
| | Improvement Cut | 3 | 3 |
| 15 | Clearcut with Reserves | 6 | 6 |
| | Improvement Cut | 36 | 28 |
| | Commercial Thin | 180 | 92 |
| | Group Selection | 0 | 0 |
| | Daylighting | 0 | 0 |
| | Pre-commercial Thinning | 345 | 345 |
| | Fill Planting | 158 | 158 |
| | Prescribed Burning | 303 | 303 |
| 15C | Clearcut with Reserves | 10 | 10 |
| | Seed Tree | 15 | 4 |
| | Improvement Cut | .5 | .5 |
| | Commercial Thin | 23 | 23 |
| | Prescribed Burning | 0 | 0 |
| | Pre-commercial thinning | 325 | 128 |
| **Total Acres of Proposed Activities on Acquired Lands** | | **2015.7** | **1634.7** |

# COMPARISON OF ALTERNATIVES

To define the issues and provide a clear comparison of alternatives, the following tables (Table 13 – 15) provide several different summaries of the Beaver Creek Project by alternative, displaying proposed activities, key issues for the project, and purpose and need.

**TABLE 13. COMPARISON OF ALTERNATIVES.**

| PROPOSED ACTIVITIES | ALT. 1 | ALT. 2 | ALT. 3 |
|---|---|---|---|
| **VEGETATION RESTORATION ACTIVITIES** | **ACRES** | **ACRES** | **ACRES** |
| Total Acres of Vegetation Restoration | 0 | 5,286 | 4,180 |
| Acres of Silviculture Treatments with Commercial Component | 0 | 2,351 | 1,586 |
| Acres of Silviculture Treatments without Commercial Component | 0 | 1,293 | 952 |
| Acres of Prescribed Burning without other Silviculture Treatments | 0 | 1,642 | 1,642 |
| **AQUATIC RESTORATION ACTIVITIES** | **STRUCTURES** | **STRUCTURES** | **STRUCTURES** |
| Total Number of Aquatic Restoration Activities | 0 | 4 | 3 |
| Concrete Fish Barrier off NFS Road #91202 | 0 | 1 barrier installation | 0 barrier installations |

**TABLE 13. COMPARISON OF ALTERNATIVES.**

| PROPOSED ACTIVITIES | ALT. 1 | ALT. 2 | ALT. 3 |
|---|---|---|---|
| Culvert Replacement on NFS Road #9658 | 0 | 1 culvert replacement to provide fish passage | 1 culvert replacement to serve as fish barrier |
| Culvert Installation on NFS Road #11636 to Serve as Fish Barrier | 0 | 1 culvert installation | 1 culvert installation |
| Culvert Replacement on NFS Road #906 to Address Inter-Basin Exchange | 0 | 1 culvert replacement | 1 culvert replacement |
| **ROAD MANAGEMENT ACTIVITIES** | **MILES** | **MILES** | **MILES** |
| Miles of Haul Route | 0 | 48.2 | 41.0 |
| Miles to be evaluated for BMPs | 0 | 49.7 | 42.4 |
| Miles of ISS/Reclaimed Roads | 0 | 12.6 | 12.6 |
| Miles of Decommissioning | 0 | 4.5 | 4.5 |
| Miles of Temporary Road | 0 | 7.5 | 5.0 |
| Miles of Road System Realignment | 0 | 0.15 | 0.15 |

**TABLE 14. COMPARISON OF MEASUREMENT INDICATORS BY ALTERNATIVE.**

| KEY ISSUE | MANAGEMENT INDICATOR | ALT. 1 | ALT. 2 | ALT. 3 |
|---|---|---|---|---|
| Wildlife Habitat Connectivity | % High/Med Quality Marten Habitat | 59% | 58% | 58% |
| Wildlife Habitat Connectivity | Radius of Habitat Distance | 123 meters | 118 meters | 122 meters |
| Wildlife Habitat Connectivity | Nearest Neighbor Distance | 124 meters | 110 meters | 111 meters |
| Visual Effects of Proposed Treatments to the Lindbergh Lake Users | Unit 83 | 0 | Yes | No |
| Vegetation Management with RHCAs | Acres of Vegetation Management in RHCAs | 0 | 110 acres | 6 acres |

**TABLE 15. COMPARISON OF PURPOSE AND NEED OBJECTIVES BY ALTERNATIVE.[3]**

| PURPOSE AND NEED OBJECTIVE | ACTIVITY | ALT. 1 | ALT. 2 | ALT. 3 |
|---|---|---|---|---|
| **Reduce the Risk of Uncharacteristic Wildfire** | Using fire for ecological restoration and to modify fire behavior | 0 acres | 1,808 acres | 1,772 acres |
| | Reduce fuels near private land and residences within the WUI. Reduce stocking in stands within the WUI and along strategic fuels breaks. | 0 acres | 2,783 acres | 2,147 acres |
| **Improve fish and wildlife habitat** | Protecting and creating lynx habitat by treating stem exclusion stands to recruit dense patches of understory vegetation.[4] | 0 acres | 1,103 acres | 1,043 acres |
| | Designing management activities, such as burning or thinning, to increase aspen presence on suitable sites. | 0 acres | 947 acres | 806 acres |
| | Designing management activities, such as thinning or burning, to increase shrub and huckleberry production. | 0 acres | 1,308 acres | 936 acres |
| | Achieving Amendment 19 numerical road density objectives in Beaver Creek Grizzly Bear Subunit[5] | 6/26/66 ORD/TRD/Core | 6/19/68 ORD/TRD/Core | 6/19/68 ORD/TRD/Core |
| **Activities to benefit native fish species** | Probability of Westslope Cutthroat Trout persistence in Sunset Creek in 20 years. | 10% | 50% | 20% |
| | Number of wetlands protected from invasive species | 0 wetlands | 4 wetlands | 4 wetlands |
| **Improve forest health, composition, spatial arrangement, structure, and ecological resilience** | Reducing stocking in stands where densities are high to promote tree vigor, alter species composition, and reduce susceptibility of loss due to white pine blister rust and mountain pine beetle. | 0 acres | 3,110 acres | 2,168 acres |
| | Replacing (regenerating) stands heavily affected by current and past mountain pine beetle infestations, root disease, and dwarf mistletoes and replace with fire-adapted early-seral species | 0 acres | 777 acres | 220 acres |
| | Reduce understory to maintain large legacy trees where they occur on the landscape and place them on a trajectory towards old growth | 0 acres | 1,719 acres | 1,068 acres |
| | Restore health and vigor of western white pine and whitebark pine through stocking control | 0 acres | 1,461 acres | 981 acres |
| **Maintain or improve** | Reclaiming roads through ISS and Decommissioning | 0 acres | 17 miles | 17 miles |

[3] Some acres have been counted twice because they meet multiple purposes and need objectives.
[4] These acres reflect the forest stands treated as is analyzed in the Canada lynx analysis but because treatments units often include multiple stand or portions of stands, these acres may not match the totals in Appendix A – Treatment Summary
[5] Please see the Chapter 3 – Threatened and Endangered Species Section for more information about Amendment 19 to the Flathead National Forest Plan and road densities in the Buck Holland Grizzly Bear Subunit.

**TABLE 15. COMPARISON OF PURPOSE AND NEED OBJECTIVES BY ALTERNATIVE.**[3]

| PURPOSE AND NEED OBJECTIVE | ACTIVITY | ALT. 1 | ALT. 2 | ALT. 3 |
|---|---|---|---|---|
| **water quality and watershed hydrologic function** | Maintaining roads through Best Management Practices | 0 acres | 49.69 miles | 42.42 miles |
| | Watershed Condition Framework Rating | Functioning At Risk | Functioning Appropriately | Functioning Appropriately |
| **Benefit local economy** | Utilizing woody biomass and small-diameter trees produced from the project | 0 acres | 1,585 acres | 999 acres |
| | Capture value of restoration activities through commercial product | 0 CCF (saw)<br>0 CCF (non-saw) | 14,296 CCF<br>6,147 CCF | 9,099 CCF<br>3,913 CCF |
| | Provide local employment through training and use of local contractors | 0 acres | 2,013 acres | 1,428 acres |

# PROJECT DESIGN CRITERIA

The Design Criteria identified in the following table serve to further reduce impacts to the specific resources identified and are included in both Alternative 2 and 3.

Several abbreviations are used in the responsibility section of Table 16. The following explains those abbreviations:

ARCH Archeologist
BT Botanist
DR District Ranger
DRC District Road Coordinator
ENG Engineer
AFMO Assistant Fire Mgmt Officer
FISH Fisheries Biologist
FMO Fire Management Officer
HYD Hydrologist
IDT Interdisciplinary Team
LA Landscape Architect
LEO Law Enforcement Officer
NWM Noxious Weed Manager
RA Range Administrator
RF Resource Forester
SA Sale Administrator
SILV Silviculturist
SP Sale Prep
SS Soils Scientist
TMC Timber Marking Crew
TP Timber Sale Purchaser
WB Wildlife Biologist

**TABLE 16. MANAGEMENT REQUIREMENTS AND DESIGN CRITERIA.**

| OBJECTIVE | TASK | RESPONSIBILITY | DUE DATE |
|---|---|---|---|
| GRIZZLY BEAR SECURITY AND SWAN VALLEY GRIZZLY BEAR CONSERVATION AGREEMENT (SVGBCA) COMPLIANCE | Harvest operations are expected to begin in 2016 and are anticipated to be completed within a 5-year time frame. The Beaver Creek Grizzly Bear Subunit is active in 2015-2017. The Buck Holland Subunit is active 2018-2020. The project would follow active subunit guidelines from 2015-2017 for the Beaver Creek subunit and active subunit guidelines from 2018-2020 for the Buck Holland subunit. Activities within inactive subunits will comply with inactive subunit guidelines. Commercial harvest activities may also occur during the denning season from November 15 through March 31 in the project subunits. No commercial activities (defined by the SVGBCA) would occur in the Beaver or Buck Holland subunits during the Restricted Period (April 1 – November 15) when the subunit is inactive. Salvage harvest activities are not considered commercial as per the SVGBCA. Commercial activities will include log hauling on restricted roads, commercial timber harvest, and road building. Administrative activities, as defined by the SVGBCA, such as pre-commercial thinning, road maintenance, tree planting, slash disposal and Salvage Harvest, may still occur when the subunit is inactive. Short-term Salvage activities for the harvest of dead and dying trees may occur in an inactive subunit occur between June 15 and August 31 and will not exceed 14 consecutive days and 30 days in aggregate when the unit is inactive (Project File I-10). | WB, SA, SP | Pre & Post Sale |
| GRIZZLY BEAR SECURITY AND SVGBCA COMPLIANCE | Motorized use for administrative use activities including timber sale layout, road location, pre-commercial thinning, road maintenance, tree planting, slash disposal, and salvage harvest will not occur on restricted roads during the Spring Period (April 1 through June 15) in Spring Habitat with the exception for limited spring burning, planting, and non-motorized access. Log hauling may occur during the Spring Period in Spring Habitat on roads open to the public. | SP, SA, TMC, WB | Pre & Post Sale |
| GRIZZLY BEAR SECURITY AND SVGBCA COMPLIANCE | In order to avoid the potential disturbance of grizzly bear in important Spring Habitat, management activities that are planned in Spring Habitat, which is defined as areas within designated Linkage Zones, below 5,200 feet, will not occur within the spring period (April 1 through June 15). This timing restriction would apply to all units except: 109, 110, 113, 114, 116, 118, 119, 120, 229, 259, 260, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 4110, and 4262. These units are not within a linkage zone and/or above 5,200 feet elevation. Planting and limited spring burning are permitted in the spring period per the SVGBA. | SP, SA, TMC, WB | Pre & Post Sale |
| GRIZZLY BEAR SECURITY AND SVGBCA COMPLIANCE | Regeneration units will be designed so that no point in the unit is more than 600 feet from cover; in other words, a bear in the unit would be able to find cover anywhere in the unit within 600 feet or less. When harvest units are located adjacent to natural or manmade openings, hiding cover will be maintained on approximately 75 percent of the openings perimeter. | SP, WB | Pre & Post Sale |
| GRIZZLY BEAR SECURITY SVGBCA COMPLIANCE - GENERAL WILDLIFE SECURITY | Visual screening (Project File H-9) will be retained adjacent to open roads in proposed cutting units. | SP, SA, TMC, WB | Pre & Post Sale |
| WILDLIFE, FISH, AND PLANTS– TES | Provisions will be included in the contract to cease activity or otherwise protect populations and individuals of threatened, endangered or sensitive species. This allows for modification of the project should an unforeseen issue(s) be identified during operations. Standard contractual requirements used in all contracts provide for modification or termination of the contract to avoid impacts and protect TE and sensitive species. | WB, SA, SILV, BT, FISH | Contract Prep & During Harvest Activities |

| TABLE 16. MANAGEMENT REQUIREMENTS AND DESIGN CRITERIA. | | | |
|---|---|---|---|
| **OBJECTIVE** | **TASK** | **RESPONSIBILITY** | **DUE DATE** |
| **WILDLIFE – TES** | Public motorized access will be prohibited on roads and skid trails currently closed to public motorized use. | WB, SA, DRC | Pre & Post Sale, During Harvest Activities |
| **WILDLIFE– TES** | Contractors working under contract on Forest Service lands are prohibited from hunting, transporting hunters, or transporting game on roads closed to public motorized use. | SA, LEO, WB | Pre & Post Sale, During Harvest Activities |
| **WILDLIFE - TES** | In burn units 300, 313, and 314 ignition will be timed so that weather conditions result in low to moderate intensity burn that retains mature forest vegetation and large blocks or strips of regenerating forest vegetation in a mosaic pattern distributed across the burn area. | WB, AFMO | During Implementation |
| **WILDLIFE - SECURITY** | Where available within commercial thinning and improvement cut units, retain and protect live sub-merchantable trees in patches/clumps on approximately 10% of unit acreage and all hardwoods. Favor subalpine fir, Engelmann spruce or Douglas fir. Patches should be evenly distributed across the unit. | WB, SA, TMC, SP | Pre & Post Sale |
| **WILDLIFE - SECURITY** | Vegetation and/or rock barriers will be retained around berms and gates, where needed, to maintain closure effectiveness. | DRC, SA, WB | Pre & Post Sale, During Harvest Activities |
| **WILDLIFE – SECURITY** | If berms are removed for access to treatment units, temporary gates will be installed. Berms will be re-installed at the conclusion of project activities. | SB, SA, DRC | Pre & Post Sale, During Harvest Activities |
| **WILDLIFE - SECURITY** | Stored roads (ISS) will be thoroughly treated so that they are completely impassable to motorized vehicles and meet the minimum criteria for a “reclaimed road” as defined by Forest Plan Amendment 19. The intent will be that ISS treatments will no longer function as roads, yet these roads will retain a road number and stay on the road system. ISS roads will continue to have a legal closure order. ISS roads will receive the following treatments:<br>The entire road will receive treatment such that maintenance or entries to maintain road drainage is not needed. Culverts aligned with stream channels will be removed. Road related sediment sources will be repaired and road reworked to eliminate ditch water flow without the aid of cross drain culverts. Typically this is achieved by cutting waterbars into the ditch line every 200 feet. Waterbars can be placed closer or further apart depending on site specific conditions and are typically installed 50ft above grade or near existing cross drains.<br>The first portion of the road (200 to 600 feet) will be recontoured to the original hillslope. In level topography where recontouring is not feasible rock barriers or berms and placement of natural debris will be used to make the road junction unattractive as travel way and preclude motorized or non-motorized use on the remainder of the first portion of road (first 200 to 600 feet).<br>Beyond the first portion of the road (200 to 600 feet), the roadway will be treated to discourage use including sporadic placement of natural debris where available and seeding or planting to encourage re-vegetation | WB, SA, DRC | Post Sale |

**TABLE 16. MANAGEMENT REQUIREMENTS AND DESIGN CRITERIA.**

| OBJECTIVE | TASK | RESPONSIBILITY | DUE DATE |
|---|---|---|---|
| **WILDLIFE - SECURITY** | Whitebark pine restoration treatments in Units 262 and 268 will be completed by hand work. | SA, DRC | Pre & Post Sale, During Harvest Activities |
| **SNAG RETENTION FOR SNAG ASSOCIATED WILDLIFE SPECIES AND FOR FOREST VEGETATION** | In treatment units, where available, a minimum average of 6 snags per acre that are 12-20 inches DBH would be left, and all snags greater than 20 inches would be left. If existing snag densities are below these densities, substitute live trees would be left. If existing large snag (>20” DBH) are below 2 per acre, substitute 5 live replacement trees (≥12” DBH) for each large snag. All standing dead western larch, ponderosa pine, and Douglas-fir trees 16 inches DBH or greater would be retained. Generally, snags to be left would be further than 150 feet from open roads and private land boundaries. Snags that pose a safety hazard to the Contractor’s operation would be felled and left on site. | SILV, WB, SP, SA, TP | Pre & Post Sale, During Harvest Activities |
| **RETENTION OF DOWN WOODY MATERIAL FOR DOWN WOODY HABITAT ASSOCIATED WILDLIFE SPECIES AND FOR FOREST VEGETATION** | The minimum retention for down woody material will be approximately 10 tons per acre, where available. To achieve the tonnage required, retain (where it exists) down woody material in the longest material available (e.g., 16 feet long or longer) and retain the woody debris in the largest diameters available (e.g., 15 inches DBH or greater), sufficient to achieve the tons per acre. | SILV, WB, SP, SA, TP | Pre & Post Sale, During Harvest Activities |
| **HARDWOOD RETENTION FOR ASSOCIATED WILDLIFE SPECIES AND FOR FOREST VEGETATION** | All hardwood trees will be reserved where feasible. | SILV, SA, TP, SP | Pre & Post Sale, During Harvest Activities |
| **PROTECT SITE AND SOIL PRODUCTIVITY** | All mechanized units that remove commercial products would be logged using designated skid trails. Equipment would occasionally leave the trails to access trees or accomplish other activities. | SA | During Harvest Activities |
| **PROTECT SITE AND SOIL PRODUCTIVITY** | Skid trail spacing must average at least 75 feet in all tractor harvest units. If a cut-to-length system is used, with a harvester and forwarder, 50 feet spacing of skid trails will be specified. The goal is to occupy less than 15 percent of the treatment area including soil disturbance from skid trails, temporary roads and landings associated with past and proposed activities. | SA, SP, SS | Pre & Post Sale, During Harvest Activities |
| **PROTECT SITE AND SOIL PRODUCTIVITY** | Winter harvest to protect sensitive soils and/or to meet the Region 1 soil quality standard is required in the following units: 3, 5, 12, 28, 32, 34, 51, 54, 62, 204, 224, 263, 412, 419, 429, 430, and 432. | SA, SP, SS | During Harvest Activities |
| **PROTECT SITE AND SOIL PRODUCTIVITY** | Winter logging requires that there be enough snow to prevent muddy water from mixing into the snow where equipment operates. This would require about 10 inches of snow. The depth of snow varies with the snow conditions. It takes more dry powder snow than wet dense snow to protect the soil surface. | SA, SS | During Harvest Activities |

**TABLE 16. MANAGEMENT REQUIREMENTS AND DESIGN CRITERIA.**

| OBJECTIVE | TASK | RESPONSIBILITY | DUE DATE |
|---|---|---|---|
| **IMPROVE SOIL CONDITION, PROTECT FISH AND WILDLIFE HABITAT,REDUCE THE SPREAD OF INVASIVE PLANT SPECIES, AND PROTECT WATER QUALITY** | All temporary roads constructed and used for project activities would be rehabilitated by any site-appropriate combination of the following:<br>• Treating for noxious weeds two weeks prior to road rehabilitation activities.<br>• Removing any installed culverts or temporary bridges.<br>• Recontouring the entire template to natural ground contour,<br>• Where recontouring is not appropriate because of potential resource impacts, scarify with excavator teeth to a depth equal sufficient to ameliorate the presence of detrimental soil compaction (usually between 2 and 12 inches),<br>• Seeding with the native plant mix as specified by the Forest Botanist,<br>• Placing woody material and soil inoculum on template<br>• Planting native shrubs/trees to augment natural vegetation.<br>Following rehabilitation activities these roads will cease to function as roads. | SA, SS, TP, BT, NWM | Post-Sale |
| **PROTECT SITE AND SOIL PRODUCTIVITY** | All existing roads and skid trails would be reused to the extent feasible unless doing so would adversely affect soil, water or other resources. If roads or trails cannot be reused, their extent and location must be considered when laying out additional skid trails. | SA, SP, SS | Pre & Post Sale, During Harvest Activities |
| **PROTECT SITE AND SOIL PRODUCTIVITY** | Logging would occur when soils are dry as determined by the hand feel method (Project File Exhibit L-23). | SA | During Harvest Activities |
| **PROTECT SITE AND SOIL PRODUCTIVITY** | Sale administrators would monitor soil moisture conditions prior to allowing equipment to begin operations in summer. This monitoring must be documented in the Timber Sale Daily Report. | SA | Pre-Sale |
| **PROTECT SITE AND SOIL PRODUCTIVITY** | All mechanical fuel reduction will be accomplished with excavators or similar track based mastication equipment. Excavators will, to the extent feasible, remain on skid trails. | SA | During Harvest Activities |
| **PROTECT SITE AND SOIL PRODUCTIVITY** | Prescribed burning prescriptions would be prepared and implemented to not exceed moderate burn severity conditions. | FMO, AFMO | Post Sale |
| **FOREST VEGETATION** | Prepare detailed site-specific silvicultural prescription for all treatment areas requiring vegetation manipulation | SILV | Prior to presale activities |
| **FOREST VEGETATION** | Consult with Project Silviculturist where treatment deviations are required during contract execution, as a result of changed or unidentified conditions that materially affect the intended treatment as described in the detailed site specific silvicultural prescription. As needed, the silvicultural prescription will be modified and re-approved by a certified silviculturist. | SILV, TSA, SP, FMO | Pre, During, and Post-Harvest Activities |
| **FOREST VEGETATION**<br><br>**(LEAVE TREE PROTECTION)** | Contractor will take all reasonable care to avoid damage to the roots, bole, and crown of trees to be reserved from cutting. No more than 5 percent of the trees designated to be reserved should be damaged beyond recovery by the Contractor's operations. Any tree damaged beyond recovery, (will die within 1 year due to damage), can be removed or otherwise treated by the Contractor as instructed by the Forest Service. | TP, TSA, SILV | Pre, During, and Post -Harvest Activities |

**TABLE 16. MANAGEMENT REQUIREMENTS AND DESIGN CRITERIA.**

| OBJECTIVE | TASK | RESPONSIBILITY | DUE DATE |
|---|---|---|---|
| **PRESERVE TES PLANT POPULATIONS AND THEIR HABITATS** | Protect occupied and unoccupied howellia ponds located near haul routes and in treatment units by a 300-foot buffer. If ground-disturbing BMP-related activities occur within 300 feet of these ponds, natural filtration zones, sediment retention structures, or straw bales would be applied to ensure limited sediment deposition into these ponds. See Chapter 3 for occupied pond label and location, and see Project File Exhibit J-3 for a map of ponds. | SILV, SA, TP, SP, ENG, BT | Pre & Post Sale & During Harvest Activities |
| **PRESERVE TES PLANT POPULATIONS AND THEIR HABITATS** | Howell's gumweed is documented in Units 1, 3, 4, 5 and 6 along Highway 83. Individual plants were not found during surveys. If plants are found, the sites would be flagged prior to implementation to be avoided during operations. Common camas occurs in Units 19, 219, 419, 28, 32, 44, 201, 217, and 429. Sites will be flagged by the Forest Botanist or certified botany technicians ahead of pre-sale prior to implementation to be avoided by equipment and other disturbance. | SP, SA, BT | Pre & Post Sale & During Harvest Activities |
| **PRESERVE TES PLANT POPULATIONS AND THEIR HABITATS** | All healthy and reproducing populations (cone-bearing or mature trees) of whitebark pine are to be avoided during vegetation management activities (daylighting and prescribed burning); unless it is to specifically benefit the species, such as the daylighting prescription. Burn plans will include specific implementation measures to minimize effects to cone-bearing and mature whitebark pine trees. | SILV, SP, TP, SP | Pre & Post Sale & During Harvest Activities |
| **PRESERVE TES PLANT POPULATIONS AND THEIR HABITATS** | Burn units 308 and 309 are higher elevation burns on south facing slopes that have missed several natural fire intervals. The upper elevation portions of these burns are historically and currently capable of supporting whitebark pine. Burn treatments will be of moderate intensity, with a goal of 40% to 60% mortality of existing conifer trees, 75% to 100% top kill of shrubs, and 100% duff consumption across >30% of the unit. This treatment will reduce fuel loads and vegetative competition and create the open conditions that could favor the germination and growth of whitebark pine. | AFMO, SILV | Pre and Post Prescribed Burning. |
| **CONTROL SPREAD AND REDUCE POTENTIAL SPREAD OF NOXIOUS WEEDS** | Re-establish vegetation on bare ground created by road decommissioning or timber harvest activity. Seed landings, decommissioned roads and ISS roads, temporary roads, and disturbed roadsides with a certified grass ground cover (seed mix of native plants will be specified by the Forest Botanist), either in the spring or the late fall (to enable the best chance of success) after disturbance to provide for site protection until native species are established. | SA, BT, DRC | Post-Sale |
| **CONTROL SPREAD AND REDUCE POTENTIAL SPREAD OF NOXIOUS WEEDS** | Intermittent stored service and decommissioned roads not used as haul routes will require treatment of noxious weeds two weeks prior to ground disturbing activities and disturbed areas will be seeded following active work. | ENG, BOT | Pre-ISS |
| **CONTROL SPREAD AND REDUCE POTENTIAL SPREAD OF NOXIOUS WEEDS** | Intermittent stored service of impassible roads should be seeded with native mix prior to barrier installation if funding is available. | BOT | Pre-ISS |

**TABLE 16. MANAGEMENT REQUIREMENTS AND DESIGN CRITERIA.**

| OBJECTIVE | TASK | RESPONSIBILITY | DUE DATE |
|---|---|---|---|
| **CONTROL SPREAD AND REDUCE POTENTIAL SPREAD OF NOXIOUS WEEDS** | Equipment use associated with timber harvest and road maintenance (excluding pickups and trucks used to remove forest products) would be power scrubbed or steam cleaned on the undercarriage and chassis before transport to the project area. This cleaning shall remove all soil, plant parts, seeds, vegetative matter, or other debris that could contain or hold seeds. All subsequent entries of equipment to the project area shall be treated in the same manner as the initial entry. “Off-road equipment” includes all logging and construction machinery, except for log trucks, chip vans, service vehicles, water trucks, pickup trucks, cars, and similar vehicles. | SA, TP | Pre-Harvest |
| **CONTROL SPREAD AND REDUCE POTENTIAL SPREAD OF NOXIOUS WEEDS** | As funding allows, survey and monitor for weeds in all ground-disturbed areas in treatment units (slash piles, exposed soil from excavator tracks, skid trails), roads, and temporary roads. Monitoring would occur for at least 3 years following proposed action. | BT, NWM | Post-Sale |
| **CONTROL SPREAD AND REDUCE POTENTIAL SPREAD OF NOXIOUS WEEDS** | Spray weeds along designated Forest Road haul routes (prism) and disturbed areas. Existing roads within the project boundary would be identified for noxious weed treatment. Specific roads and mileage to be treated would be prepared in consultation with the Forest Weeds Coordinator. Road prism is the road and associated toe of the fill to the top of the cut slope, including the running surface and turnouts. However, when a contiguous patch of weeds extends beyond the road prism, the area beyond the road prism shall be treated via force account or other means. Spraying of appropriate herbicides would occur pre- and post-haul, during the periods from June 1 to July 15 or September 1 to September 30. Roads would be monitored after initial treatment, and additional treatments would be the responsibility of the Forest. Treatment of invasive plants would be consistent with the strategy outlined in the Noxious and Invasive Weed Control Environmental Assessment (March 2001). | SA, TP | Post-Sale |
| **CONTROL SPREAD AND REDUCE POTENTIAL SPREAD OF NOXIOUS WEEDS** | The Noxious Weeds Manager or Forest Botanist will, if necessary, provide noxious weed material to sale administrators and contractors identifying the Forest’s target species and recommended control measures. | NWM, BT | Post Sale |
| **PUBLIC SAFETY** | Appropriate signing or other cautionary measures will be implemented in conjunction with prescribed burning and commercial harvest operations to ensure public safety. Public notice will be given prior to prescribed burning and commercial harvest activities. | SA, FMO | |

**TABLE 16. MANAGEMENT REQUIREMENTS AND DESIGN CRITERIA.**

| OBJECTIVE | TASK | RESPONSIBILITY | DUE DATE |
|---|---|---|---|
| **PUBLIC SAFETY** | Temporary closure of Trail #351 from the Beaver Creek Trailhead to the junction with Trail #34 should be implemented during felling and skidding operations in Unit #252.<br>Temporary closure encompassing Trail #351 would be implemented during road storage activities for NFS Road #91203 and decommissioning activities for NFS road #91204.<br>In Alternative 2, a temporary closure encompassing Trail #351 would be implemented during construction of Temporary Road H1.<br>Temporary closure of Trail #34 between the junction of Trail #351 and private land should be implemented during felling and skidding operations for Units #102, #237, and #238.<br>Temporary closure encompassing Trail #34 would be implemented during road storage activities for NFS Roads #10737 and 10739 and decommissioning activities for NFS Road #10740.<br>Temporary area closures encompassing Trail #490 and the appropriate portion of Trail #351 would be implemented during prescribed burning operations and for the entire period in which fire activity may threaten public safety. | SA, TP, ENG, RF | During Project Implementation |
| **PROTECT TRAIL INTEGRITY** | Non-motorized trails would be shown as protected improvements on timber sale maps. Project administrators would ensure protection of trails during project implementation.<br>In Unit #102, skid trails crossing Trail #34 would be kept at a maximum of two and cross the trail in a perpendicular manner to the extent feasible.<br>In all treatment units encompassing or adjacent to Trail #34 and Trail #351, all slash and debris would be removed from within 20 ft. of the trail tread post-operations. Any damage done to the trails would be repaired, thus returning the trails as near as possible to their original condition.<br>The district recreation specialist shall assist the pre-sale forester with design and placement of Temp road H1 in and around Trail #351 as planned in Alternative 2. | SA, RF, TP | During Project Implementation |
| **MINIMIZE VIEW OF FIRE FROM RECREATION SITES** | For prescribed burning operations, a 100-foot no ignition buffer would be applied adjacent to Lindbergh Trail # 490 and Crystal Lake Trail #351. | FMO | During Project Implementation |

**TABLE 16. MANAGEMENT REQUIREMENTS AND DESIGN CRITERIA.**

| OBJECTIVE | TASK | RESPONSIBILITY | DUE DATE |
|---|---|---|---|
| **REDUCE IMMEDIATE FOREGROUND VIEW EFFECTS TO PRIVATE LANDOWNERS VIEWSHED AND FROM HIGHWAY 83** | Units 1,3,4,5, 6 16, 44, 57, 62 and 300. (Foreground residential and highway viewshed with high concern)<br>Mask any boundary or otherwise reduce impacts of leave tree marking that is clearly visible from sensitive viewing locations (Highway 83, private driveway, and residential views). It would generally not be necessary to extend this treatment further than about 150 feet from the boundary edge.<br>Site landing offset from private property edge and from Highway to reduce visual impact if feasible. Do not locate landings immediately adjacent to sensitive viewshed. Extend short "jump up" road spurs into unit to landings, with vegetative screening between road and landing location left where possible. If sited within the viewshed, landing clean up should be more thorough than may ordinarily occur, specifically the burning of the debris in landing piles should be nearly complete, with repiling/reburning occurring if it burned poorly the first time and left unsightly "bones". Slash piles visible from roadside shall be removed or burned upon unit completion.<br>Maintain 12-inch or less stumps (flush cut if feasible) within 150 feet of boundary edge if visible from highway and residential views.<br>Reduced slash impacts visible from Highway 83 and within 150 feet of driveway and residential views. Slash, root wads, and other debris will be removed, buried, burned, chipped or lopped to a height of 2 feet or less.<br>If contrast can be seen from highway or private residences, apply transition zones that would be left along north and south edge of unit where tree retention would be modified to create a more gradual visual transition of the treated stand to the adjacent stand and soften unit edges. This may mean progressively decreasing the leave tree density in this zone (such as if next to an existing opening) or progressively increasing the leave tree density in this zone (such as if next to a dense uncut forest). | SP, SA, LA. FMO | Post Sale |
| **REDUCE IMMEDIATE FOREGROUND VIEW EFFECTS TO RECREATIONAL LAKE USERS** | Unit 83 (Foreground viewshed of Lindbergh Lake)<br>To reduce the visual contrast of skyline corridors align corridors so they are less visible, where feasible designate skyline corridors after felling trees (avoiding regular spaced widths between corridors) and/or avoid skyline corridors on alignment perpendicular to sensitive view, and/or use lateral yarding capabilities .<br>During tree marking, if openings greater than a half-acre are created, soften the edges.<br>If feasible, retain leave trees in denser groups where the crown of trees would screen the access road and landings as seen from below. | SP, SA, LA | Pre and Post Sale, During Harvest Activities |

| TABLE 16. MANAGEMENT REQUIREMENTS AND DESIGN CRITERIA. | | | |
|---|---|---|---|
| **OBJECTIVE** | **TASK** | **RESPONSIBILITY** | **DUE DATE** |
| **REDUCE IMMEDIATE FOREGROUND VIEW EFFECTS TO RECREATIONAL TRAIL USERS** | Unit 102, 238, 251, 252 and 310 (Foreground viewshed of trails and trailhead)<br>Maintain 12-inch or less stumps (flush cut if feasible) within 20 feet of trail.<br>Where new access roads and skid trails meet a trail, the sale-prep forester and recreation forester will meet to discuss placement to reduce visual impacts.<br>Mask any boundary or otherwise reduce the visual impacts of leave tree marking that is clearly visible from sensitive trail and trailheads. It would generally not be necessary to extend this treatment further than about 150 feet from the boundary edge.<br>Landing offset from trail. Do not locate landings immediately adjacent to the trail. Extend short "jump up" road spurs (<300 feet) into unit to landings, with vegetative screening between trail and landing location left where possible. | SP, SA, LA | Pre and Post Sale, During Harvest Activities |
| **AQUATICS – PROTECT FISH HABITAT, WATER QUALITY AND SENSITIVE PLANT SPECIES.** | Standard RHCA buffers will be applied to all units except 219, 412, 419, 429, 430, 431, 432, 449, 459, 491, 494, 495, 498, 4108, 4110, 4208, 4209, 4222, 4225, 4226 and 4262. The standard buffers are:<br>300 feet from either side of fish-bearing streams.<br>150 feet from either side of perennial streams without fish.<br>50 feet from intermittent streams.<br>150 feet from edge of wetlands greater than 1 acre (edge is defined as ordinary high water mark).<br>50 feet from edge of wetlands less than 1 acre.<br>Any water bodies that are not mapped but discovered during implementation shall have standard INFISH buffers. | SA, SP, FISH, AFMO | Pre & Post Sale, During Harvest Activities |
| **AQUATICS – PROTECT FISH HABITAT AND PROTECT WATER QUALITY** | Units 412, 449, 459, 491, 494, 495, 498, 4108, 4110, and 4209 will have no harvest activity within 50 feet of streams or wetlands. Harvest activity is permitted between the 50-foot no-cut zone and the standard RHCA boundary as long as it results in little to no ground disturbance within that zone. Unit 412 will be whole tree yarded but residual slash will not be piled and burned. | SA, SP, FISH, AFMO | Pre & Post Sale, During Harvest Activities |
| **AQUATICS – PROTECT FISH HABITAT AND WATER QUALITY, SNAG RETENTION** | In units 419, 429, 430, 431 and 432, where the slope adjacent to the wetland exceeds 20%, machinery is precluded from 50 feet of the wetland boundary. Where the slope is less than 20%, machinery may operate to the wetland boundary where feasible however all hardwoods and spruce greater than or equal to 16" DBH will be retained. Within Units 419 and 429, create an average of 3 high stumps per acre. High stump diameter shall be at least 9 inches DBH and 5 feet in height or greater. Slash generated by activity will be retained. Units 430, 431 and 432 will be whole tree yarded and slash piled and burned. | SA, SP, FISH, AFMO | Pre & Post Sale, During Harvest Activities |
| **AQUATICS – PROTECT FISH HABITAT AND PROTECT WATER QUALITY** | Units 4108 and 4110 will only conduct commercial thinning on dry-site ridges found within the unit boundary. Marking crews will ensure no thinning takes place near springs and seeps scattered throughout the units. No thinning will take place within 50 feet of the streams. | SA, SP, FISH, AFMO | Pre & Post Sale, During Harvest Activities |

**TABLE 16. MANAGEMENT REQUIREMENTS AND DESIGN CRITERIA.**

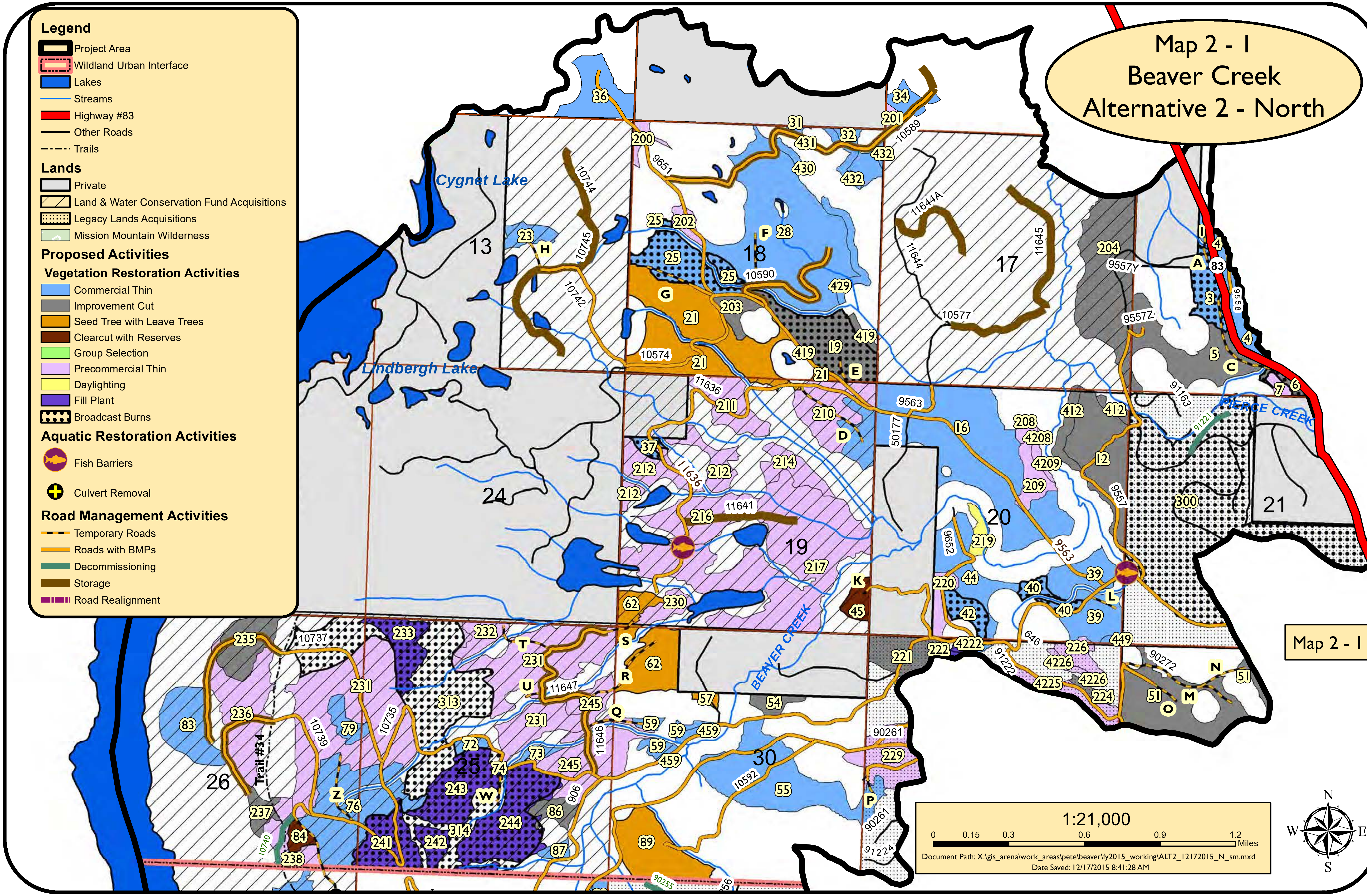
| OBJECTIVE | TASK | RESPONSIBILITY | DUE DATE |
|---|---|---|---|
| **AQUATICS – PROTECT FISH HABITAT AND PROTECT WATER QUALITY** | Unit 219 will have daylighting of no more than an average of 2 legacy trees/acre (thus 14 legacy trees total). Daylighting may fell intermediate or suppressed trees within the radius of the legacy tree crown plus 5 feet. Work will be done by hand crews only and may take place to the stream edge to conserve legacy trees. Trees will be felled away from the legacy tree as much as safely feasible. Limbs and slash will be scattered with the objective of having a fuel bed no greater than 2 feet high. Larger boles (greater than 15-inches) will be retained whole as much as feasible. | SA, SP, FISH, AFMO | Pre & Post Sale, During Harvest Activities |
| **AQUATICS - PROTECT FISH HABITAT, BMP COMPLIANCE, PROTECT BENEFICIAL USES** | All stream culvert installations or removals will secure a 124 permit from the State of Montana prior to work and comply with all requirements provided. | FISH, HYD, ENG, DRC | Pre-Sale |
| **AQUATICS - PROTECT FISH HABITAT, BMP COMPLIANCE, PROTECT BENEFICIAL USES** | Culvert installation, replacement or removals on intermittent streams will be completed when the stream is dry. For culvert removals, the newly exposed channels reshaped to match their historic shape. Road spoils would be placed outside of the floodplain. The area would be seeded and mulched. | FISH, HYD, ENG, DRC | Pre and Post Sale, During Harvest Activities |
| **AQUATICS – PROTECT FISH HABITAT AND PROTECT WATER QUALITY** | Culvert replacement on perennial streams will be done during low flow, typically July to November. Water will be diverted with a coffer dam into bypass channel/pipe during work. Upon completion, water will be re-introduced to the channel gradually over several hours. | FISH, HYD, ENG, DRC | Pre-Sale |
| **AQUATICS – PROTECT FISH HABITAT AND PROTECT WATER QUALITY** | Culvert removals done on perennial streams will be done during low flow, typically July to November. The newly exposed channels reshaped to match their historic shape. Road spoils would be placed outside of the floodplain. The area would be seeded and mulched. Straw bales or “sedimats” will be staked into the stream downstream of project area prior to work and then removed after the work is complete. | FISH, HYD, ENG, DRC | Pre-Sale |
| **AQUATICS – PROTECT FISH HABITAT AND PROTECT WATER QUALITY** | All new culverts on system roads shall be designed to pass 100-year flow events and shall be correctly aligned with natural channel. Furthermore, the new culvert on NFS road #9658 at Sunset Creek shall be designed to pass all aquatic organisms during most flow events (Alternative 2 only). | FISH, HYD, ENG, DRC | Pre-Sale |
| **AQUATICS – PROTECT FISH HABITAT AND PROTECT WATER QUALITY** | Alternative 3 only: Broadcast burn units will not allow fire to enter standard RHCA buffers | FISH, HYD, FMO, AFMO | During Burning Activities |
| **AQUATICS – PROTECT FISH HABITAT AND PROTECT WATER QUALITY** | Prescribed burn units 308 and 309 will have the bull trout spawning patch identified in burn plans as an avoidance zone for helicopter flight paths. All flight paths will avoid flying straight down the inlet river and a half-sphere shaped avoidance zone will be identified that is 500’ tall at dead center and 0’ tall when 500’ away horizontally. No flights will take place from 1 hour before sunset to 1 hour after sunrise. No bucket work (water withdrawal) will take place in the inlet river. | FISH, HYD, FMO, AFMO | During Burning Activities |
| **AQUATICS – PROTECT FISH HABITAT AND PROTECT WATER QUALITY** | The free-standing fish barrier on Sunset Creek (Alternative 2 only) will block upstream fish passage for all flows up to a 25 year return interval flood event. The structure shall withstand up to a 100 year return interval flood event. Any brook trout captured above the barrier shall be released downstream of the barrier. | FISH, HYD, ENG, DRC | Pre-Sale |

| TABLE 16. MANAGEMENT REQUIREMENTS AND DESIGN CRITERIA. | | | |
|---|---|---|---|
| **OBJECTIVE** | **TASK** | **RESPONSIBILITY** | **DUE DATE** |
| **AQUATICS – PROTECT FISH HABITAT AND PROTECT WATER QUALITY** | Best Management Practices will be installed on all NFS roads identified for haul prior to timber harvest. Best management practices are defined by Soil & Water Conservation Practices in FSH 2509.22. | FISH, HYD, ENG, DRC | Pre-Sale |
| **AQUATICS – PROTECT FISH HABITAT AND PROTECT WATER QUALITY** | Best Management Practices for temporary roads shall follow the National Core BMP Technical Guide Volume 1: Standard Road-5. This does not require advanced engineering design prior to construction. Temporary roads shall be built with erosion and stormwater controls as necessary. Roads shall be regularly inspected to be sure erosion and stormwater controls are functional and properly maintained. Temporary stream crossings will be installed as needed. Unless otherwise approved by the designated soil scientist, engineer and/or hydrologist, construction activities shall avoid winter operations and periods of substantial precipitation. | FISH, HYD, ENG, DRC | Pre and Post Sale, During Harvest Activities |
| **AQUATICS – WETLAND PROTECTION** | Monitoring will occur in Unit 300 following implementation of the prescribed burn to determine if cattle use is increasing in wetlands located within the Holland Grazing allotment. If cattle grazing appears to be adversely affecting the wetland, an exclusion fence will be constructed to protect the wetland. | FISH | Post Burning Activities |
| **PROTECT AIR QUALITY** | Comply with burning restrictions issued by the Montana Airshed Group | AFMO, FMO | During Burning Activities |

# Final Environmental Assessment - Beaver Creek Landscape Restoration Project

## Chapter 2 – Maps

**Swan Lake Ranger District, Flathead National Forest, Missoula County, Montana**


Map 2 - 1
Beaver Creek
Alternative 2 - North
Legend
Project Area
Wildland Urban Interface
Lakes
Streams
Highway #83
Other Roads
Trails
Lands
Private
Land & Water Conservation Fund Acquisitions
Legacy Lands Acquisitions
Mission Mountain Wilderness
Proposed Activities
Vegetation Restoration Activities
Commercial Thin
Improvement Cut
Seed Tree with Leave Trees
Clearcut with Reserves
Group Selection
Precommercial Thin
Daylighting
Fill Plant
Broadcast Burns
Aquatic Restoration Activities
Fish Barriers
Culvert Removal
Road Management Activities
Temporary Roads
Roads with BMPs
Decommissioning
Storage
Road Realignment
Cygnet Lake
Lindbergh Lake
BEAVER CREEK
PIERCE CREEK
Trail #34
Map 2 - 1
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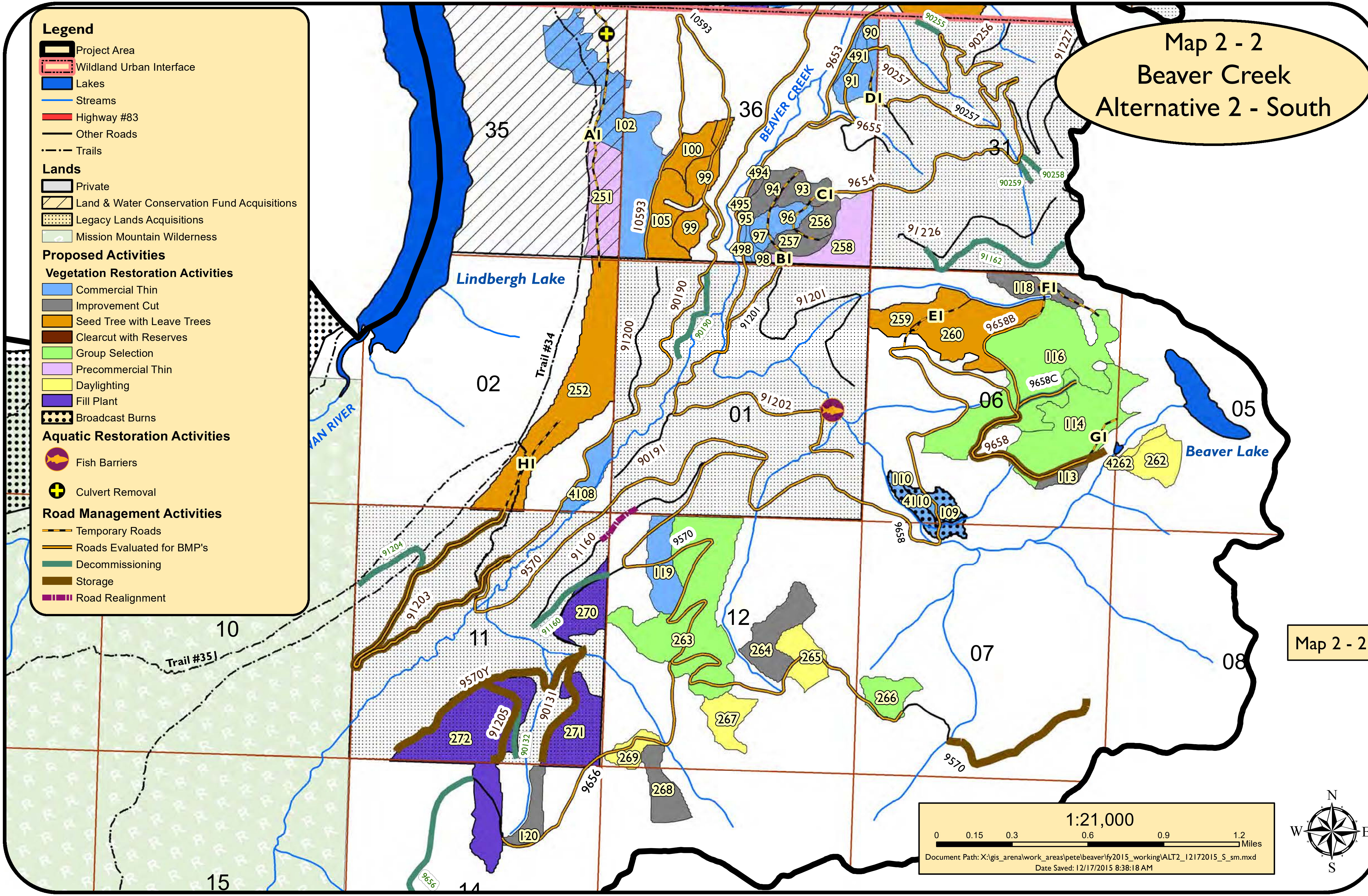

Map 2 - 2
Beaver Creek
Alternative 2 - South
Legend
Project Area
Wildland Urban Interface
Lakes
Streams
Highway #83
Other Roads
Trails
Lands
Private
Land & Water Conservation Fund Acquisitions
Legacy Lands Acquisitions
Mission Mountain Wilderness
Proposed Activities
Vegetation Restoration Activities
Commercial Thin
Improvement Cut
Seed Tree with Leave Trees
Clearcut with Reserves
Group Selection
Precommercial Thin
Daylighting
Fill Plant
Broadcast Burns
Aquatic Restoration Activities
Fish Barriers
Culvert Removal
Road Management Activities
Temporary Roads
Roads Evaluated for BMP's
Decommissioning
Storage
Road Realignment
Lindbergh Lake
Beaver Lake
BEAVER CREEK
Trail #34
Trail #351
Map 2 - 2
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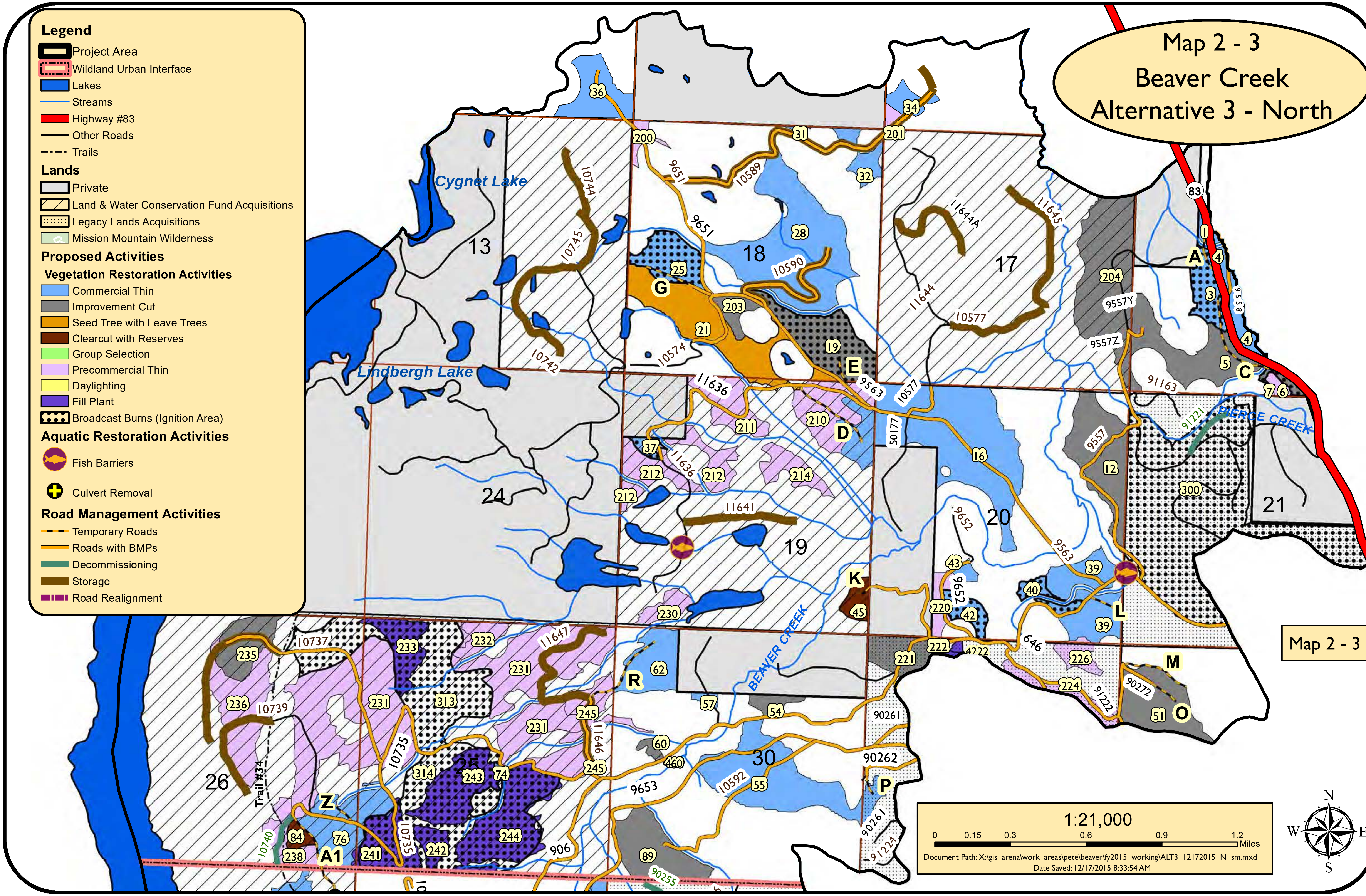

Map 2 - 3
Beaver Creek
Alternative 3 - North
Legend
Project Area
Wildland Urban Interface
Lakes
Streams
Highway #83
Other Roads
Trails
Lands
Private
Land & Water Conservation Fund Acquisitions
Legacy Lands Acquisitions
Mission Mountain Wilderness
Proposed Activities
Vegetation Restoration Activities
Commercial Thin
Improvement Cut
Seed Tree with Leave Trees
Clearcut with Reserves
Group Selection
Precommercial Thin
Daylighting
Fill Plant
Broadcast Burns (Ignition Area)
Aquatic Restoration Activities
Fish Barriers
Culvert Removal
Road Management Activities
Temporary Roads
Roads with BMPs
Decommissioning
Storage
Road Realignment
Cygnet Lake
Lindbergh Lake
BEAVER CREEK
PIERCE CREEK
Trail #34
Map 2 - 3
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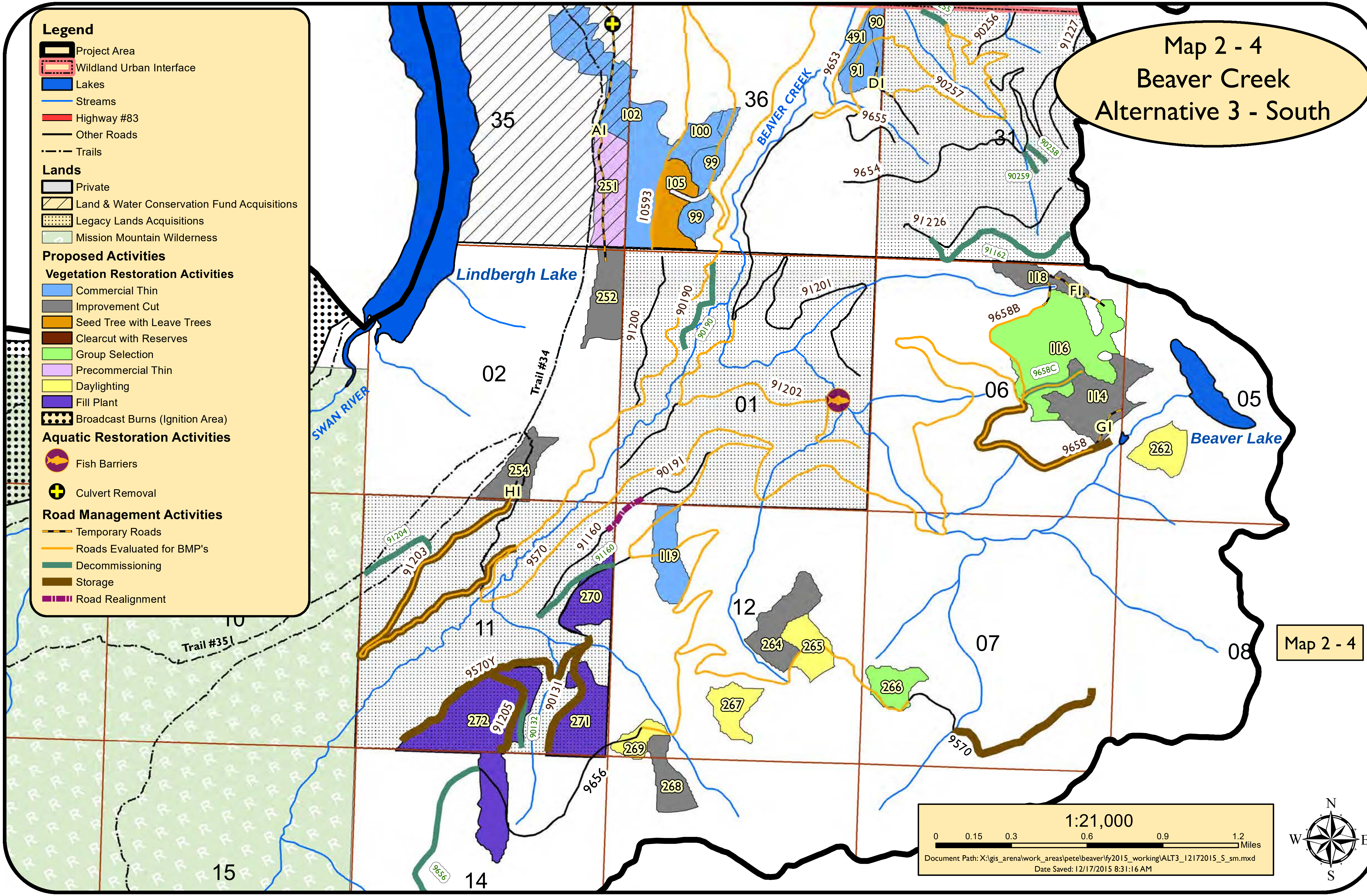

Map 2 - 4
Beaver Creek
Alternative 3 - South
Legend
Project Area
Wildland Urban Interface
Lakes
Streams
Highway #83
Other Roads
Trails
Lands
Private
Land & Water Conservation Fund Acquisitions
Legacy Lands Acquisitions
Mission Mountain Wilderness
Proposed Activities
Vegetation Restoration Activities
Commercial Thin
Improvement Cut
Seed Tree with Leave Trees
Clearcut with Reserves
Group Selection
Precommercial Thin
Daylighting
Fill Plant
Broadcast Burns (Ignition Area)
Aquatic Restoration Activities
Fish Barriers
Culvert Removal
Road Management Activities
Temporary Roads
Roads Evaluated for BMP's
Decommissioning
Storage
Road Realignment
Lindbergh Lake
Beaver Lake
BEAVER CREEK
SWAN RIVER
Trail #34
Trail #351
Map 2 - 4
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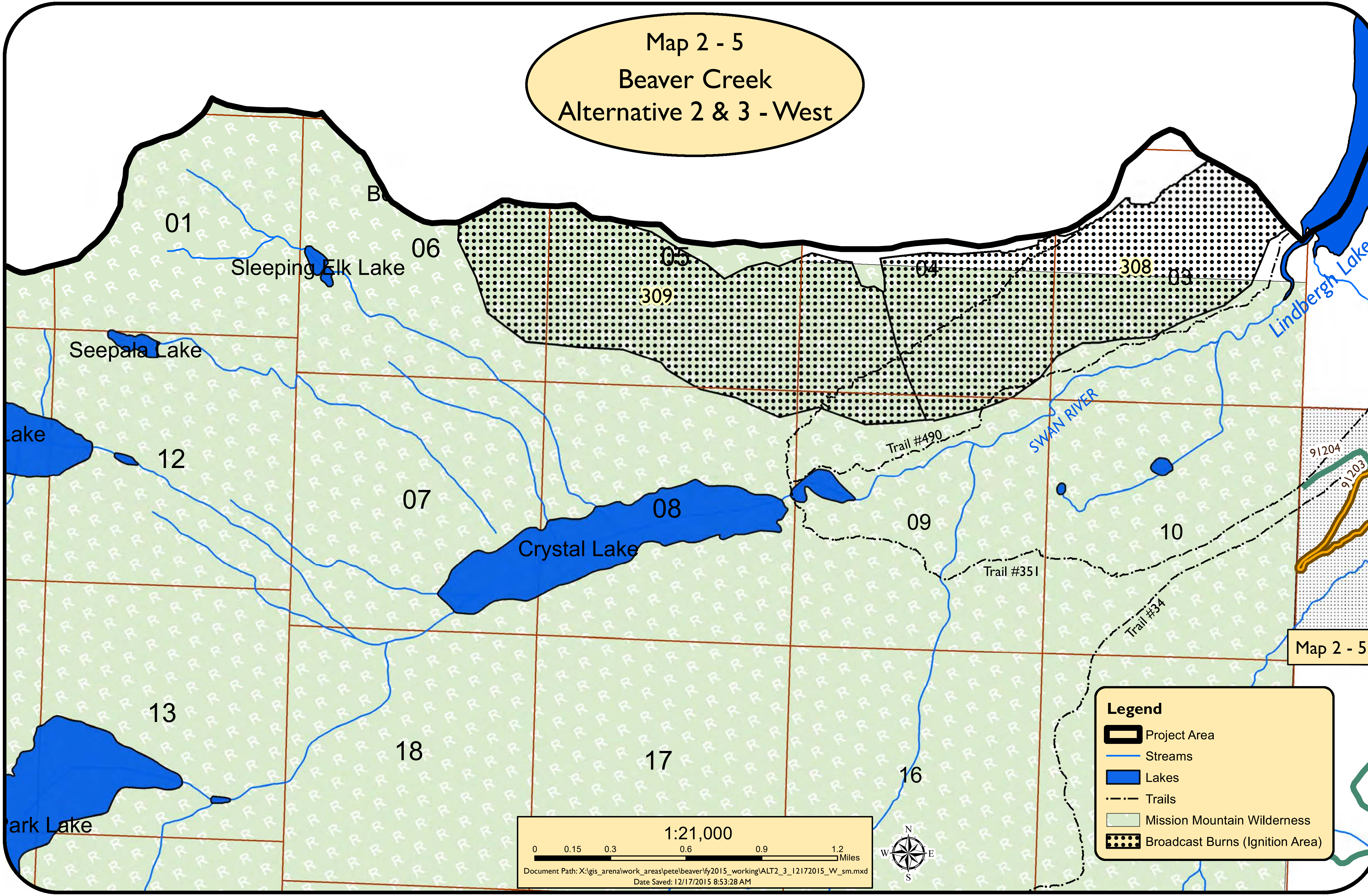

Map 2 - 5
Beaver Creek
Alternative 2 & 3 - West
01
06
05
04
03
309
308
Sleeping Elk Lake
Seepala Lake
Lake
12
07
08
Crystal Lake
09
10
Trail #490
Trail #351
Trail #34
SWAN RIVER
Lindbergh Lake
91204
91203
13
18
17
16
Park Lake
Map 2 - 5
Legend
Project Area
Streams
Lakes
Trails
Mission Mountain Wilderness
Broadcast Burns (Ignition Area)
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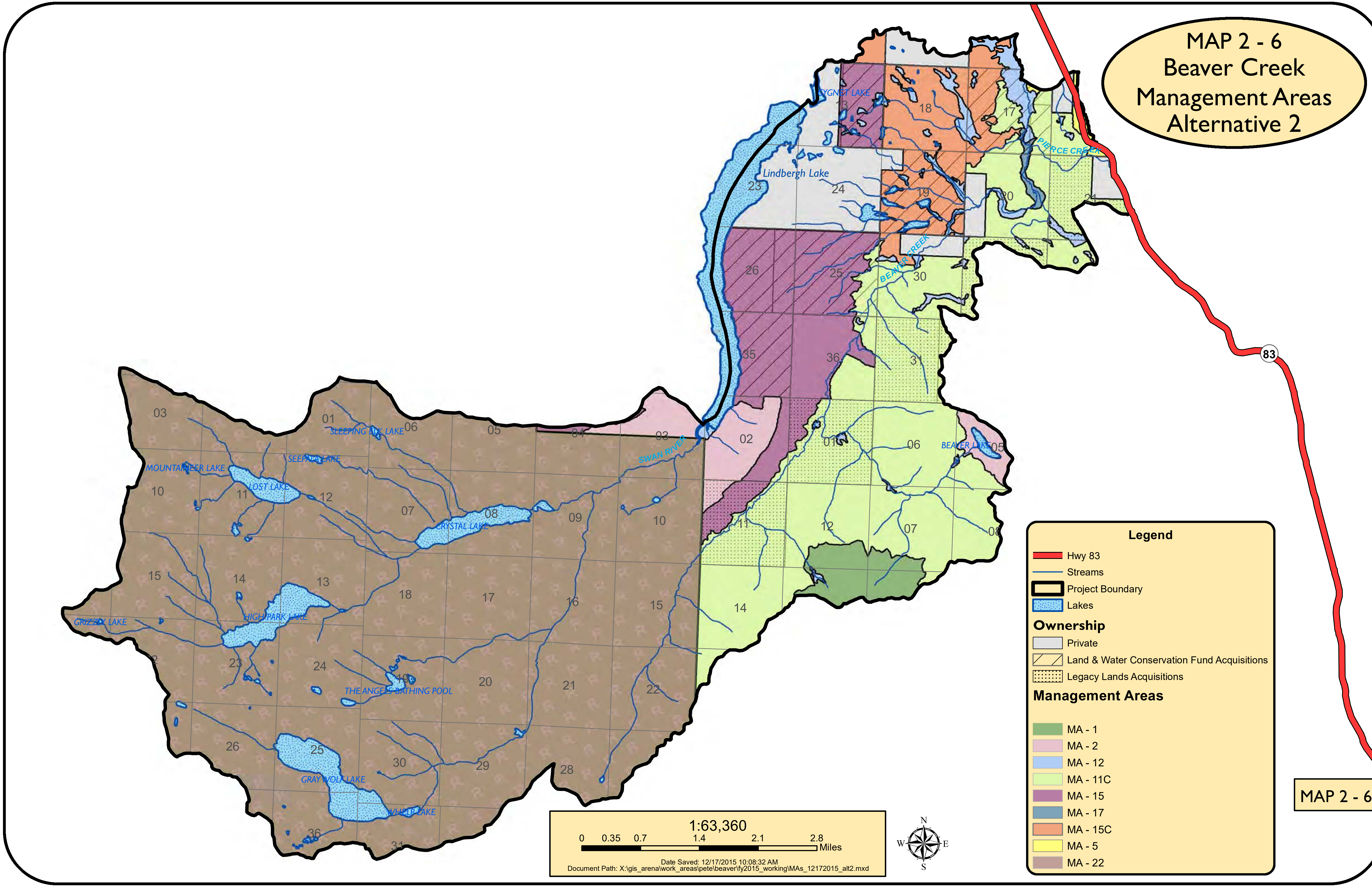
MAP 2 - 6
Beaver Creek
Management Areas
Alternative 2
Legend
Hwy 83
Streams
Project Boundary
Lakes
Ownership
Private
Land & Water Conservation Fund Acquisitions
Legacy Lands Acquisitions
Management Areas
MA - 1
MA - 2
MA - 12
MA - 11C
MA - 15
MA - 17
MA - 15C
MA - 5
MA - 22
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Miles
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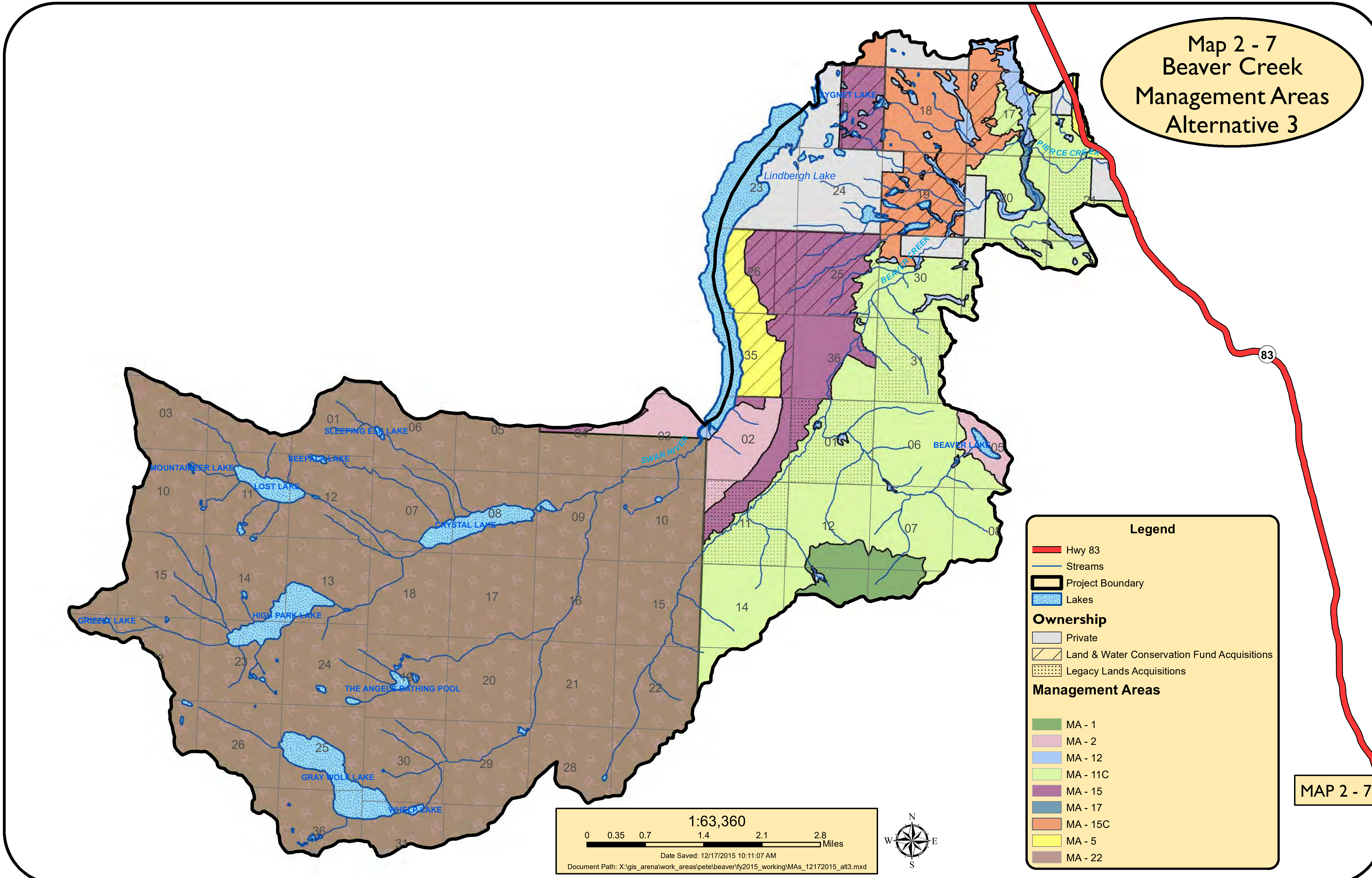
83
Lindbergh Lake
PIERCE CREEK
BEAVER CREEK
SWAN RIVER
MOUNTAINEER LAKE
LOST LAKE
CRYSTAL LAKE
HIGH PARK LAKE
THE ANGELS BATHING POOL
GRAY WOLF LAKE
BEAVER LAKE
MAP 2 - 6



Map 2 - 7
Beaver Creek
Management Areas
Alternative 3
Legend
Hwy 83
Streams
Project Boundary
Lakes
Ownership
Private
Land & Water Conservation Fund Acquisitions
Legacy Lands Acquisitions
Management Areas
MA - 1
MA - 2
MA - 12
MA - 11C
MA - 15
MA - 17
MA - 15C
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MAP 2 - 7
Lindbergh Lake
CYGNET LAKE
PIERCE CREEK
BEAVER CREEK
SWAN RIVER
BEAVER LAKE
SLEEPING ELK LAKE
SEEPAGE LAKE
MOUNTAINEER LAKE
LOST LAKE
CRYSTAL LAKE
HIGH PARK LAKE
GRIZZLY LAKE
THE ANGELS BATHING POOL
GRAY WOLF LAKE
WHELP LAKE
83

# Final Environmental Assessment - Beaver Creek Landscape Restoration Project

## Chapter 3 – Affected Environment and Environmental Consequences

**Swan Lake Ranger District, Flathead National Forest, Missoula County, Montana**

# Chapter 3 Affected Environment and Environmental Consequences

## INTRODUCTION

This chapter describes general information, location, management direction, and existing conditions for the project area or analysis area. It also describes the environmental impacts of the alternatives described in Chapter 2. Information in this chapter is based on reports written by various Resource Specialists (Appendix E – List of Preparers). These more detailed reports are kept in the project file located at the Swan Lake Ranger District. Analysis in the chapter is the basis for the summary of alternative comparisons given in Chapter 2.

The Affected Environment and Environmental Consequences are combined into one chapter for continuity and ease of reading. After providing the location and the Forest Plan management direction, this chapter discusses specific resources and issues.

## PROJECT AREA

The Beaver Creek Landscape Restoration Project Area lies within the boundaries of the Beaver Creek Grizzly Bear Subunit. The project area is located approximately 9 miles south of the community of Condon and encompasses approximately 34,962 acres within the Flathead National Forest (including 1,810 acres of private lands), all in Missoula County, Montana. The project area also contains approximately 20,026 acres of the Mission Mountains Wilderness (57 percent of the project area). The legal description of the Beaver Creek Landscape Restoration Project includes Sections 5, 6, 7, 8, 18, T18N, R16W; Sections 1-23, 27-32,T18N, R17W; Sections 1-3, 10-16, 21-27, 35-36, T18N, R18W; Sections 7-9, 16-22, 28-31, T19N, R16W; and Sections 12-14, 23-26, 31, 34-36, T19N, R17W; and Sections 34 and 36, T19N, R18W; Swan Lake Ranger District, Flathead National Forest (See Figure 1).

## DEFINITIONS

The following definitions should help the reader understand terms describing the analysis areas used to disclose the environmental consequences of implementing the alternatives.

### PROJECT AREA

A project area is an area where project activities occur. As shown in Figure 1, the project area includes approximately 37,187 acres (34,962 acres of NFS lands, 1,810 acres of private land, and 415 acres of lake).

### ANALYSIS AREA

The analysis area is the area used for determining direct, indirect, and cumulative effects for the natural resources considered in this analysis. Note, the spatial and temporal bounds of the analysis (affected) area used for the effects analysis have been identified and described for each natural resource area included in this analysis and may vary from resource area to resource area.

### GRIZZLY BEAR SUBUNITS

The Beaver Creek Project is located in the Northern Continental Divide Grizzly Bear Ecosystem (NCDE). The NCDE has been divided into Bear Management Units (BMUs) and Subunits. The BMU Subunits approximate the size of a female grizzly bear's home range. The Beaver Creek Project lies within the Beaver Creek and Buck Holland Grizzly Bear Subunits. Conservation measures for the grizzly bear, including standards and guidelines, have been addressed at the Subunit scale (e.g., Interagency Grizzly Bear Guidelines, Forest Plan Amendment No. 19, and the SVGBCA).

## AFFECTED ENVIRONMENTAL ANALYSIS

The resource information provided in the Affected Environment narratives includes the effects of past actions, assessing them as part of the existing condition of the landscape. For instance, consider a hypothetical example of a past timber sale in 1979 harvesting 150 acres of forest and constructing 2 miles of new road within the Beaver Creek Project Area. The effects of the harvest and road construction, as well as the vegetation re-growth and roadbed stabilization, occurring over the past 36 years would be accounted for in several assessments of the affected environment based on the specific resource being analyzed. Using this scenario, the following are examples that consider how past actions influence the existing affected environment.

The change in forest structure from this past regeneration harvest would be displayed in the existing successional stage distribution disclosure in the Forest Vegetation Section. Field examinations indicate this 150-acre harvest area supports a fully-stocked stand of 20-foot trees and has progressed into a mid-seral successional stage over the past 36 years. This information would be included in the acreage of mid-seral successional classification and used in disclosure of existing vegetation and wildlife habitat conditions.

The existing level of past regeneration harvest in the project area would include the 150 acres from this activity.

Stream channel surveys assessing stream conditions in the project area would reflect any remaining physical and biological effects of the past timber sale and road construction. These field classifications of existing conditions of specific streams would be disclosed in the Affected Environment Section.

The present contribution of sediment and increased streamflow from the 2 miles of road construction would also be accounted for in the calculation of existing watershed conditions as specific road segments and their construction dates are entered into the watershed resource models. Likewise, any residual effects of the 150-acre harvest unit would be reflected in the existing condition model outputs based on vegetative recovery validated through field and aerial photo reconnaissance.

Field examinations of road conditions would provide additional data on residual contributions of sediment from the 2 miles of road. These effects would be incorporated into existing road condition disclosures and provide a basis for proposed BMP projects for improved drainage, if needed.

Specific past actions considered in the Beaver Creek Project are summarized in Table 17 below. Project File Section V provides detailed information for these actions. A list of past actions is not necessarily exhaustive, as records may not exist for all past activities (by project). This is particularly true for those actions that predate the passage of the NEPA in 1969 or actions that occurred on private land, or land that was in private ownership at the time activities occurred.

Nevertheless, the effects of such past actions are fully accounted for in the assessment of existing condition as the current condition assessment necessarily reflects the impact of such actions (to the extent they are still affecting the particular resource considered).

# ENVIRONMENTAL CONSEQUENCES

The Environmental Consequences Section details the environmental effects that would occur for each alternative. It forms the scientific and analytical basis for the alternative comparisons presented at the end of Chapter 2. Information used to assess effects is based on the consideration of the best available science. The effects of Alternative 1 - No Action Alternative form a baseline against which action alternatives are evaluated. Each narrative begins with a brief explanation of how effects were analyzed and the models used for each resource. When the effects or impacts are associated with an issue, as described in Chapter 2, their relevance and connectedness with the issue are discussed and play an important role in the evaluation of alternatives.

Environmental effects can be direct, indirect, or cumulative. They can be long or short duration. Effects can be quantitative or qualitative, adverse or beneficial, actual or potential. It is important to consider timing and location of effects. Direct effects are those caused by the action and occur at the same time and place. Indirect effects are those caused by the action and are later in time or further removed in distance, but are still reasonably foreseeable (40 CFR 1508.8). In most cases, direct and indirect effects are discussed together. Cumulative effects are those that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions (40 CFR 1508.7). Therefore, the discussion of effects first considers the direct and indirect effects of each alternative and does not consider cumulative effects unless direct and indirect effects exist.

As the effects on a resource for each alternative are read, the supplemental maps should be referred to for the location of activities and area of analysis.

Discussions at the end of each resource section include a description of the Regulatory Framework associated with that resource. Environmental laws, such as the NFMA, Endangered Species Act (ESA), Wilderness Act, Clean Water Act, and Clean Air Act, provide the direction to the Forest Service for management of forest resources. These laws are interpreted and defined through the Code of Federal Regulations (CFR), Administrative Rules of Montana (ARM), Forest Plan direction, FSM direction, and Forest Service policy. The Regulatory Framework associated with each resource is helpful in relating National and Forest direction to resource analysis procedures.

The cumulative effects analysis includes the additive effect of the action being considered when added to the effects of past, present, and reasonably foreseeable future actions. As past actions are already included in the affected environment, cumulative effects analysis builds upon this existing condition assessment by considering the incremental addition of direct and indirect effects of proposed, as well as present and reasonably foreseeable actions. While impacts can be differentiated by direct, indirect, and cumulative, the concept of cumulative impacts takes into account all disturbances since cumulative impacts result in the compounding of the effects of all actions over time.

Detailed descriptions of foreseeable actions and Cumulative Effects Worksheets by natural resource are filed in the Beaver Creek Project File. The cumulative effects analysis for each resource area considered only those actions that would have measurable effects. Reasons as to why other actions had no effects are documented in the project file and are not elaborated on further in this chapter.

Table 17 and Table 18 provide a summary of the actions considered in the cumulative effects analysis for the Beaver Creek Project. There will be different cumulative effects analyses depending on the resource. The summary of actions provided in Table 17 and Table 18 are only those actions that occur at the project scale. These actions may or may not be addressed depending on the resource. Additional information, such as maps and specific details such as the timing, type, location, and scale of these past, present, and future actions, is also included in the project file. The effects of these activities are discussed by resource in Chapter 3 - Affected Environment and Environmental Consequences.

## PAST, ONGOING, AND REASONABLY FORESEEABLE ACTIONS

Past actions are management activities (timber harvest and prescribed burning) and events (wildfire) that occurred in the analysis area. The effects of these activities and events provide baseline conditions for the affected environment resources existing in the analysis area, which are described in Chapter 3 of this EA. Additional information is contained in the project file for each of the resources. Records of past activities and events for the analysis area were examined from years 1919 to 2012, depending on what type of information is available. Activities recorded during this time are listed in Table 17.

Present and Reasonably Foreseeable Actions are management activities or projects planned by the Forest Service, other government agencies, or private landowners in or near the analysis area, which could occur regardless of which alternative is selected for implementation. Present and Reasonably Foreseeable Actions are activities or projects that are ongoing or will be implemented within the next 10 years, including those that would recur annually.

**TABLE 17. PAST, ONGOING, AND REASONABLY FORESEEABLE ACTION ON NATIONAL FOREST SYSTEM LANDS.**

<table>
<tr><th>ACTIONS ON NFS LANDS ONLY</th><th>PAST</th><th>ONGOING</th><th>REASONABLY FORESEEABLE</th></tr>
<tr><td>Timber Harvest (Includes harvest records on Legacy Lands formerly owned by Plum Creek Timber Company.)</td><td>Since 1955, the following timber harvest related activities have been documented in the project area: 4,574 acres of regeneration harvest, 3,775 acres of intermediate harvest, 2,036 acres of fuels treatment, 1,655 acres of reforestation, and 317 acres of pesticide application. Some of these acres could be located on the same site with multiple harvest entries in different time frames.<br>Two timber sales have occurred on Legacy Lands since they were transferred to Forest Service Ownership.<br>Beaver Highway (2011)<br>Sec.21, T19N R16W)<br>341 acres – Overstory Removal, 320 MBF<br>Two Bears (2012)<br>Sec.1 & 11, T18N R17W)<br>203 acres - Overstory Removal, 111 acres - Commercial Thin, 345 MBF<br>Please see Project File Exhibit V-12 for a list of all timber sales that occurred within the project area within the last 30 years.</td><td colspan="2">There are no ongoing or reasonably foreseeable timber harvest activities occurring on NFS lands within the project area.</td></tr>
<tr><td>Forest Service land acquisition through the Montana Legacy Project (2008 – 2014)</td><td><table><tr><th>Legal Description</th><th>Acres*</th></tr><tr><td>Sec. 29, T19N R16W</td><td>194.2</td></tr><tr><td>Sec. 21, T19N R16W</td><td>320.6</td></tr><tr><td>Sec. 31, T19N R16W</td><td>526.9</td></tr><tr><td>Sec. 11, T18N R17W</td><td>645.2</td></tr><tr><td>Sec. 01, T18N R17W</td><td>643.8</td></tr></table>*These acres reflect the recorded parcels housed in the USFS Region 1 office. Due to GIS discrepancies, these acres do not correspond with the acreages used for MA calculations.</td><td colspan="2">There are no ongoing or reasonably foreseeable land acquisitions in the Beaver Creek Project Area.</td></tr>
</table>

**TABLE 17. PAST, ONGOING, AND REASONABLY FORESEEABLE ACTION ON NATIONAL FOREST SYSTEM LANDS.**

<table>
<tr><th>ACTIONS ON NFS LANDS ONLY</th><th>PAST</th><th>ONGOING</th><th>REASONABLY FORESEEABLE</th></tr>
<tr><td>Forest Service land acquisition through Land and Water Conservation Funds (1998 - 2006)</td><td><table><tr><th>Legal</th><th>Acres*</th></tr><tr><td>Sec. 13, T19N R17W</td><td>320.4</td></tr><tr><td>Sec. 17, T19N R16W</td><td>603.1</td></tr><tr><td>Sec. 19,T19N R16W</td><td>600.2</td></tr><tr><td>Sec. 26,T19N R17W</td><td>535.9</td></tr><tr><td>Sec. 25,T19N R17W</td><td>638.9</td></tr><tr><td>Sec. 35,T19N R17W</td><td>414.7</td></tr></table>*These acres reflect the recorded parcels housed in the USFS Region 1 office. Due to GIS discrepancies, these acres do not correspond with the acreages used for MA calculations.</td><td colspan="2">There are no ongoing or reasonably foreseeable land acquisitions in the Beaver Creek Project Area.</td></tr>
<tr><td>Road Construction</td><td>The project area has approximately 9.3 miles of road open to motorized use and approximately 61.1 miles of road closed year long. These roads were built since the middle of the last century, though the majority of roads built on federal land were completed between 1950 to the mid-1980s and many of these roads were constructed and maintained through a cost share agreement between Plum Creek Timber Company and the Forest Service.</td><td colspan="2">There is no ongoing or reasonably foreseeable road construction occurring in the project area.</td></tr>
<tr><td>Road Maintenance</td><td>Roads designated for motorized use by the public are maintained with safety as a high priority. This primarily involves repairing drainage features and clearing of live and down vegetation. Some roads have been closed and are maintained at a lower level. There are currently approximately 70.4 miles of road under Forest Service jurisdiction within the project area; of which 9.3 miles are open year-long and 61.1 miles are closed yearlong. In summer of 2015, a bridge replacement on NFS road #906 at junction with Beaver Creek – (Section 30, T19N R16W) was completed.</td><td colspan="2">Ongoing maintenance of NFS roads will continue in the project area.</td></tr>
<tr><td>Road Access/ Utilities Special Use Permits</td><td colspan="3">Special use permits have been issued for the analysis area for the following types of activities: power lines, road easement for State Highway 83, telephone lines, fiber optic lines, and private road permits. A list of special use permits can be seen in Chapter 3 in the Recreation, Wilderness, and Lands section and in Project File Exhibit V-3.<br>All permits within the analysis are up to date and in good standing. Any permit in good standing that meets the Forest's screening process, is current with their yearly fees, and requests a renewal, would be eligible for a permit.</td></tr>
<tr><td>Trail Maintenance</td><td colspan="3">The Forest Service conducts trail maintenance on the following trails in the analysis area:<br>Lindbergh Lake Trail (490) - 2.7 miles<br>Jocko Trail (34) - 11.7 miles<br>Crystal Lake Trail (351) - 6.3 miles</td></tr>
<tr><td>Noxious Weed Control</td><td colspan="3">Noxious weed control as outlined in the 2001 Flathead National Forest Noxious and Invasive Weed Control EA and DN will continue to take place in the project area.</td></tr>
<tr><td>Non-Native Fish</td><td colspan="3">Non-native fish have been identified by the Forest Service and the MFWP as a threat to the bull trout population in Lindbergh Lake, but no action is planned at this time. The Aquatics report found in Chapter 3 discusses this issue in greater detail.</td></tr>
<tr><td>Range Allotments</td><td colspan="3">The Holland Cattle and Horse allotment covers 11,797 acres in the project area. This allotment allows 50 cow/calf between 6/1 – 9/30.</td></tr>
</table>

**TABLE 18. PAST, PRESENT, AND REASONABLY FORESEEABLE ACTIONS ON ALL OWNERSHIPS.**

<table>
<tr><th>ACTIONS ON ALL OWNERSHIPS</th><th>PAST</th><th>ONGOING</th><th>REASONABLY FORESEEABLE</th></tr>
<tr><td>Timber Harvest</td><td colspan="3">Timber harvest activities have occurred on private lands in the project area, beginning in about 1955. Lands formerly owned by PCTC have been transferred to NFS ownership in the last two decades and the timber harvest that occurred on lands now owned by the NFS is documented below. The project area does not have any lands owned by the State of Montana. No records were found to accurately document timber harvest that occurred on other private land, but timber harvest is likely to occur on these lands in the future.</td></tr>
</table>

**TABLE 18. PAST, PRESENT, AND REASONABLY FORESEEABLE ACTIONS ON ALL OWNERSHIPS.**

| ACTIONS ON ALL OWNERSHIPS | PAST | ONGOING | REASONABLY FORESEEABLE |
|---|---|---|---|
| Wildland Fire Suppression | Fire history records show that fires were very frequent within the Beaver Creek Project Area until the early 1900s. Sampling near Lindbergh Lake produced several hundred years of fire history yielding a mean fire interval of 23 years. The fire interval range was 6 to 50 years long with the last large fire occurring in 1919 (Barrett 2002). The 1919 wildfire covered approximately 8,000 acres within the project area directly east of Lindbergh Lake.<br>Forest Service records show that between 1970 and 2014, a total of 51 ignitions were detected in the project area. Approximately 84 percent of these ignitions were suppressed before they reached 0.2 acres in size. Fire starts have been suppressed using a combination of ground and aerial firefighting resources. Fire suppression activities will continue into the foreseeable future. | | |
| Hunting, Trapping, and Predator Control | These activities have been and continue to be popular uses of NFS land and other ownerships. Popular hunted species include white-tailed deer, mule deer, elk, and moose. Some species that are now currently listed as threatened, such as grizzly bears and Canada lynx, were hunted and trapped in the past. Some predator populations, such as gray wolves and coyotes, were reduced in numbers from the project area in the early part of the last century. | | |
| Dispersed Recreation | The area offers a variety of motorized and non-motorized year-round recreation opportunities including, hiking, cross-country skiing, mountain biking, hunting, fishing, driving for pleasure, and snowmobiling. Wheeled motorized use is restricted to open roadways. | | |
| Firewood and Other Miscellaneous Forest Product Gathering | Firewood gathering has occurred and will continue in the future. Other products gathered in small quantities in the area include posts and poles, mushrooms, berries, and Christmas trees. | | |
| Camping | There are no developed campgrounds within the project area. It is possible that dispersed camping occurs within the project area. There is a developed campground and boat launch outside the project area on the north end of Lindbergh Lake. | | |
| Road Maintenance and Best Management Practices | Records show that there are approximately 9.6 miles of non-Forest Service maintained road within the project area, including both state and private roads. Roads on all ownerships will be maintained for use either by all users or for just the individual landowners. Roads used for the transport of forest products are generally maintained to meet Montana Best Management Practices (BMP). Road work to improve surface drainage, stabilize slopes, and reduce erosion and stream sedimentation has occurred primarily on roads used by the Forest Service and PCTC since the early 1990s. | | |
| Timber Stand Improvement (TSI) | Approximately 964 acres of NFS land has had timber stand improvement activities occurring. These activities include pre-commercial thinning of sapling sized trees or daylighting or pruning around western white pine or whitebark pine trees. Some of these stands originated from wildland fire and others from timber harvest activities. | No TSI activities are currently being implemented on any ownership. | No TSI activities are currently planned on any ownership apart from the activities proposed in the Beaver Creek Landscape Restoration Project. |
| Conservation Easements | Conservation easements exist on the following lands within the Beaver Creek Project Area.<br>T19N R17 W Section 24 – 636 Acres – Enes Uno Barbara<br>T19N R16W Section 7 - 167 acres in project area/ 738 acres total – Chugwater, LLC | | |
| Drained Wetlands | Section 24, T19N R17W<br>Section 19, T19N R16W | | |

**TABLE 19. PAST, PRESENT, AND REASONABLY FORESEEABLE ACTIONS ON STATE AND PRIVATE OWNERSHIP ONLY.**

| ACTIONS ON STATE AND PRIVATE OWNERSHIP ONLY | PAST | ONGOING | REASONABLY FORESEEABLE |
|---|---|---|---|
| Private Land Development | The construction of driveways, buildings, and other improvements on private land within the project area has been occurring for decades and will continue. Missoula County records show that most of the private land subdivision in the project area occurred between 1954 and 1973. Most of the development has occurred along the Lindbergh Lake shoreline. The Forest Service is not aware of any applications for further development. | | |
| Noxious Weed Control | Noxious weed control on state and private ownership will continue to take place in the project area and is expected to increase in the future. Individual landowners will continue to control weeds with primarily spot applications on their property. | | |

**TABLE 19. PAST, PRESENT, AND REASONABLY FORESEEABLE ACTIONS ON STATE AND PRIVATE OWNERSHIP ONLY.**

| Actions on State and Private Ownership Only | Past | Ongoing | Reasonably Foreseeable |
|---|---|---|---|
| Timber Harvest | A very limited amount of timber harvest has occurred in the past on the 80 acres of private property. An estimated 50 percent of this land has experienced intermediate harvest methods over the past 50 years, some as recently as 4 to 5 years ago. | No timber harvesting on private property is currently observed. | Lands owned by private individuals are not expected to have any timber harvest in the foreseeable future. |
| Treatments Specific to Forest Fuels Reduction | Removal of live and dead vegetation for the purpose of reducing wildland fire intensity has been accomplished on private property within the project area. This activity is expected to continue. The extent of fuel reduction on private property is not known but is primarily limited to areas immediately adjacent to structures. | | |
| Agriculture | A minor amount of land on private property has been used and will continue to be used for agricultural purposes. | | |

There are additional USFS activities that have or will be occurring outside the Beaver Creek Project Area, but are located within the appropriate analysis area for individual resources. The potential effects of these activities are discussed by resource in Chapter 3 - Affected Environment and Environmental Consequences. These activities include, but are not limited to the following:

- Glacier Loon Fuels Reduction and Forest Health project lies to the north and west of the Beaver Creek Project Area. Sections 2-6 T18N, R17W, Sections 1-3, 5-9, and 16-17 T18N, R18W; Sections 01-4, 7-23, 26-35 T19N, R17W; Sections 2-4, 9-15, 22-27, and 33-36 T19N, R18W; Sections 18-19 and 29-32 T20N R16W; and Sections 1-2, 11-15, 22-27, and 33-36 T20N R17W and proposes to reduce fuels and forest health on approximately 1,405 acres of NFS Lands. Also proposed are 5.9 miles of temporary road and 8.4 miles of road decommissioning.
- Cold Jim Fuels Reduction and Forest Health Project. This project lies to the north of the Beaver Creek Project Area (T22N R17W, Sections 21, 28, 29, 31-34; T21N R17W, Sections 3-10, 15-22, 27-33; T21N R18W, Sections 1-4, 8-17, 20-29, 32-36; T20N R18W, sections 1-5, 8-12, 14-15; T20N R17W, Sections 3-6). This project proposes to reduce fuels and restore forest health on approximately 1,155 acres of NFS lands using a combination of harvest treatments. In addition, three resource enhancement projects would be implemented to improve water quality, restore wetlands, and restore wildlife habitat. Approximately 3.1 miles of temporary road will be used to access treatment units would be constructed and Best Management Practices would be applied on 21.5 miles of existing specified road.
- Chilly James Restoration Project: This project area lies to the north of the Beaver Creek Project Area (Sections 1-3, 10-12, Protraction Block 37-40 T20N, R18W and Sections 4-9, 17 T20N, R17W and Sections 9-36, T21N, R17W and Sections 11-14, 24-25 and 36 of T21N, R18W. In Lake County, the project area includes Sections 1-4, Protraction Block 37-38 T21N, R18W and Sections 3-10, 15-22, 27-34 T21N, R17W and Sections 28-34, T22N, R17W and Sections 1-4, 35-36, T22N, R18W). This project will implement BMPs on 20.9 miles of system roads, place 4.8 miles of system roads into storage, passively decommission 14.9 miles of system roads; activity decommission 9.8 miles of system roads, decommission and recontour an estimated 2.4 miles of system road, and realign about 0.2 miles of road to mitigate inefficiencies.

## THE MONTANA LEGACY PROJECT

On June 30, 2008, The Nature Conservancy (TNC) and The Trust for Public Land (TPL) announced they reached agreement to purchase approximately 310,000 acres of Plum Creek Timber Company (PCTC) lands in three phases over 2 years culminating in December 2010.

The lands in the agreement include more than 65,630 acres in the Swan Valley. By 2014, TNC had conveyed approximately 47,000 acres in the Swan Valley to the Forest Service.

The Legacy Lands Acquisition includes a timber supply agreement on donated lands to provide timber to PCTC for 10 years through a timber reservation that TNC and TPL will place on deeds to honor the original purchase agreement with PCTC. Specific harvest plans for this volume are developed for each harvest. Approximately 2,331 acres of Legacy Lands exist within the project area. Overall, timber harvests from Legacy Lands, over time, are expected to be at or below rates harvested when owned by PCTC. Road systems on Legacy Lands, while under the timber supply agreement, would be regulated under the same agreements and guidelines as existed with PCTC.

# SOILS

## INTRODUCTION

The following section documents the soil resource effects of the proposed Beaver Creek Landscape Restoration Project. Specific management indicators to be analyzed include soil productivity, soil erosion, and mass failure. Effects to the watershed resource as a whole are discussed in the Aquatics Section of this EA.

## ANALYSIS AREA

### SPATIAL BOUNDS

The analysis area forms the boundary for the direct, indirect, and the cumulative effects soils analysis. It consists of the proposed treatment units and temporary roads for the Beaver Creek Project. This analysis area was selected because it is where the effects of implementing the proposed activities would occur. The effects on soils would not extend beyond the units proposed for treatment.

### TEMPORAL BOUNDS

The temporal bounds for the soil resource analysis are considered to be within 10 years for short-term impacts and up to 70 years for long-term impacts.

## DATA SOURCES, METHODS, AND ASSUMPTIONS USED

Forest Service Manual Section 2550 and the Region 1 Supplement 2500-2014-1 (Project File Exhibit L-3) provide direction for maintaining soil quality. Numerous bulk density samples have been taken from the Flathead National Forest in areas that were managed for timber production. Statistical analyses of bulk density measurements establish their validity in determining the effects of management on the ground (Project File Exhibits L-3 and L-4).

A study of soil moisture trends on the Flathead National Forest (Project File Exhibit L-5) demonstrates the average annual period when soils are sufficiently dry (soil moisture less than field capacity) to reduce detrimental soil disturbance, a practice recommended in literature cited in this document. Literature has been cited that documents the effectiveness of Design Criteria proposed to reduce anticipated disturbance from the Beaver Creek Project. In addition, monitoring reports for activities on soils similar to those in the Beaver Creek Project Area (Project File Exhibits L-6 through L-17) were used to estimate the effects of the proposed activities. Information gathered in field investigations was used to determine cumulative effects (Project File Exhibit L-18).

The soils in the project area are described in the updated landtype report for the Flathead National Forest (Martinson et al. 1983). Landtypes provide the basis for the soil analysis. All soils are classified according to Soil Taxonomy, a national system used to classify and group soils. Classification allows soils to be grouped to permit the largest number and the most precise predictions possible about responses to use and management (USDA 1999c). This system allows for monitoring results from one taxonomic unit to be related to other, similar taxonomic units.

Predicted detrimental soil disturbance from proposed temporary roads are calculated based on average clearing width. Temporary road prisms are part of the productive land base as defined by NFMA Sections 4 through 7, and therefore, predictions of potential impacts on soil productivity are required. All temporary roads are estimated to average 22 feet in width of total disturbance resulting in 2.7 acres of detrimental disturbance per mile. All associated impacts from temporary road construction and closure are assigned to the related harvest units.

Past timber harvest information was assembled from the Forest Service Activity Tracking System (FACTS).

# MEASUREMENT INDICATORS

This section discusses the soil measurement indicators that could be affected by the proposed activities. They are:

- Soil productivity,
- Soil erosion,
- Mass Failure.

## SOIL PRODUCTIVITY

Soil productivity is the ability of the soil to supply the water and nutrients needed to sustain plant growth. Variables that influence soil productivity include physical soil characteristics, organic matter and soil biological activity.

## PHYSICAL SOIL CHARACTERISTICS

Physical soil characteristics include soil depth, porosity and bulk density. Changes in these occur most often when ground-based equipment makes repeated passes over the soil (Lull, 1959). These activities compact soils and, if soils are moist enough, cause rutting and puddling. All of these changes to the physical soil characteristics reduce the pore space volume and water holding capacity. These physical changes reduce infiltration rates, slow soil drainage, impede root growth and reduce plant-available water and nutrients. Physical soil disturbances also decrease gas exchange, affecting both plants and soil biota. These physical changes to soil characteristics are classified as classified as detrimental soil disturbance (DSD).

## ORGANIC MATTER

Organic matter in its various forms contributes to soil productivity. Organic matter is particularly important for water retention, cation exchange, nutrient cycling, and erosion control (Page-Dumroese et al. 1991). Humus is decomposed organic matter. Duff and litter are partially decomposed leaves, needles and twigs less than three inches in diameter on the soil surface. 85 to 90 percent of the total nutrients in most coniferous trees are contained in branches, twigs and foliage (Garrison et al. 1998). Coarse woody debris consists of woody stems greater than three inches in diameter (Harvey et al. 1994). This material has no effect on soil nitrogen or other nutrients regardless of decay stage and it can compete with vegetation for limited nutrients through immobilization (Busse 1994; Prescott et al. 2002).

## SOIL BIOLOGICAL ACTIVITY

Soil organisms, including fungi and bacteria, drive the nutrient cycling process by decomposing organic matter and mineralizing nutrients for use by plants. Soil organisms depend on organic matter for the nutrients they need to carry out their life processes. Decomposed large woody debris provides habitat for the survival of mycorrhizae fungi. These fungi form a symbiotic relationship with tree roots, increasing water and nutrient uptake by the trees and the fungi (Perry et al. 1990).

### SOIL EROSION

Soil erosion is the movement of soil particles by water, wind or ice. In forested sites on steep slopes, water is the most common cause of soil erosion. Erosion is infrequent on undisturbed forest soils for two reasons:

Abundant organic matter provides a protective layer on the soil surface that reduces the impacts of raindrops and allows water to infiltrate; and

The surface soil below the organic layer is by nature porous, allowing water to infiltrate into and through the soil profile (Goldman et al. 1986).

Soil erosion can occur when the surface soil is compacted or when the loose surface soil and its protective layer of organic material are changed by management activities. Compaction, rutting and puddling reduce the movement of water into the soil and tend to channel and concentrate water. As a result, run off (overland flow) is increased and carries soil particles with it. Natural occurrences, such as fire, remove organic matter from the soil surface. When organic matter is removed, soil pores can be plugged by impact from raindrops resulting in overland flow and increased rates of soil erosion.

### MASS FAILURE

Mass failures can be caused by natural or man-made disturbances. Mass failures can result from sequences of natural events, such as wildfire followed by high-intensity precipitation. Some areas are prone to mass failures because of the nature of the bedrock geology or soil.

Management activities can also saturate a soil by channeling water and concentrating it onto a limited area, for example, below a road culvert or a rutted skid trail. All mass failures triggered by human causes are classified as DSD. These disturbances cause long-term changes in soil productivity that can last centuries.

## AFFECTED ENVIRONMENT

In order to determine the existing condition of soils within the proposed activity areas, field investigations were conducted to determine if and how existing soil condition was affected by past management activities or other dispersed activities (e.g., off-highway vehicle travel and firewood cutting). In addition, areas within proposed activity areas that would require Design Criteria to address conditions, such as sensitive soils that are wet, steep, or had evidence of past harvest that caused compaction, displacement, rutting, puddling, or soil erosion, were identified.

Most soils on the Flathead National Forest, including those within the project area, have a surface that formed in or is strongly influenced by volcanic ash loess and, thus, are similarly classified. Since most soil quality monitoring on the Flathead National Forest has occurred on soils that have a volcanic ash-influenced surface, there are a large number of both quantitative bulk density measurements and qualitative ratings that relate to the soils in the project area. This information has two valuable implications;

We can estimate the amount of detrimental soil disturbance that exists from past management activities by doing transects and observing the amount of visible detrimental disturbance present and

We can estimate the amount of detrimental soil disturbance to expect from proposed management activities on given soil types and thus estimate the effects on the soil resource.

## SOIL DISTURBANCE EVALUATIONS

Establishment of existing condition for proposed treatment units followed the approach outlined in the Region 1 Soil/NEPA technical guide (Project File Exhibit L-19). When initial observations showed potential for existing detrimental disturbance to be in excess of 2 percent of the activity area, the Forest Soil Disturbance Monitoring Protocol (SDMP) (Page-Dumroese et al. 2009) was used. This protocol provides a method for systematically quantifying soil conditions based on visual indicators.

The Forest Soil Scientist determines which visual classes represent detrimental soil disturbance based on the characteristics of the soils within the project area. For the area, where soil depths and water holding capacities are generally favorable, visual soil disturbance class 3 is considered detrimental. Some instances of class 2 were judged detrimental due to compounding factors.

All SDMP surveys were conducted using an 80 percent confidence interval. The margin of error around each estimate is ±5 percent. Sample size is determined automatically on the electronic SDMP field form. The SDMP field data collection spreadsheets and activity area documentation forms are located in Project File (Exhibit L-17). Information gathered during field investigations is also used to determine cumulative effects.

Table 20 summarizes SDMP results for mechanical treatment proposed action units with existing detrimental soil disturbance. In units with multiple past activities, these activities did not spatially overlap with one another.

**TABLE 20. PROPOSED MECHANICAL TREATMENTS EXISTING CONDITION INFORMATION.**

| UNIT | ACRES | PRESCRIPTION | DSD PERCENT |
|---|---|---|---|
| 1 | 4 | Commercial Thin | 0.0 |
| 3 | 24 | Commercial Thin | 3.3 |
| 4 | 19 | Commercial Thin | 0.0 |
| 5 | 47 | Improvement Cut | 5.6 |
| 6 | 5 | Improvement Cut | 3.3 |
| 7 | 3 | Pre-Commercial Thin | 3.3 |
| 12 | 55 | Improvement Cut | 2.4 |
| 16 | 141 | Commercial Thin | 2.8 |
| 19 | 48 | Improvement Cut | 3.3 |
| 21 | 67 | Seed Tree with Leave | 2.1 |
| 25 | 27 | Commercial Thin | 0.0 |
| 28 | 110 | Commercial Thin | 0.0 |
| 31 | 1 | Commercial Thin | 0.0 |
| 32 | 12 | Commercial Thin | 0.0 |
| 34 | 10 | Commercial Thin | 0.0 |
| 36 | 29 | Commercial Thin | 0.0 |
| 37 | 5 | Commercial Thin | 1.0 |
| 39 | 45 | Commercial Thin | 1.0 |
| 40 | 9 | Commercial Thin | 0.0 |
| 42 | 11 | Commercial Thin | 0.0 |
| 43 | 4 | Commercial Thin | 5.2 |
| 45 | 10 | Clearcut with Reserves | 0.0 |
| 51 | 45 | Improvement Cut | 3.0 |
| 54 | 8 | Improvement Cut | 3.3 |
| 55 | 82 | Commercial Thin | 1.0 |
| 57 | 3 | Seed Tree with Leave | 0.0 |
| 60 | 3 | Improvement Cut | 0.0 |
| 62 | 31 | Seed Tree with Leave | 0.0 |
| 74 | 1 | Commercial Thin | 0.0 |
| 76 | 43 | Commercial Thin | 0.0 |
| 84 | 6 | Clearcut with Reserves | 0.0 |
| 89 | 41 | Seed Tree with Leave | 0.0 |

**TABLE 20. PROPOSED MECHANICAL TREATMENTS EXISTING CONDITION INFORMATION.**

| | | | |
|---|---|---|---|
| 90 | 8 | Commercial Thin | 0.0 |
| 91 | 16 | Commercial Thin | 0.0 |
| 99 | 26 | Seed Tree with Leave | 0.0 |
| 100 | 14 | Seed Tree with Leave | 0.0 |
| 102 | 95 | Commercial Thin | 0.0 |
| 105 | 27 | Seed Tree with Leave | 0.0 |
| 114 | 46 | Seed Tree with Leave | 0.0 |
| 116 | 92 | Group Select | 0.0 |
| 118 | 17 | Improvement Cut | 0.0 |
| 119 | 26 | Commercial Thin | 4.5 |
| 201 | 4 | Pre-Commercial Thin | 0.0 |
| 203 | 11 | Improvement Cut | 3.3 |
| 204 | 83 | Improvement Cut | 5.6 |
| 210 | 36 | Pre-Commercial Thin | 3.3 |
| 212 | 40 | Pre-Commercial Thin | 4.6 |
| 214 | 17 | Pre-Commercial Thin | 6.7 |
| 220 | 10 | Pre-Commercial Thin | 0.0 |
| 221 | 24 | Improvement Cut | 3.3 |
| 224 | 18 | Pre-Commercial Thin | 0.0 |
| 226 | 10 | Pre-Commercial Thin | 6.7 |
| 231 | 222 | Pre-Commercial Thin | 3.3 |
| 232 | 13 | Pre-Commercial Thin | 0.0 |
| 235 | 26 | Improvement Cut | 0.0 |
| 236 | 52 | Pre-Commercial Thin | 0.0 |
| 238 | 18 | Pre-Commercial Thin | 3.3 |
| 245 | 33 | Pre-Commercial Thin | 1.0 |
| 251 | 37 | Pre-Commercial Thin | 8.3 |
| 252 | 29 | Seed Tree with Leave | 0.0 |
| 254 | 25 | Improvement Cut | 0.0 |
| 265 | 20 | Daylighting | 0.0 |
| 266 | 18 | Group Select | 3.3 |
| 300 | 233 | Prescribed Fire | 6.7 |
| 308 | 520 | Prescribed Fire | 0.0 |
| 309 | 584 | Prescribed Fire | 0.0 |
| 313 | 125 | Prescribed Fire | 6.0 |
| 314 | 180 | Prescribed Fire | 6.0 |
| 460 | 1 | Commercial Thin | 0.0 |
| 491 | 4 | Commercial Thin | 0.0 |

Field surveys found evidence of past disturbance within some units that have no database record of past harvest activity. In these cases, the above table provides the existing disturbance information. Units that had database records of past activities, but had no measured detrimental disturbance, might have recovered or were logged in a manner that minimized disturbance.

## SOIL PRODUCTIVITY TRENDS

Soil quality in the Beaver Creek Project Area is stable to trending upward. Past activities were minimal. Literature indicates that disturbed soils improve by means of plant growth, bioturbation, freeze/thaw cycles, wet/dry cycles, and organic matter additions, all of which naturally occur in the project area. These natural processes effectively improve compacted soils over time (Lull 1959). Compaction recovery rates are highly variable with an expected range of 10 to 70 years (Gonsior 1983). The target downed wood for these forest types is 5 to 20 tons/acre for moderating soil productivity while minimizing fuels hazard (Brown et al. 2003; Graham et al. 1994).

Most disturbed soils have abundant organic matter and roots throughout the upper soil layers. In addition, the pre-harvest surveys of proposed units show that many old disturbances are no longer detrimental; indicating they are recovering and soil quality is trending upward.

## LANDTYPES AND INTERPRETATIONS

Table 21 lists landtype map units for the proposed units (Martinson et al. 1988). The dominant soils in the project area are typified by rocky subsoil horizons, moderate erosion hazard, high infiltration rates, and moderate to high relative productivity.

**TABLE 21. LANDTYPES OF PROPOSED TREATMENT UNITS.**

| LANDTYPE | RELATIVE PRODUCTIVITY | SENSITIVE | SURFACE EROSION HAZARD | MASS FAILURE HAZARD | ACRES |
|---|---|---|---|---|---|
| VI | Not Rated | No | Moderate | Moderate | 2134 |
| VII | Moderate | No | Moderate | Moderate | 1112 |
| 26D-7 | Moderate | No | Moderate | Low | 1006 |
| 26D-8 | Moderate | No | Moderate | Low | 248 |
| 57-8 | Moderate | No | Moderate | Low | 879 |
| Vb | Moderate | No | Moderate | Low | 760 |
| 73 | Moderate | No | Moderate | Moderate | 689 |
| 27-8 | Moderate | No | Moderate | Low | 678 |
| 57-9 | Moderate | No | Moderate | Low | 676 |
| II | Low | No | Moderate | Low | 472 |
| III | High | No | Moderate | Low | 263 |
| 10-3 | Moderate | Yes | Not Rated | Low | 200 |
| 26C-8 | High | No | Moderate | Low | 68 |
| 12 | Not Rated | Yes | Slight | Low | 30 |
| 14-3 | Moderate | Yes | Moderate | Low | 28 |
| 55 | Not Rated | No | Moderate | Not Rated | 24 |
| 16 | High | No | Moderate | Low | 1 |

### PRODUCTIVITY

Productivity of the landtypes in the Beaver Creek Project Area is dominantly moderate. All soils within the proposed units, with the exception of small, shallow, rocky inclusions, support forest vegetation.

### SURFACE EROSION HAZARD

The dominant erosion risk for the landtypes in the Beaver Creek Project Area is moderate. A majority of these landtypes are characterized by gentle slopes and soils with high infiltration rates. The high rock fragment content of most subsurface horizons also promotes water movement through the soils. Runoff from these soils is uncommon.

### SENSITIVE SOILS

Sensitive soils contain an excess of soil moisture either yearlong or on a seasonal basis. Disturbance on sensitive soils can lead to loss of soil productivity. Areas of sensitive soils typically require Design Criteria for protection. Where ground-based mechanical treatments are proposed on these landtypes, winter logging would be required.

Landtype 10-3 consists of moist, poorly-drained soils formed in alluvium. Due to close proximity to streams, this landtype has high sediment delivery efficiency. Tractor operation should be carefully managed and confined to periods when soil is frozen or snow covered.

Landtype 12 consists of moist, poorly-drained soils formed in organic deposits. Tractor operation would be carefully managed and confined to periods when soil is frozen or snow covered.

Landtype 14-3 consists of moist, somewhat poorly-drained soils formed in lacustrine deposits. This landtype has potential for slow movement of water into compacted skid trails or landings. This characteristic results in the potential for overland flow that causes soil erosion and sediment. Tractor operation would be carefully managed and confined to periods when soil is frozen or snow covered. Adequate and well-maintained surface drainage is necessary on all roads and skidtrails that cross this landtype. Temporary roads would exhibit low strength and be subject to rutting when wet, increasing the potential for sediment.

## MASS FAILURE HAZARD

The dominant mass failure hazard rating for the Beaver Creek Project Area is low. None of the landtypes have increased potential for mass failure.

# ENVIRONMENTAL CONSEQUENCES

The analysis of effects for soils assumes that all Design Criteria outlined in Chapter 2 would be effectively implemented. The analysis will show the expected amount of detrimental soil disturbance resulting from the implementation of the action alternatives and will describe the risk that the expected amount of disturbance would be exceeded. The proposed harvest systems and Design Criteria have been implemented in previous projects and monitored for effectiveness. These monitoring reports are located in the Project File (Exhibits L-6 through L-17).

The soil analysis process is described in the soil analysis guideline document (Project File Exhibit L-21). Cumulative effects are discussed in terms of the activity areas. The FSM R-1 Supplement No. 2500-914-1 defines an activity area as a land area affected by a management activity to which soil quality standards are applied. An example of an activity area is a harvest unit or burn unit. Soil quality standards do not apply outside of an activity area.

The soil analysis is based on the current soil condition as determined from field data collection, along with predicted changes in soil condition caused by implementation of the proposed management activities. Detrimental disturbances are defined as the condition where established soil quality standards are not met, and the result is a significant change in soil productivity. At least 85 percent of an activity area must have soil that is in satisfactory condition.

It is important to consider that not all soil disturbances are detrimental. Our past monitoring of projects on the Flathead National Forest suggests that some soil disturbances create bulk density below the levels that inhibit root growth (Project File Exhibit L-3). Research has shown that increased bulk density on coarse textured soils results in increased production capacity because of associated increases soil water holding capacity (Powers et al. 2005). They also noted that increases in bulk density were not reflected in site production if an understory was absent. In other words, reducing competition from forbs, brush and trees could leave more abundant resources for the remaining vegetation, even if soil bulk density increases.

## ALTERNATIVE 1 – NO ACTION ALTERNATIVE
## DIRECT AND INDIRECT EFFECTS

Alternative 1 provides a baseline to evaluate the effects of the action alternatives. The effects on soils are discussed as changes over time on soil productivity, soil erosion, and mass failures.

### SOIL PRODUCTIVITY

Alternative 1 would not cause short-term effects on the Soil Resource over and above existing condition. No additional road building, timber harvest, prescribed burning, or fuels reduction would disrupt natural soil processes.

#### PHYSICAL SOIL CHARACTERISTICS

Alternative 1 would not cause soil compaction, rutting, puddling, or soil displacement. Undisturbed soils would remain so. Soil productivity in areas where past timber management compacted soils would slowly improve as plant roots, soil organisms, and freeze-thaw events loosen the soil. Most soil disturbances would recover after 70 years (Gonsior 1983). Sites that are slightly compacted would recover in fewer than 70 years. Displaced, rutted, and puddled soils would have reduced productivity for a longer time than compacted soils.

#### ORGANIC MATTER

Standing dead trees would eventually fall over and contribute coarse-woody debris. Fine-woody debris would remain on site. Soil organisms would decompose the organic materials adding humus to the soil. Nutrients associated with this material would slowly become available for plant growth. As the tree canopies close and shade the soil surface, decomposition rates would slow, allowing organic matter and nutrients to accumulate on the soil surface. This process would continue until another major disturbance, such as fire or a windstorm, opens the tree canopy and speeds up the recycling process again.

#### SOIL ORGANISMS

Microorganism populations would fluctuate with the changes in microclimate and supply of organic matter on the soil surface. These changes would be in response to the changing vegetation as a result of natural events such as fire, wind throw, and other sources of natural vegetation mortality. Any changes would be buffered by the capability of soil microbial communities to adapt to changing conditions on very short time scales (Schmidt et al. 2007).

### SOIL EROSION

Alternative 1 would allow any current soil erosion to decrease as vegetation returns to soils that lack plant cover. Wildfires could cause short-term increases in soil erosion. Soil erosion rates would fluctuate with natural changes in vegetation.

### MASS FAILURES

Alternative 1 would not change the risk of mass failures within the project area. All slopes are considered stable. Mass failures are very unlikely.

## ALTERNATIVES 2 AND 3 – ACTION ALTERNATIVES DIRECT AND INDIRECT EFFECTS

### SOIL PRODUCTIVITY

The following paragraphs are based on our intent to maintain soil productivity by designing skid trails and landings so they occupy less than 15 percent of each activity area and to use site preparation methods that minimize soil detrimental disturbance. In addition, implementation of Design Criteria has the potential to further reduce soil impacts.

#### PHYSICAL SOIL CHARACTERISTICS

##### TRACTOR HARVEST

These operations would result in direct and indirect effects on soil physical characteristics within the boundaries of proposed activity areas. Most detrimental effects would be concentrated on the proposed skid trails, temporary roads, and landings within or associated with timber harvest units. Minimizing the area occupied by landings and skid trails to reduce the detrimental effects on soil productivity from changes in physical soil properties is recommended in several papers (Garland 1983; Page-Dumroese 1993; Williamson et al. 2000).

Skid trails and landings would be laid out to occupy less than 15 percent of the activity unit. Calculations demonstrate that spacing skid trails 75 and 100 feet apart limits detrimental disturbance to less than 15 percent of the activity area (Project File Exhibit L-20). Designated skid trails with 100-foot spacing impact 11 percent of the harvest area (Garland 1983). Post- harvest monitoring on the Flathead National Forest consistently shows less than 15 percent detrimental soil disturbance from ground-based operations that use designated skid trails (Project File Exhibits L-9 through L-16).

In addition to using designated skid trails and landings, there would be potential to reduce soil effects further by limiting equipment operation, to the extent possible, on skid trails when soils are drier than field capacity (McNabb et al. 2001; Startsev et al. 2001). Rutting and puddling are most often associated with logging on wet soils (Williamson et al. 2000). Soil moisture monitoring on the Flathead National Forest showed that soils are drier than field capacity during the summer dry period, which begins in early summer and often lasts through October (Project File Exhibit L-5). Most summer logging would occur when soils are drier than field capacity. By operating on low soil moisture conditions we have the potential to reduce the amount of detrimental disturbance from skidding operations.

### Temporary Road Construction and Extended Log Skidding Corridors

All temporary roads and extended log skidding corridors constructed for this project would be reclaimed by any site-appropriate combination of the following:

- Removing any installed culverts or temporary bridges,
- Recontouring the entire template to natural ground contour,
- Where recontouring is unnecessary, scarify with excavator teeth to a depth equal sufficient to ameliorate the presence of detrimental soil compaction (usually between 2 and 12 inches),
- Seeding with the native plant mix as specified by the Forest Botanist,
- Placing woody material on the template, and
- Planting native shrubs/trees to augment natural vegetation.

Re-contouring activities would not ameliorate the long-term impacts to soil productivity immediately, but would improve soil conditions compared to those of an existing or abandoned road. The establishment of vegetation and associated additions of organic matter would encourage recovery over time. Re-contouring would provide a suitable seed bed for native forest vegetation while increasing soil hydraulic conductivity, organic matter, total carbon, and total nitrogen (Lloyd et al. 2013). These conditions would likely accelerate the recovery of the soil productivity.

Erosion is expected from temporary roads and extended log skidding corridor construction where native surfaces are exposed to rainfall impact and overland flow. Some areas would likely have short-term increases of soil erosion above 2 tons per acre per year. Erosion rates would decrease as roads are obliterated immediately following use.

The WEPP model results estimate the potential amount of soil erosion from these uses (Table 22) at 0.7 tons per acre per year over the 3-year sale contract period. These figures represent total erosion from all segments for the anticipated duration of use in all action alternatives (Project File Exhibit L-23).

**Table 22. Potential Soil Erosion - Temporary Roads and Extended Ski Corridors.**

| Alternative | Potential Erosion Rate (tons/acre/year) | Disturbance Acres | Potential Total Erosion (tons) |
|---|---|---|---|
| 1 | 0 | 0 | 0 |
| 2 | 0.7 | 15.6 | 34.1 |
| 3 | 0.7 | 11.2 | 23.7 |

#### SKYLINE HARVEST

These operations would result in direct and indirect effects on soil physical characteristics within the boundaries of the proposed activity areas. Effects would be less than those from ground-based operations. Skyline yarding disturbs 2 to 8 percent of the soil in a unit (McIver et al. 2000). Monitoring results on the Flathead National Forest show skyline yarding had consistent levels of detrimental disturbance far below 15 percent of an activity area.

#### EXCAVATOR PILING

Excavator piling of logging slash minimizes changes to physical soil properties from mechanical slash treatments. All mechanical slash piling would be accomplished with excavators. This method reduces the aerial extent of detrimental soil impacts from the site preparation activities. Excavator effects have been monitored at the project level on the Flathead National Forest since the early 1990s. In a detailed study, approximately 200 bulk density samples were collected where excavators worked. Those samples exhibited minor increases in soil bulk density (Project File Exhibit L-4). In addition, when they are used on slopes less than 45 percent, displacement of the topsoil is rare.

#### PRE-COMMERCIAL THINNING – MECHANICAL TREATMENT

Use of ground-based mastication equipment would have direct and indirect effects on soil physical characteristics within the boundaries of proposed activity areas. There would be potential to greatly reduce these effects by limiting equipment operation to dry soils. Soil compaction is reduced when soils are drier than field capacity (McNabb et al. 2001; Startsev et al. 2001). Rutting and puddling are most often associated with ground-based mechanical equipment operation on wet soils (Williamson et al. 2000). Flathead National Forest soils are typically drier than field capacity between July and mid- to late-October (Project File Exhibit L-3). Mechanical mastication would occur only when soils are drier than field capacity.

Mastication treatments would substantially increase woody debris (Harrod et al. 2009). This heavy slash is effective for buffering the effect of ground-based mechanical equipment operation on mineral soil (Han et al. 2006; Han 2006). A significant relationship exists between the presence of bare ground and the potential for increased compaction (Hatchett et al. 2006). Further soil protection would be expected though retention of forest floor due to absence of displacement normally associated with ground-based skidding of logs.

Monitoring on two recent mechanical mastication units on the Flathead National Forest met the Regional Soil Quality Standard from the cumulative effects of original regeneration harvest and mastication (Project File Exhibit L-17). Measured detrimental impacts in these two units were well below the Regional standard. In addition, all observed detrimental impacts were attributable to the original harvest activities. Bare soil occurrence in these units ranged from 2 to 6 percent.

#### PRE-COMMERCIAL THINNING – HAND TREATMENT

Treatment in these units would typically reduce tree densities to within a target range. Reductions would be accomplished by cutting with chainsaws. In lop and scatter treatments, cut saplings would be left on site. No detrimental soil disturbance would result from the hand cutting of saplings or the hand piling of cut saplings.

Burning of hand piles could result in some minor changes to soil structure where temperatures between 220 to 460°C are generated (DeBano et al. 1998). No significant effects to soil bulk density, infiltration capacity, or soil moisture content are expected (Seymour et al. 2004).

### SUMMARY

Local monitoring and literature indicates that Regional Soil Quality Standards can be met by using designated skid trails. Additional protection of the Soil Resource would be afforded by tractor logging only when soils are dry, snow covered, or frozen. Literature and local monitoring on soils similar to those in the project area indicate that skyline logging would meet the Regional Soil Quality Standards. The effects from skyline harvest would impact less soil than tractor harvest when used on the appropriate slopes. Excavators used to treat slash minimize detrimental disturbance levels. Excavator piling was monitored on the Flathead National Forest and was determined to have caused few detrimental impacts (Project File Exhibit L-4). When excavator piling was used in combination with tractor logging systems, Region 1 Soil Quality Standards were met. Pre-commercial thinning activities would not be expected to result in any additional detrimental impacts.

## ORGANIC MATTER

All proposed treatments would leave varying amounts of organic matter on the site. Woody debris would be retained at 5 to 21 tons per acre as per Forest Plan Amendment 21.

The total amount of nutrients on a site would likely be reduced where organic matter would be removed or displaced. However, plant available nutrients mineralized from organic matter would increase due to increased incoming solar radiation and soil moisture. These conditions would accelerate the decomposition of the remaining organic matter and the release of plant-available nutrients in the treated stands (Harvey et al. 1994).

After project implementation, competition between trees would be reduced because fewer trees would remain on the sites. This situation could result in more available nutrients and water for the remaining trees, potentially conferring greater growth, vigor and disease resistance (Powers et al. 2005).

Nutrients in soil and organic matter are not the only nutrients available to the forest vegetation. In logging followed by low-severity broadcast burning, there would be no long-term depletion of nitrogen reserves because lost nitrogen would be more than replenished by inputs from precipitation and by biological nitrogen fixation over a rotation of 100 to 150 years (Jurgensen et al. 1981).

### PHYSICAL SOIL CHARACTERISTICS

#### REGENERATION HARVEST

These treatments would remove the most live vegetation and have the potential to remove more amounts of organic matter than intermediate harvests. Whole tree yarding would remove tops and branches of harvested trees from the stand to the landing for disposal by chipping and removal. Units proposed for excavator pile burning or broadcast burning would leave nutrients associated with the slash on the site to be used by the remaining forest vegetation.

All harvest prescriptions would leave a portion of the existing stand on the site. Remaining living trees in stands would serve as potential nutrient sources on the site.

#### COMMERCIAL THINNING AND MECHANICAL PRE-COMMERCIAL THINNING

These treatments would leave a large portion of the existing stand on site, which would maintain more organic matter on the site than regeneration harvests. Whole tree yarding would remove tops and branches of harvested trees from the stand to the landing for disposal by chipping and removal rather than piling and burning.

#### PRE-COMMERCIAL THINNING – MECHANICAL TREATMENT

Mastication treatments increase woody debris and result in a net increase of forest floor carbon. These types of increases do not appear to decrease nitrogen and phosphorus availability (Ryan et al. 2009). Physical forest floor impacts would be limited to track deformation and minor amounts of displacement (less than 100 square feet).

#### PRE-COMMERCIAL THINNING – HAND TREATMENT

Limiting hand pile size to less than 50 square feet could reduce surface organic horizon loss and limit soil heating. Pile burning when duff moisture is 80 to 100 percent may also reduce organic matter loss and soil heating.

The amount of nutrients lost as particulate matter would be minor. Ash from burned hand piles would contain nutrients available to emergent vegetation, but no significant increases in nitrogen and phosphorus are anticipated (Seymour et al. 2005).

Lop and scatter treatment units would be treated by hand and have slash dispersed throughout the unit. Organic matter would not be removed, and there would be no measureable effects to the forest floor.

#### EXCAVATOR PILING AND BURNING

This post-harvest treatment would be used for mechanical site preparation work. The proposed site preparation activities would reduce organic material on sites while reducing hazardous fuel loads. A variety of organic material would remain on the site after project implementation.

#### BROADCAST BURNING

The effect of fire on soil is described as burn severity, which depends on the duration of burning and the intensity (Certini 2005). Long-duration burns tend to reach higher temperatures and penetrate deeper into soil, resulting in more soil microbial kill and consumption of soil organic matter (ibid.). These burns result from burning of heavy ground fuel, such as with downed logs and large slash piles. Short-duration burning can be associated with fast-moving wildfire that blackens all the trees but leaves some of the forest floor intact. This usually results in low- to moderate-burn severities on the ground, with heat only penetrating a few centimeters (Hartford et al. 1992).

Prescribed fire activities that result in dominantly low- to moderate-burn severities would best preserve soil productivity. The amount of nutrients available to plants would increase as a result of the burning. Proposed burn conditions would allow many plants to quickly return to the burned sites from unburned roots and seeds in the soil. Post-fire vegetation response would utilize available nutrients, reducing nutrient leaching. Native forest vegetation would remain on the site, including some of the existing trees.

The ultimate goal of this effort is to maximize the intended vegetative response while minimizing resource effects. Fire intensity represents the magnitude of produced heat. It is distinct from burn severity. Fire management personnel would design burn plans and implement burning activities to minimize the occurrence of high-burn severity, while achieving burn intensities adequate to attain objectives.

### SUMMARY

All proposed units would leave live vegetation. Most of the living grass, forb, and shrub components would be left behind in all of the proposed units. Many live trees would remain on all of the sites with the fewest trees left on the proposed regeneration harvest units. The material that remains in all of the units would provide an active, microorganism-rich organic layer on the soil surface.

## SOIL MICROORGANISMS

Post-fire recovery of soil microorganisms occurs rapidly, frequently resulting in population levels greater than before the fire (Jurgensen et al. 1977). Less disturbed areas of soil play an important role in inoculating soil lacking or having reduced populations of soil microorganisms (Borchers et al. 1990). Unburned areas within burns, adjacent undisturbed areas, large woody debris and soils that have only minor amounts of disturbance contain propagules for fungi, bacteria and other soil organisms and that these propagules can be freely dispersed by wind, animals and other agents (Borchers et al. 1990).

The variety of organic matter left on the proposed harvest areas would benefit soil microorganisms by providing substrate and habitat. Microbial measures in harvest areas are expected to meet, or exceed, levels in unharvested stands within 40 years (Page-Dumroese et al. 2015). All alternatives would leave both dead and live trees. All alternatives and all proposed activity areas would have less than 15 percent of the area detrimentally disturbed. Many areas would be undisturbed by equipment. These areas would be a source of propagules in disturbed sites. The amounts of live and dead trees to be left in the proposed harvest areas are described in Chapter 2.

Soil compaction, puddling, rutting, and displacement reduce gas exchange and could potentially affect soil microorganism survival. Favorable habitat for soil organisms would be maintained because all proposed harvest areas would be designed to reduce soil disturbance to meet Regional soil standards.

#### SUMMARY

Because the amount of detrimental physical soil changes would be minimized and because organic matter in various forms would remain on the proposed units, the effects to soil microorganisms would be minor. Soil microorganisms are mobile. They can quickly re-colonize disturbed sites from adjacent, undisturbed sites. A variety of organic matter would remain on all sites, including living trees and other forest vegetation. In addition, the organic layer on the soil surface would be retained over at least 85 percent of the area, providing habitat and nutrients for soil microorganisms.

### SOIL EROSION

Where there is a risk of soil erosion, it would be minimized by implementing the following management practices:

- Reducing the area where equipment operates,
- Locating landings on relatively flat ground that can be properly drained,
- Locating skid trails on slopes less than 35 percent that have soils with a low or moderate erosion hazard,
- Using erosion control features, such as water bars, replanting, and placing slash on disturbed soils.

Sediment from the permanent transportation system has direct effects on water quality, but is not a component of the soil quality assessment process. These effects are evaluated in the Aquatics Section of this EA.

#### PHYSICAL SOIL CHARACTERISTICS

##### REGENERATION HARVEST AND COMMERCIAL THINNING

Management activities that leave organic matter on the soil surface reduce soil erosion. Watershed Erosion Prediction Project (WEPP) model results estimate the potential soil erosion rate from commercial treatment units at a maximum of 0.03 tons/acre (Table 23) (Project File Exhibit L-23). By way of comparison, the average annual erosion on Montana cropland in 2007 was 6.4 tons/acre/year. A ton of soil spread across and acre would be as thick as a dime.

| TABLE 23. POTENTIAL SOIL EROSION - COMMERCIAL TREATMENTS. | | |
|---|---|---|
| ALTERNATIVE | POTENTIAL EROSION RATE (TONS/ACRE) | POTENTIAL TOTAL EROSION (TONS) |
| 1 | 0 | 0 |
| 2 | 0.03 | 63.8 |
| 3 | 0.02 | 35.2 |

#### PRE-COMMERCIAL THINNING – MECHANICAL TREATMENTS

Any increase in overland flow from existing areas of compacted soil would likely be buffered by existing forest floor and/or new accumulations of woody debris. Mastication treatments are not anticipated to result in any increase of soil erosion in the proposed units. Existing areas of bare soil may benefit from additions of masticated material as effective ground cover.

#### PRE-COMMERCIAL THINNING – HAND TREATMENTS

Maintenance of infiltration rates and effective ground cover of soils is necessary to prevent erosion. The lack of compactive forces and small pile burning would not result in a significant reduction in infiltration rates over undisturbed soil. Although reductions in effective ground cover would be expected at burn pile locations, the lack of accompanying increase in overland flow and the rapid establishment of live plant cover would reduce short-term soil erosion. No long-term soil erosion is anticipated from this treatment.

Soil erosion would be unlikely to occur as a result of the pre-commercial thinning treatments. Masticated material and hand thinning slash would add cover to the soil surface, reducing the risk of erosion. Hand piling would not increase risk of soil erosion.

#### BROADCAST BURNING

The WEPP model results indicate that the amount of soil erosion would likely be 0 tons per acre from the prescribed fire treatments. With return period analysis based on 30-year climate average, there is a 10 percent probability there would be erosion following implementation of broadcast burns. Model results put the amount of burned area erosion in this scenario at 0 tons per acre. There is a 3 percent probability that the burned area erosion rate could be as high as 0.1 tons per acre in that same year (Project File Exhibit L-22).

Post-fire vegetative response would be rapid, regardless of burn severity and areas that burn intensely would have sufficient organic material and vegetative response to reduce risks to soil erosion (Lentile et al. 2007). Soil erosion rates would decrease as vegetation and effective ground cover are re-established.

#### MASS FAILURES

High rates of slope stability were observed during field investigations of all proposed activity areas. These areas are well-suited for the proposed management activities.

The majority of proposed tractor harvest treatments are planned for areas with slopes less than 40 percent, which greatly reduces the risk of mass failures. The occurrence of any mass failure activity as a result of implementation of any of the proposed actions is unlikely.

### ROAD MANAGEMENT

#### ROAD DECOMMISSIONING

The project plans to decommission up to 4.5 miles of road using techniques ranging from blockage and abandonment to removal of culverts and installation of water bars. Decommissioning of these system roads would return these features to the productive land base to be managed according to NFMA requirements for soil productivity and forest cover. These segments are currently closed to all but administrative use, and many have well-established vegetation at this time. The lack of any significant efforts to address soil productivity impairment on these areas would result in persistence of physical soil impacts in excess of 30 to 70 years. Measurable increases in soil productivity on these areas are not expected during the temporal extent of this analysis.

#### INTERMITTENT STORED SERVICE

The project plans to place 12.58 miles of road into intermittent stored service using techniques ranging from blockage and abandonment to removal of culverts and installation of water bars. These roads are not likely to be used for resource management activities within the next 10 to 20 years and are being stored to provide secure wildlife habitat. Stored roads would not be returned to the productive land base.

#### ROAD CONSTRUCTION

Although impacts on soils from system road construction fall outside of the analysis areas, they are discussed and reviewed for potential soil stability concerns. New system roads are discussed to provide extent of impacts but are considered dedicated lands. Permanent road construction would consist of a maximum of 900 feet of new NFS road. Construction would result in a loss of soil productivity from the corresponding area. Road construction would result in soil displacement, compaction, and erosion in the proposed locations.

Erosion is expected from permanent road construction where native surfaces are exposed to rainfall impact and overland flow. Approximately 80 percent of total accumulated road erosion occurs within the first year after construction (Food and Agriculture Organization 1989). Road erosion and sediment yield typically decline after construction (Jones et al. 2000; Switalski et al. 2004).

### AQUATIC RESTORATION ACTIVITIES

Culvert installations and replacements would cause some short-term soil erosion during the construction phase, but would result in improved road drainage and a reduction of road failure risk during high flow events. Concrete fish barrier construction would result in minor amounts of compaction, displacement, and soil erosion from equipment access to in-stream construction site.

## ALTERNATIVES 2 AND 3 – ACTION ALTERNATIVES CUMULATIVE EFFECTS

The risks of cumulative effects were assessed within each proposed activity area. Cumulative effects consist of the impacts from all past, present, future, and proposed activities overlapping in time and space with the proposed project area. Units proposed for mechanical treatment were reviewed on the ground to quantify the effects from past activities and determine if existing levels of detrimental disturbance exceed the Region 1 Soil Quality Guidelines.

The estimated cumulative effects for each activity area from implementation of an action alternative are displayed in Table 24. These predicted cumulative detrimental soil disturbance values are based on implementation of all required Design Criteria, most notably and the required use of winter harvest in several units. See associated Design Criteria for the Soil Resource in Chapter 2.

**TABLE 24. CUMULATIVE EFFECTS SUMMARY.**

| ACTIVITY AREA | EXISTING CONDITION DSD PERCENT | POTENTIAL DSD PERCENT INCREASE | | | | CUMULATIVE DSD PERCENT | |
|---|---|---|---|---|---|---|---|
| | | VEGETATION TREATMENTS | | TEMPORARY ROADS | | | |
| | | ALT. 2 | ALT. 3 | ALT. 2 | ALT. 3 | ALT. 2 | ALT. 3 |
| 1 | 0.0 | 8.0 | 8.0 | 1.8 | 1.8 | 9.8 | 9.8 |
| 3 | 3.3 | 6.6 | 6.6 | 3.0 | 3.0 | 12.9 | 12.9 |
| 4 | 0.0 | 8.0 | 8.0 | 0.0 | 0.0 | 8.0 | 8.0 |
| 5 | 5.6 | 6.0 | 6.0 | 1.2 | 1.2 | 12.8 | 12.8 |
| 6 | 3.3 | 6.0 | 6.0 | 1.2 | 1.2 | 10.5 | 10.5 |
| 7 | 3.3 | 2.0 | 2.0 | 0.0 | 0.0 | 5.3 | 5.3 |
| 12 | 2.4 | 8.0 | 8.0 | 0.0 | 0.0 | 10.4 | 10.4 |
| 16 | 2.8 | 8.0 | 8.0 | 0.4 | 0.5 | 11.2 | 11.3 |
| 19 | 3.3 | 8.6 | 8.3 | 0.6 | 0.6 | 12.5 | 12.2 |
| 21 | 2.1 | 8.0 | 8.0 | 0.3 | 0.3 | 10.4 | 10.4 |
| 23 | 0.0 | 8.0 | - | 2.8 | - | 10.8 | - |
| 25 | 0.0 | 8.6 | 6.3 | 0.2 | 0.5 | 8.8 | 6.8 |
| 28 | 0.0 | 4.0 | 4.0 | 0.2 | 0.0 | 4.2 | 4.0 |
| 31 | 0.0 | 8.0 | 8.0 | 0.0 | 2.0 | 8.0 | 10.0 |
| 32 | 0.0 | 4.0 | 4.0 | 0.0 | 2.0 | 4.0 | 6.0 |
| 34 | 0.0 | 2.0 | 2.0 | 0.0 | 0.0 | 2.0 | 2.0 |
| 12 | 2.4 | 8.0 | 8.0 | 0.0 | 0.0 | 10.4 | 10.4 |
| 16 | 2.8 | 8.0 | 8.0 | 0.4 | 0.5 | 11.2 | 11.3 |
| 19 | 3.3 | 8.6 | 8.3 | 0.6 | 0.6 | 12.5 | 12.2 |
| 21 | 2.1 | 8.0 | 8.0 | 0.3 | 0.3 | 10.4 | 10.4 |
| 23 | 0.0 | 8.0 | - | 2.8 | - | 10.8 | - |
| 25 | 0.0 | 8.6 | 6.3 | 0.2 | 0.5 | 8.8 | 6.8 |
| 28 | 0.0 | 4.0 | 4.0 | 0.2 | 0.0 | 4.2 | 4.0 |
| 31 | 0.0 | 8.0 | 8.0 | 0.0 | 2.0 | 8.0 | 10.0 |
| 32 | 0.0 | 4.0 | 4.0 | 0.0 | 2.0 | 4.0 | 6.0 |
| 34 | 0.0 | 2.0 | 2.0 | 0.0 | 0.0 | 2.0 | 2.0 |
| 36 | 0.0 | 8.0 | 8.0 | 0.0 | 0.0 | 8.0 | 8.0 |
| 37 | 1.0 | 10.2 | 10.2 | 0.0 | 0.0 | 11.2 | 11.2 |
| 39 | 1.0 | 6.0 | 6.0 | 0.5 | 0.5 | 7.5 | 7.5 |
| 40 | 0.0 | 9.3 | 9.4 | 0.0 | 0.0 | 9.3 | 9.4 |
| 42 | 0.0 | 9.4 | 8.4 | 0.0 | 0.0 | 9.4 | 8.4 |
| 44 | 5.2 | 8.0 | 8.0 | 0.0 | 0.0 | 13.2 | 13.2 |
| 45 | 0.0 | 10.0 | 10.0 | 1.3 | 1.3 | 11.3 | 11.3 |
| 51 | 3.0 | 2.0 | 2.0 | 2.4 | 2.4 | 7.4 | 7.4 |
| 54 | 3.3 | 4.0 | 4.0 | 0.0 | 0.0 | 7.3 | 7.3 |
| 55 | 1.0 | 8.0 | 8.0 | 0.2 | 0.2 | 9.2 | 9.2 |
| 57 | 0.0 | 10.0 | 8.0 | 0.0 | 0.0 | 10.0 | 8.0 |
| 59 | 0.0 | 6.0 | 6.0 | 4.8 | 0.0 | 10.8 | 6.0 |
| 62 | 0.0 | 6.0 | 4.0 | 2.3 | 2.4 | 8.3 | 6.4 |

**TABLE 24. CUMULATIVE EFFECTS SUMMARY.**

| ACTIVITY AREA | EXISTING CONDITION DSD PERCENT | POTENTIAL DSD PERCENT INCREASE | | | | CUMULATIVE DSD PERCENT | |
|---|---|---|---|---|---|---|---|
| | | VEGETATION TREATMENTS | | TEMPORARY ROADS | | | |
| | | ALT. 2 | ALT. 3 | ALT. 2 | ALT. 3 | ALT. 2 | ALT. 3 |
| 72 | 0.0 | 6.0 | - | 0.0 | - | 6.0 | - |
| 73 | 0.0 | 6.0 | - | 0.0 | - | 6.0 | - |
| 74 | 0.0 | 8.0 | 8.0 | 0.0 | 0.0 | 8.0 | 8.0 |
| 76 | 0.0 | 8.0 | 8.0 | 0.9 | 0.9 | 8.9 | 8.9 |
| 79 | 0.0 | 8.0 | - | 0.0 | - | 8.0 | - |
| 83 | 0.0 | 8.0 | - | 0.0 | - | 8.0 | - |
| 84 | 0.0 | 10.0 | 10.0 | 1.4 | 2.1 | 11.4 | 12.1 |
| 86 | 3.3 | 8.0 | - | 0.0 | - | 11.3 | - |
| 87 | 3.3 | 8.0 | - | 0.0 | - | 11.3 | - |
| 89 | 0.0 | 10.0 | 8.0 | 0.0 | 0.0 | 10.0 | 8.0 |
| 90 | 0.0 | 6.0 | 6.0 | 1.5 | 1.3 | 7.5 | 7.3 |
| 91 | 0.0 | 2.0 | 2.0 | 1.5 | 1.3 | 3.5 | 3.3 |
| 93 | 0.0 | 8.0 | - | 1.4 | - | 9.4 | - |
| 94 | 0.0 | 5.0 | - | 1.4 | - | 6.4 | - |
| 95 | 0.0 | 8.0 | - | 1.4 | - | 9.4 | - |
| 97 | 0.0 | 2.0 | - | 1.4 | - | 3.4 | - |
| 98 | 0.0 | 6.0 | - | 0.0 | - | 6.0 | - |
| 99 | 0.0 | 10.0 | 6.0 | 0.0 | 0.0 | 10.0 | 6.0 |
| 100 | 0.0 | 2.0 | 2.0 | 0.0 | 0.0 | 2.0 | 2.0 |
| 102 | 0.0 | 8.0 | 8.0 | 1.4 | 2.1 | 9.4 | 10.1 |
| 105 | 0.0 | 5.0 | 5.0 | 0.0 | 0.0 | 5.0 | 5.0 |
| 109 | 0.0 | 6.0 | - | 0.0 | - | 6.0 | - |
| 110 | 3.3 | 2.0 | - | 0.0 | - | 5.3 | - |
| 113 | 0.0 | 2.0 | - | 0.0 | - | 2.0 | - |
| 114 | 0.0 | 10.0 | 8.0 | 0.6 | 1.0 | 10.6 | 9.0 |
| 116 | 0.0 | 10.0 | 10.0 | 0.6 | 0.8 | 10.6 | 10.8 |
| 118 | 0.0 | 8.0 | 8.0 | 0.6 | 0.8 | 8.6 | 8.8 |
| 119 | 4.5 | 6.0 | 6.0 | 0.0 | 0.0 | 10.5 | 10.5 |
| 120 | 5.6 | 2.0 | - | 0.0 | - | 7.6 | - |
| 200 | - | 0.0 | 0.0 | 0.0 | 0.0 | - | - |
| 201 | 0.0 | 6.0 | 6.0 | 0.0 | 0.0 | 6.0 | 6.0 |
| 202 | - | 8.0 | - | 0.0 | - | 8.0 | - |
| 203 | 3.3 | 8.0 | 8.0 | 0.0 | 0.0 | 11.3 | 11.3 |
| 204 | 5.6 | 2.0 | 2.0 | 0.0 | 0.0 | 7.6 | 7.6 |
| 208 | - | 0.0 | - | 0.0 | - | - | - |
| 209 | 0.0 | 2.0 | - | 0.0 | - | 2.0 | - |
| 210 | 3.3 | 2.0 | 2.0 | 0.0 | 0.0 | 5.3 | 5.3 |
| 211 | - | 0.0 | 0.0 | 0.0 | 0.0 | - | 0.0 |
| 212 | 4.6 | 2.0 | 2.0 | 0.0 | 0.0 | 6.6 | 6.6 |

**TABLE 24. CUMULATIVE EFFECTS SUMMARY.**

| ACTIVITY AREA | EXISTING CONDITION DSD PERCENT | POTENTIAL DSD PERCENT INCREASE | | | | CUMULATIVE DSD PERCENT | |
|---|---|---|---|---|---|---|---|
| | | VEGETATION TREATMENTS | | TEMPORARY ROADS | | | |
| | | ALT. 2 | ALT. 3 | ALT. 2 | ALT. 3 | ALT. 2 | ALT. 3 |
| 214 | 6.7 | 2.0 | 2.0 | 0.0 | 0.0 | 8.7 | 8.7 |
| 216 | 3.3 | 2.0 | - | 0.0 | - | 5.3 | - |
| 217 | - | 0.0 | - | 0.0 | - | - | - |
| 219 | - | 0.0 | - | 0.0 | - | - | - |
| 220 | 0.0 | 2.0 | 2.0 | 0.0 | 0.0 | 2.0 | 2.0 |
| 221 | 3.3 | 8.0 | 8.0 | 0.0 | 0.0 | 11.3 | 11.3 |
| 222 | - | 0.0 | 0.0 | 0.0 | 0.0 | - | 0.0 |
| 231 | 3.3 | 2.0 | 2.0 | 0.0 | 0.0 | 5.3 | 5.3 |
| 232 | 0.0 | 2.0 | 2.0 | 0.0 | 0.0 | 2.0 | 2.0 |
| 233 | - | 0.0 | 0.0 | 0.0 | 0.0 | - | - |
| 235 | 0.0 | 6.0 | 6.0 | 0.0 | 0.0 | 6.0 | 6.0 |
| 236 | 0.0 | 2.0 | 2.0 | 0.0 | 0.0 | 2.0 | 2.0 |
| 237 | 0.0 | 8.0 | - | 0.0 | - | 8.0 | - |
| 238 | 3.3 | 2.0 | 2.0 | 0.0 | 0.0 | 5.3 | 5.3 |
| 241 | - | 0.0 | 0.0 | 0.0 | 0.0 | - | - |
| 242 | - | 0.0 | 0.0 | 0.0 | 0.0 | - | - |
| 243 | - | 0.0 | 0.0 | 0.0 | 0.0 | - | - |
| 244 | - | 0.0 | 0.0 | 0.0 | 0.0 | - | - |
| 245 | 1.0 | 2.0 | 2.0 | 0.0 | 0.0 | 3.0 | 3.0 |
| 251 | 8.3 | 2.0 | 2.0 | 0.0 | 0.0 | 10.3 | 10.3 |
| 252 | 0.0 | 10.0 | 6.0 | 2.3 | 2.1 | 12.3 | 8.1 |
| 254 | 0.0 | - | 6.0 | - | 2.8 | - | 8.8 |
| 256 | 0.0 | 6.0 | - | 2.4 | - | 8.4 | - |
| 257 | 0.0 | 2.0 | - | 2.4 | - | 4.4 | - |
| 258 | - | 0.0 | - | 0.0 | - | - | - |
| 259 | 0.0 | 5.0 | - | 1.1 | - | 6.1 | - |
| 260 | 0.0 | 10 | - | 1.1 | - | 11.1 | - |
| 262 | - | 0.0 | 0.0 | 0.0 | 0.0 | - | - |
| 263 | 4.5 | 2.0 | - | 0.0 | - | 6.5 | - |
| 264 | - | 0.0 | 0.0 | 0.0 | 0.0 | - | - |
| 265 | 0.0 | 2.0 | 2.0 | 0.0 | 0.0 | 2.0 | 2.0 |
| 266 | 3.3 | 10.0 | 10.0 | 0.0 | 0.0 | 13.3 | 13.3 |
| 267 | - | 0.0 | 0.0 | 0.0 | 0.0 | - | - |
| 268 | - | 0.0 | 0.0 | 0.0 | 0.0 | - | - |
| 269 | - | 0.0 | 0.0 | 0.0 | 0.0 | - | - |
| 270 | - | 0.0 | 0.0 | 0.0 | 0.0 | - | - |
| 271 | - | 0.0 | 0.0 | 0.0 | 0.0 | - | - |
| 300 | 6.7 | 5.3 | 5.1 | 0.0 | 0.0 | 12.0 | 11.8 |
| 308 | 0.0 | 5.1 | 5.1 | 0.0 | 0.0 | 5.1 | 5.1 |

**TABLE 24. CUMULATIVE EFFECTS SUMMARY.**

| ACTIVITY AREA | EXISTING CONDITION DSD PERCENT | POTENTIAL DSD PERCENT INCREASE | | | | CUMULATIVE DSD PERCENT | |
|---|---|---|---|---|---|---|---|
| | | VEGETATION TREATMENTS | | TEMPORARY ROADS | | | |
| | | ALT. 2 | ALT. 3 | ALT. 2 | ALT. 3 | ALT. 2 | ALT. 3 |
| 309 | 0.0 | 5.1 | 5.1 | 0.0 | 0.0 | 5.1 | 5.1 |
| 313 | 6.0 | 5.2 | 5.4 | 0.0 | 0.0 | 11.2 | 11.4 |
| 314 | 6.0 | 5.3 | 5.4 | 0.0 | 0.0 | 11.3 | 11.4 |
| 412 | 0.0 | 4.0 | - | 0.0 | - | 4.0 | - |
| 419 | 3.3 | 4.0 | - | 0.5 | - | 7.8 | - |
| 429 | 0.0 | 4.0 | - | 0.0 | - | 4.0 | - |
| 430 | 0.0 | 4.0 | - | 0.0 | - | 4.0 | - |
| 431 | 0.0 | 8.0 | - | 0.0 | - | 8.0 | - |
| 432 | 0.0 | 4.0 | - | 0.0 | - | 4.0 | - |
| 449 | 0.0 | 6.0 | - | 0.0 | - | 6.0 | - |
| 459 | 0.0 | 6.0 | - | 0.0 | - | 6.0 | - |
| 460 | 0.0 | | 6.0 | | 0.0 | | 6.0 |
| 491 | 0.0 | 2.0 | 2.0 | 1.3 | 1.3 | 3.3 | 3.3 |
| 494 | 0.0 | 2.0 | - | 1.4 | - | 3.4 | - |
| 495 | 0.0 | 8.0 | - | 0.0 | - | 8.0 | - |
| 498 | 0.0 | 6.0 | - | 0.0 | - | 6.0 | - |
| 4108 | 0.0 | 6.0 | - | 0.0 | - | 6.0 | - |
| 4110 | 3.3 | 2.0 | - | 0.0 | - | 5.3 | - |
| 4208 | - | 0.0 | - | 0.0 | - | - | - |
| 4209 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 2.0 | 0.0 |
| 4222 | - | 0.0 | - | 0.0 | - | - | - |
| 4225 | - | 0.0 | - | 0.0 | - | - | - |
| 4226 | - | 0.0 | - | 0.0 | - | - | - |
| 4262 | - | 0.0 | - | 0.0 | - | - | - |

Table 25 displays the total acres of detrimental soil disturbance expected from the proposed activities. The action alternatives are designed to reduce the amount of detrimental soil disturbance by implementing the Design Criteria described in Chapter 2.

**TABLE 25. DETRIMENTAL SOIL DISTURBANCE BY ALTERNATIVE.**

| DESCRIPTION | ALTERNATIVE 2 | ALTERNATIVE 3 |
|---|---|---|
| Acres Detrimental Disturbance From Past Activities | 87.2 | 72.5 |
| Acres Detrimental Disturbance From Proposed Activities | 269.2 | 208.8 |
| Acres Cumulative Detrimental Disturbance | 356.3 | 281.3 |

## CONTRASTING EFFECTS OF PROPOSED ACTION WITH PAST ACTIONS

The estimated level of detrimental disturbance from the Beaver Creek Project would be less than that associated with harvest activities that occurred earlier than 1990. During the past two decades, the level of concern for maintaining soil productivity has greatly increased. This increase has been accompanied with implementation of management practices that protect the soil. These changes include:

- The use of excavators instead of dozers for mechanical site preparation,
- Use of designated skid trails,
- Operating when soils are dry or when winter conditions would protect soil productivity,
- Log forwarder systems, and
- Use of slash layers to reduce effects on skid trails.

In addition, timber sales are audited for compliance with BMPs and are monitored as specified in the NEPA decision, both of which contribute to better results.

#### DURATION OF EFFECTS

Displacement and erosion, the loss of topsoil, is a long-term and perhaps a permanent loss of soil productivity. However, management practices outlined in the Design Criteria would reduce the occurrence of displacement and erosion to within the Region 1 guidelines.

Compaction may last from 10 to 70 years (Gonsior 1983). Monitoring of 40-year old activities within this project area averaged between 3 and 6 percent DSD, indicating significant recovery of compacted soils has occurred.

Reductions in organic matter content reverse quickly as vegetation is established. Organic debris accumulates on the surface and roots grow and are decomposed in the soil. These organic materials break down and release nutrients and improve the quality of the soil by improving its structure and reducing compaction and other DSDs. Loss of organic matter is a short-term change lasting about 10 years once vegetation returns to the soil.

Light and moderate-severity burned areas have minor effects well within the natural range of variability for wildfire. Areas burned under conditions that produce light or moderate burn severity would vegetate quickly due to viable seeds or roots that could produce more plants and the complement of microorganisms and nutrients remaining on site (Ryan et al. 1985).

Changes in soil microorganisms are not permanent. Recovery would occur as soon as organic matter is present in the soil, which could be immediately after the proposed management is carried out.

Soil erosion would be controlled through the use of erosion control measures. In addition, bare soils would naturally recover or be re-vegetated with native seed. Any erosion that occurs would be short-lived, most likely occurring during the time between the soil disturbance and the implementation of erosion control measures.

#### EFFECTS OF ONGOING AND REASONABLY FORESEEABLE ACTIVITIES

Most ongoing and foreseeable activities would not overlap with either action alternatives in both time and space. Specifically, their effects do not overlap in space as they occur outside of the proposed activity areas.

#### COMBINED EFFECTS FROM PAST, PROPOSED, ONGOING AND FORESEEABLE ACTIVITIES

Several proposed units in the action alternatives would have cumulative effects from the combination of past and proposed activities. These effects are displayed in Table 24. All proposed activities associated with the action alternatives would meet the soil quality standards with the implementation of the Design Criteria for soils described in Chapter 2.

Post-implementation monitoring would be performed to determine if selected units were meeting Region 1 Soil Quality Standards. The Sale Administrator would monitor all units during management activities to assure that skid trails meet specified spacing requirements and that operating conditions are adequate to minimize effects to the soil resource.

Restoration efforts would be undertaken on units where post-implementation monitoring indicates that detrimental soil disturbance for these units exceed 15 percent. Restoration activities to improve soil conditions would include ripping heavily-used skid trails and landings. The goal would be to reduce soil compaction and meet the direction provided in Region 1 Supplement 2500-99-1. Several studies discuss the effectiveness of ripping as a soil restoration activity. Seedling survival and growth can be improved by 39 percent after tilling of compacted soils (Froehlich et al. 1983)

Subsoiling restores biological processes that are reduced by soil compaction (Dick et al. 1988). In general, tilling or scarifying a compacted soil improves productivity by reducing the resistance of soil to root penetration and providing improved soil drainage and aeration to enhance seedling establishment and tree growth (Bulmer 1998). These conditions also improve the environment for soil microorganisms. Soil restoration is not the immediate result of ripping, planting or any other activity. The goal of soil restoration is to create favorable conditions for impaired soils to begin the recovery process.

## EFFECTS OF A FOREST PLAN AMENDMENT TO ASSIGN MANAGEMENT AREAS TO ACQUIRED LANDS

The Beaver Creek Project includes a Forest Plan Amendment to assign interim management areas (MAs) to approximately 5,457 acres of former PCTC lands acquired by the USDA Forest Service to be managed as part of the Flathead National Forest. These interim management areas would be in effect on acquired lands until the ongoing Forest Plan Revision effort is completed, anticipated in 2 years.

Alternative 1 - No Action Alternative proposes not to assign MAs to acquired lands, although forest-wide standards and guidelines would continue to apply to all NFS lands on the Flathead National Forest.

Alternative 2 proposes to assign 55 acres of acquired lands to MA 2, 8 acres of acquired lands to MA 5, 2,312 acres to MA 11C, 320 acres to MA 12, 2,033 acres to MA 15, 712 acres to MA 15C, and 17 acres to MA 17. These proposed MA assignments were made in consideration of the characteristics of the acquired parcel and the management direction on surrounding lands. Table 11 describes the management emphasis for each of these MAs, but lands assigned to MA 5, MA 11C, MA 15, MA 15C, and MA 17 are considered suitable for timber production, while MA 2 and MA 12 are considered unsuitable for timber production although management activities may occur to benefit other resources.

Alternative 3 proposes different MA assignments to reflect public concern about the scenic integrity of lands on the east side of Lindbergh Lake. To accomplish this, Alternative 3 assigns MA 5 instead of MA 15 on approximately 502 acres of acquired land on the east side of Lindbergh Lake to maintain or enhance the scenic quality of these lands when viewed from Lindbergh Lake. Although MA 5 would allow for timber harvest to occur on these lands, it would emphasize the maintenance of a natural appearing landscape where management activities are not evident.

The effects of the Forest Plan Amendment to the soil resource within the analysis area under Alternative 1 – No Action Alternative are minor because the Forest Plan soil standards and regional guidance apply to all lands managed by the Flathead National Forest, even if management areas are not assigned. The effects of the Forest Plan Amendment under Alternative 2 and 3 are also minor in scale because although they allow for timber management to occur on some lands they would maintain consistency with the forest-wide standards and guidelines that are in place to conserve soil resources over time, as has been supported by post-implementation monitoring at the forest level (Project File Exhibit U-12). These MA assignments are consistent with the existing condition of these lands and the management direction assigned to adjacent lands and would not preclude future MA assignment under the Flathead Forest Plan Revision effort.

The cumulative effects of this forest plan amendment are very limited due to the geographic scope and expected duration of the amendment. At the Flathead National Forest scale, this amendment is only addressing management area direction on less than 1 percent of the NFS acreage on the Flathead National Forest. Additionally, the duration of this amendment is expected to be short-term since forest plan revision is ongoing with a decision expected in 2017. When the revision effort is completed, new management areas will be assigned across the entire Flathead National Forest, including the Beaver Creek project area, and will supersede any of the interim management areas proposed in this amendment. Reasonably foreseeable activities identified on the lands associated with the amendment is very limited as identified in Table 17 in Chapter 3 of this EA. If future land management activities occur on these lands they will be subject to forest-wide direction found in the Flathead National Forest Land and Resource Management Plan, federal and state laws, and other Forest Service regulations, as they are now, and will be guided by the proposed management area direction. Future land management activities such as timber harvest, road work, changes to public access etc. would be subject to site-specific NEPA analysis in the future.

## REGULATORY FRAMEWORK AND CONSISTENCY

Forest Plan Soil Resource Standards are as follows:

- Ensure that all resource management activities will maintain soil productivity and minimize erosion through implementation of:
    - Management direction presented in the Landtype Guidelines,
    - Erosion Prevention Standards (Engineering Handbook Supplement).
- Design or modify all management practices as necessary to protect land productivity.

The Soil and Water Conservation Practices Handbook is incorporated by reference in the Forest Plan (USDA 1988). The Handbook describes BMPs to be used in the planning and implementation of timber sales and associated activities.

The NFMA requires that Forest Service regulations implementing NFMA specify guidelines to insure that timber will be harvested from NFS lands only where “soil, slope, or other watershed conditions will not be irreversibly damaged.” 16 USC 1604(g)(3)(E)(i). Region 1 Regional Soil Quality Standards identified as FSM R-1 Supplement 2500-99-01 (Project File Exhibit L-24) were set forth to meet the direction of NFMA to manage NFS lands without permanent impairment of land productivity and to maintain or improve soil quality.

Regional guidance is available from the Region 1 FSM for Soil Management FSM 2500-99-1 (Project File Exhibit L-25). Regional policy states

> “(d)esign new activities that do not create detrimental soil conditions on more than 15 percent of an activity area. In areas where less than 15 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effect of the current activity following project implementation and restoration must not exceed 15 percent.”

# FOREST VEGETATION

## INTRODUCTION

This report provides analysis and silvicultural review of forest vegetation associated with the Beaver Creek Landscape Restoration Project (Beaver Creek Project). Analysis area(s), methodologies used, the affected environment, and the environmental consequences of implementing the alternatives are considered relative to forest vegetation. A full copy of the forest vegetation report for the Beaver Creek project area is available at Project File Exhibit I-1 and detailed information not included in this report is in individual stand files located at the Swan Lake Ranger District Office.

## ANALYSIS AREA

The scale of the analysis area was chosen to allow sufficient size and time to illustrate the potential effects of the alternatives without those effects diminishing to unnoticeable levels.

### SPATIAL BOUNDS

The spatial boundary for this analysis is the Beaver Creek Project Area, which is largely coincident with the Beaver Creek Grizzly Bear Subunit, henceforth referred to as the analysis area. This approximately 34,962 acre area is large enough to capture trends and patterns of forest vegetation, but not too large to have the potential effects of the 5,128 acres of proposed activities associated with this project be so small as to be negligible.

### TEMPORAL BOUNDS

The temporal bounds of this analysis are designed to capture the direct, indirect, and cumulative effects of the alternatives to forest vegetation within the analysis area. Activities are planned to begin during summer 2016 and would likely extend through the summer of 2017. There is the possibility that operations would continue into the winter of 2017/2018. The effects of the proposed activities on forest vegetation would likely last between 15 and 100+ years.

Where intermediate silvicultural treatments are proposed, an effects time frame of 15 to 20 years is estimated. This length of time seems reasonable given site index curves and forest succession data for western Montana (Arno et al. 1985; Milner 1992). Beyond this time period, and in the absence of additional disturbance or treatments, normal forest succession would substantially alter residual stand conditions from those resulting from initial treatment. Long-term stand trajectories would be different from pre-treatment conditions, but accumulation of surface fuels, height growth of advanced regeneration, ingrowth of shade-tolerant species, expansion of residual tree crowns, and individual tree mortality would all have cumulative effects on the character of the stand to such an extent that they would mask the effects of initial treatments. Where regeneration treatments are applied, effects would be expected to last longer, possibly a time period required for the stands to progress through successional stages from stand initiation to a mature stand condition (estimated 100 years) (Arno et al. 1985). Some effects, such as changes in species composition, and the quantity of large down woody material, could last even longer. For past activities considered in the cumulative effects analysis temporal bounds are limited by the availability of accurate data relating to forest vegetation condition. Data is generally available dating back only to the 1950s.

# DATA SOURCES, METHODS, AND ASSUMPTIONS

This section discusses the data sources, methodologies, and assumptions used in this analysis.

## DATA SOURCES

### LANDSCAPE LEVEL ANALYSIS

A landscape analysis for the Upper Swan Valley was completed in February 2004 by the Swan Ecosystem Center in cooperation with the USDA Forest Service and provides a broad view of existing and historic vegetation conditions (Swan Ecosystem Center 2004). The Beaver Creek Project falls within this assessment's analysis area. This assessment and its conclusions are incorporated here by reference and available in the project file (Exhibit U-1).

Additional data was used at a finer scale to characterize the landscape associated with this project. Forest Inventory and Analysis (FIA) plot data was summarized and used to describe existing forest vegetation conditions. The FIA plots are installed at random locations on all land ownerships across the United States. These plots are monumented and re-measured periodically allowing for estimates of forest conditions over broad areas and at variable times. Data related to historical forest vegetation conditions was derived from a variety of publications and will be referenced later in this report. Insect and disease aerial detection surveys are conducted annually using fixed-wing aircraft. Results of the most recent surveys have been incorporated into the assessment.

### STAND-LEVEL ANALYSIS

Individual stand inventory data was used in the stand-level silvicultural diagnosis process to develop alternative treatments and in the analysis of the affected environment. Stand exam data (collected using USDA Forest Service Common Stand Exam [CSE] protocols) for this project was collected between the years 1993 and 2014. Formerly stored in the Timber Stand Management Records System (TSMRS), it is now housed in the Field Sampled Vegetation (FSVeg) databases. As is discussed below under Remote Sensing, a product known as VMAP was also used to characterize forest attributes within the analysis area.

In addition to the stand exam (inventory) data, observation data was collected for each stand within the analysis area that was a candidate for potential management actions. Silvicultural walkthrough exams were conducted in 2011, 2012, and 2015 by the District's Silvicultural Staff. During these walkthroughs, forest vegetation and site conditions were recorded and the stand diagnosed as to the degree it met target conditions. Additionally, recommendations as to potential treatments were recorded. This information is summarized in Project File Exhibit I-1 (Appendix A) and hard copies of diagnostic analyses are on file at the Swan Lake Ranger District office. Stand-level data from these sources was compiled into GIS layers and analyzed spatially.

## ASSUMPTIONS

When completing an analysis of a dynamic resource, such as forest vegetation at this scale, some assumptions are necessary in the interest of efficiency. These include variation and interpretation of terminology and standards associated with silviculture and forest vegetation conditions. The following assumptions were used in this analysis:

- Vegetation data used in this analysis is assumed to represent current on-the-ground conditions. Efforts were made to ensure that this assumption is true including field verification, new inventory (stand exam) data, aerial photo interpretation, and incorporation of remote sensing data. At the time this report was written, no large-scale or catastrophic events were known to have occurred in the analysis area since the data for this project was compiled.

- GIS data used in this analysis is assumed to be accurate to within acceptable standards. This includes ownership boundaries, stand delineations, project and analysis area boundaries, etc.
- Modeling of forest stand dynamics using the methods described above gives a reasonable estimate of how stands would respond to treatment as to be able to compare alternative treatment options. Also, outputs from growth and yield modeling can be applied to "un-modeled" stands with similar conditions, existing on similar sites, and within close proximity to the modeled stands.
- Definitions of terminology related to silviculture and forest vegetation for this analysis come from The Dictionary of Forestry (Helms 1998) and/or the Flathead National Forest Plan and associated amendments.
- Areas identified as "Old Growth" in this report are only those areas that meet the specifications and descriptions in Old-Growth Forest Types of the Northern Region (Green et al. 1992) for the Western Montana Zone.

# METHODOLOGIES

## SILVICULTURAL PRESCRIPTION PROCESS

The silvicultural prescription process is a systematic procedure used to evaluate existing vegetation conditions, identify target conditions that would meet land management objectives, determine if stands meet target conditions, and if not, prescribe a treatment or series of treatments that would move forest vegetation toward the desired condition. It integrates interdisciplinary resource goals and objectives and is done at both the landscape and individual stand level as per national and regional direction provided by FSH 2409.17.

### LANDSCAPE-LEVEL PROCESS

Landscape assessment normally precedes the stand-level process. This helps to place stand-level analysis into context with the surrounding ecological conditions. The Flathead National Forest Guide for Watershed Analysis provides direction related to this process. Steps typically included in the landscape assessment:

**Step 1**: Characterize the existing condition of the landscape.

**Step 2**: Develop desired landscape conditions based on overall landscape characteristics, capabilities, resource objectives, and land management direction.

**Step 3**: Identify treatment options and alternatives that could move the landscape towards the desired condition. This is accomplished by comparing the existing condition to the desired condition.

**Step 4**: Develop a silvicultural prescription for the landscape which includes the generalized activities that could achieve the desired condition.

### STAND-LEVEL PROCESS

The following steps are used in the stand-level process to systematically achieve desired stand and ultimately desired landscape conditions:

**Step 1**: Stand examination: to identify and quantify existing stand conditions.

**Step 2:** Diagnosis:

a. a. Formulate target (desired) stand conditions based on site capabilities, site characteristics, resource objectives, and land management direction.

b. Compare existing stand conditions to the desired stand conditions (DSCs).

c. Determine if the existing stand essentially meets requirements of DSCs.

d. If not, can the existing stand be modified by intermediate cutting, planting, burning, or other appropriate measures to achieve DSCs?

e. If the existing stand cannot be treated to meet DSCs, what are the alternatives to replace it?

f. If the existing stand cannot be treated to meet DSCs, and cannot be replaced due to reasons external to the stand, what alternatives exist to stabilize or improve the existing condition?

g. If conditions external to the stand do not permit any action, consider deferring treatment.

h. Develop a reasonable range of potential treatment strategies from the foregoing comparison that will lead to the DSCs.

**Step 3**: Develop a detailed silvicultural prescription for each treatment area that identifies the area to be treated and the specific activities to be implemented. This step is done following the issuance of a decision by the Deciding Official.

## Spatial Analysis

Spatial analysis of the forest vegetation resource for this project was done using ArcMap 10.2 software. Data from the Flathead National Forest Geographical Information System (GIS) library was used as the basis for the analysis. A number of project specific GIS layers were created by Swan Lake Ranger District Resource Specialists.

## Remote Sensing

The 2012 Northern Region VMAP product, developed by the Forest Service Region 1 Geospatial Services Group, was used to estimate stand conditions where existing inventory data was lacking or where it was determined that it no longer reflects current stand conditions. VMAP classifies vegetation into spatially distinct polygons with attributes related to life form, dominance type, size class, and canopy cover. VMAP data was used to summarize various forest vegetation attributes within the project area.

## Forest Stand Dynamics Modeling

The Forest Vegetation Simulator (FVS, Version 4688 Inland Empire Variant) was used to summarize existing stand conditions and project future stand conditions with no treatments imposed. Current and past stand exam data archived in the Forest Service corporate database (FSVeg) was available for approximately 85 percent of the stands in the analysis area outside of the Mission Mountains Wilderness. Recent data was available for only about 75 percent of these stands. For the remainder of stands for which inventory data was available, the data was old, in some cases collected in the early 1980s and earlier (see Stand-Level Analysis section). Although the FVS model was used to project stand conditions forward to the present and beyond, the data is not considered reliable since conditions may have changed substantially over the intervening period. Nevertheless, results were considered of some utility. The VMAP data was used to supplement this information (see above). In addition, the Fire Model (V. 1.0) was used to assess potential fire and fuel conditions for the present and into the future with no treatments imposed. The mountain pine beetle risk rating subroutine was used to assess bark beetle hazard and risk. Detailed output from this modeling is available at the Swan Lake Ranger District office.

### Best Available Science

An internal review of literature was conducted prior to this analysis in order to compile relevant information. Sources included recent and historic peer reviewed publications, past Forest Service EAs, relevant MS and PhD thesis works, and contractor and Forest Service specialist reports. If new information is presented through the public involvement process for this project, it will be considered before a final decision is made.

### Measurement Indicators

Four measurement indicators were identified to evaluate the effects to forest vegetation. These were chosen because they are measurable (both qualitatively and quantitatively), are affected by silvicultural activities, are related to the project purpose and need and Forest Plan direction, and speak to the vegetation issues previously identified.

- **Forest Structure** - This indicator discusses the horizontal (i.e., stand density) and vertical arrangement of forest vegetative attributes. Forest structure is relevant to tree vigor, fuel arrangement, disturbance processes, and general forest resiliency.
- **Forest Seral Stage** - This indicator includes age class and size class distribution and has implications related to management objectives, landscape insect population dynamics, and vegetative fuel continuity.
- **Forest Composition** - This indicator discusses species composition within the analysis area. This is important given management direction and observed landscape trends. Species composition affects forest health and resilience and susceptibility to disturbance.
- **Forest Insect and Disease Conditions** - This indicator measures how the alternatives affect the extent of known insect and disease agents in the analysis area. It will also report the risk of stands within the analysis area to potential insect and disease damage (including tree damage).

## Affected Environment

This section explores and discusses the historic, existing, and desired conditions of general forest vegetation within the analysis area. This information is useful in placing the proposed actions into context.

### Historical Condition

Historic forest vegetation conditions of the Swan Valley and western Montana have been summarized in several recent reports. While this work covered areas broader than the Beaver Creek Project Area, it often included portions of, and can be applied to, the analysis area. The Upper Swan Valley Landscape Assessment (Swan Ecosystem Center 2004) includes a detailed historical analysis that is also applicable to the analysis area. Historical forest vegetation conditions suggest what the area looked like at various points in time. However, these descriptions are limited by the availability and accuracy of historical information and do not necessarily identify desired current or future conditions.

#### Vegetation

Forest vegetation conditions within the Swan Valley were first documented starting at about the turn of the 20$^{th}$ Century. H. B. Ayres (Ayres 1900) recorded observations of the Swan Valley in 1899 during his mission to survey the timber of the then Lewis and Clark Forest Reserve. Ayres' survey was summarized in the final EIS for the Flathead National Forest Plan Amendment 21

(USDA 1998). Ayres' journals describe large expanses of the Swan Valley dominated by large trees of ponderosa pine, Douglas-fir, and western larch grown in an open canopy on the valley, benches and foothills and denser stands of shade-tolerant species on the stream bottoms and high elevations.

Valley bottoms, benches and lower foothills were dominated by dense stands of western larch, Douglas-fir, and ponderosa pine. Understories of spruce, Douglas-fir, and larch were common in the lower valley, while the upper portion was dominated by lodgepole pine and western larch. In the lower valley, stands showed considerable scarring from fires, but were otherwise intact, especially in the tributary stream bottoms. Western hemlock, western redcedar, and western white pine were found in sheltered areas. Ponderosa pines were commonly 48 inches DBH with Engelmann spruce and western larch 30 inches DBH or more and lodgepole pine 14 inches DBH. Mid- to upper-elevation slopes were dominated by stand-replacing fires that covered extensive areas and that probably had return intervals from 100 to 170 years. Lodgepole pine was the predominant tree species on these slopes. Moist sites that escaped burning were comprised of mixed stands of lodgepole pine, Douglas-fir, and spruce. Old-growth stands of spruce and subalpine fire occurred in high basins.

Old growth was more likely to develop along the valley bottoms and along streams where lower-intensity fires occurred, usually with short-return intervals. Mid-slopes subject to more frequent stand-replacing fires had old growth on sites that escaped one or two fire events; high elevations allowed development of old growth between long fire-return intervals (USDA 1998).

A digitized version of Ayres' 1899 mapping identified forest structure and allowed estimating volumes of timber. Conditions and structure in 1898 within the Beaver Creek analysis area portion of Ayres' descriptions are presented in Figure 16 and Figure 16.

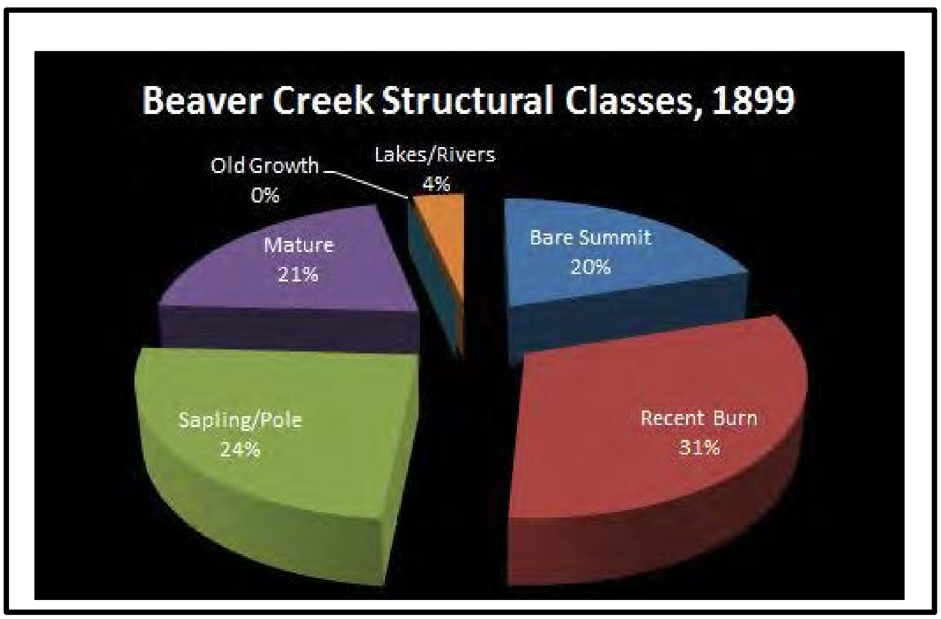



**FIGURE 15. AYRES' FOREST STRUCTURAL CLASSES WITHIN THE BEAVER CREEK ANALYSIS AREA (CA 1899).**

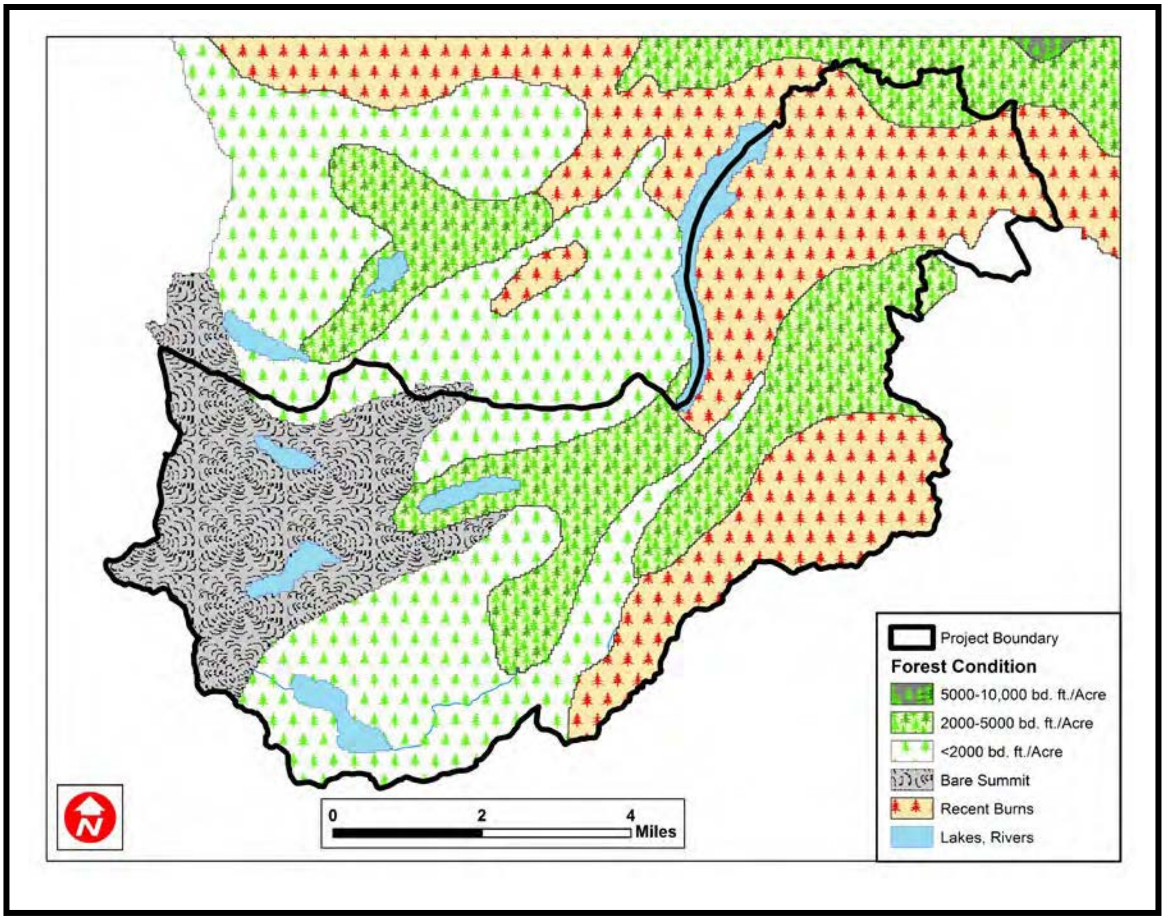



**FIGURE 16. DISTRIBUTION OF AYRES' FOREST CONDITIONS WITHIN AND NEAR THE BEAVER CREEK ANALYSIS AREA (CA. 1899).**

In another contemporary account, Whitford (Whitford 1905a, 1905b, 1905c) described the forests of the lower Swan Valley and the role of fire in shaping species composition:

"There is scarcely a section of land in the area investigated that has not been more or less burned over. In some places mere surface fires have run through the woods, scorching the trunks of the trees sufficiently to scar them. In other situations the fires have burned vigorously through small areas killing many of the trees. Still other fires have destroyed completely large areas, leaving many acres with not a single tree."

A broad scale timber inventory of Flathead National Forest was conducted in the 1930s, which identified cover, stocking, and estimated age. Although lacking the resolution of today's inventories, these data were considered a reasonable representation of the extant conditions (Hart 1989; Hart et al. 1994). A digitized version of this inventory allowed partitioning that portion of the 1930s inventory that was within the Beaver Creek analysis area (Figure 17). Some 77 percent of the inventory was in the combined cover classes of western larch/Douglas-fir (19 percent), lodgepole pine (27 percent), spruce/subalpine fir (12 percent) and mixed/whitebark pine (16 percent). All other vegetated portions were 1 percent or less.

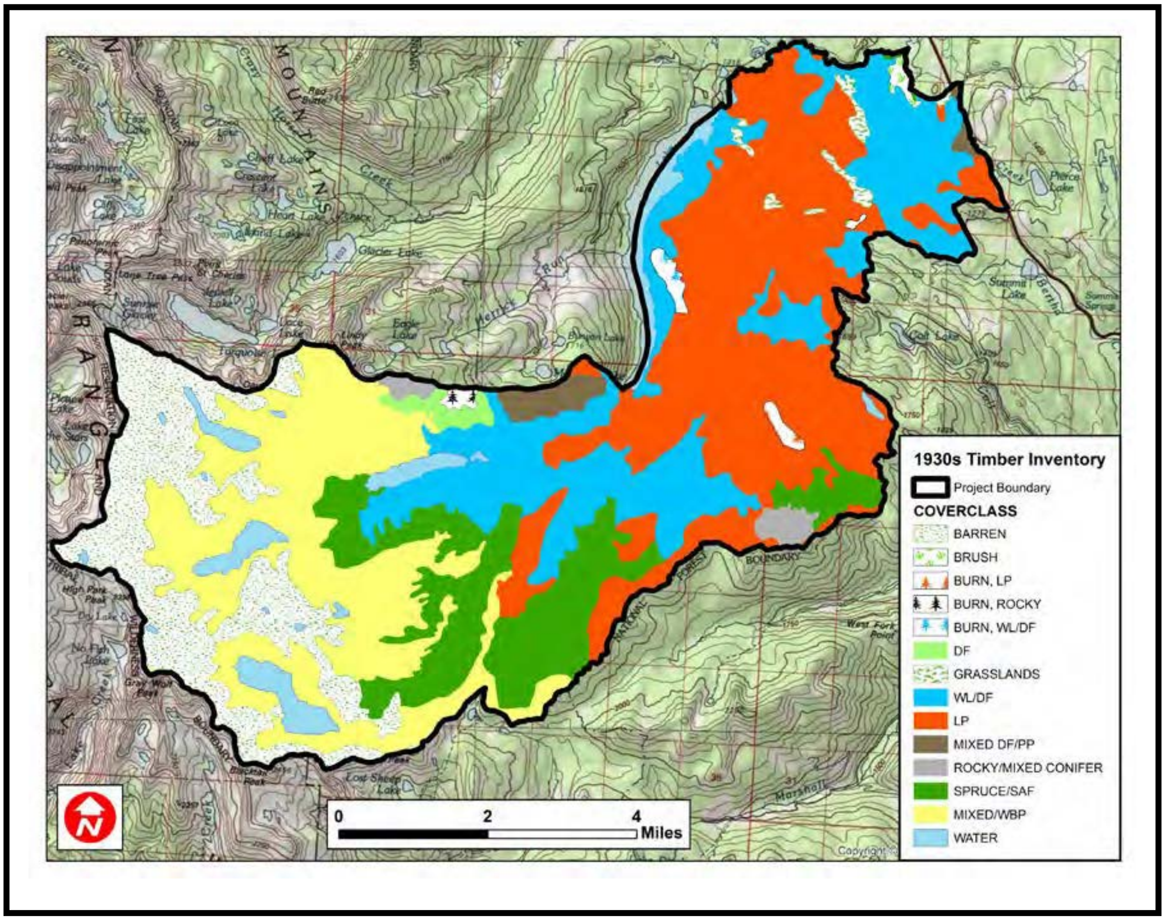



**FIGURE 17. DISTRIBUTION OF THE 1930S TIMBER INVENTORY COVER CLASSES IN THE BEAVER CREEK ANALYSIS AREA.**

Further analysis of historic vegetation conditions was provided in the FEIS for Amendment 21 (USDA 1998). In addition to the timber inventories mentioned above, this analysis used data from aerial photo interpretations, computer modeling, fire history studies, and pollen and charcoal records. The historical distribution of seral stages by forested terrestrial community groups for the Swan Subbasin is shown in Table 26. This is a broader assessment than necessarily applies specifically to the Beaver Creek analysis area, but is useful in delineating the historic range of variation.

The Swan Subbasin historically had a relatively large representation of the lower montane group (9 percent) and a small representation non-forest area. At the time of the analysis, the lower montane group had been substantially decreased, likely due to timber harvest (targeting of fire-resistant species) and fire suppression, allowing fire-intolerant and shade-tolerant species typical of the montane group to invade. A substantial increase in non-forested area (from 1 to 12 percent) was attributed to agricultural and residential development (USDA 1998). Given that the Beaver Creek analysis area is a subset of the Swan Subbasin, and given the disturbance regime within the Beaver Creek analysis area, the actual distribution of seral stages could be significantly different than the Amendment 21 analysis results at any given point in time.

**TABLE 26. HISTORICAL CONDITIONS OF TERRESTRIAL COMMUNITY GROUPS SWAN VALLEY SUBBASIN. PERCENTAGES REFLECT PROPORTION OF THE SUBBASIN OCCUPIED BY EACH GROUP.**

| SERAL STAGE | SUBALPINE | MONTANE | LOWER MONTANE |
|---|---|---|---|
| Late Seral | 8 - 10% | 20 - 22% | 2 - 6% |
| Mid Seral | 7 - 10% | 31 - 37% | 2 - 5% |
| Early Seral | 2 - 3% | 7 - 18% | 0 - 1% |

## DISTURBANCES

### FIRE

Fire has been the most influential natural disturbance factor in the Upper Swan Valley since the end of the last glacial period (Arno et al. 1995; Ayres 1900; Barrett 1998, 2002; Freedman et al. 1985). Fires were frequent in the Upper Swan Valley until the early 1900s, with the earliest fire evidence dating from about 1241 A.D. Barrett (Barrett 1998) reported that 1768, 1814, 1850, 1889, 1919, and 1929 were important fire years in the area. Fire occurred about every 20 years (range of 6 to 50 years) between 1687 and 1919, with the last major fire occurring in 1919. A fire in 1898, between Barber Creek and Cooney Creek, converted a large area of western larch, ponderosa pine, and Douglas-fir to dense stands of lodgepole pine (Swan Ecosystem Center 2004). The 1919 fire(s) burned approximately 25,000 acres near Lindbergh Lake and to the north; 7,891 acres of this in the Beaver Creek Project Area. These fires were mostly stand replacing (severe) and occurred during a significant regional drought (Barrett 2002). Ayres' 1899 study indicated recent burns in the Beaver Creek area, some of which were reburned in 1919 (Figure 15). Both of these fires burned areas that are now occupied by residences along Lindbergh Lake.

Fires were the result of natural causes (lightning) and traditional burning by Indians (Arno et al. 1997; Ayres 1900; Barrett 1998, 2002; Barrett et al. 1982). Most Indian fires occurred in the valley grasslands and lower-elevation forests dominated by ponderosa pine, Douglas-fir, and western larch. These fires were likely ignited to improve big game browse, berry production, food gathering and hunting, improved travel, communication, and horse grazing (Barrett et al. 1982).

Areas of similar fire severity, frequency, size, and pattern have a similar fire regime (Brown 2000). The Upper Swan Valley Landscape Assessment defines three fire regimes:

1. Frequent, low intensity non-lethal severity fire regime with 1- to 25-year intervals;
2. Less frequent, mixed-severity fire regime with 25- to 75-year return intervals resulting in scattered mortality;
3. Infrequent stand-replacing lethal severity fire regime with intervals greater than 75 years (Swan Ecosystem Center 2004).

Barrett (Barrett 2002) further classified the mixed-severity (MS) fire regime into three sub-classes:

- MS1 with fire intervals ranging from 15 to 25 years;
- MS2 (dominant fire regime) with fire intervals ranging from 40 to 100 years; and
- MS3 high elevation sites with highly variable fire and fire intervals.

Most fires burned with low to moderate severity with the occasional severe fire. The result was a diverse mosaic across the landscape comprised of mature stands that burned repeatedly interspersed with younger, fire-regenerated age classes. Prior to Euro-American settlement, Upper Swan Valley bottom forests were dominated by mixed-severity fire regimes (~50 percent). Low-severity fires were restricted to the driest terrain (~5 percent), and high-severity fires were largely found on steep slopes at higher elevations and moist canyon bottoms (~45 percent) (Barrett 2002). Barrett (Barrett 1998) observed that even in the unique riparian pothole stands, frequent non-lethal and mixed-severity fires burned within a few feet of the shoreline at intervals similar to adjacent drier sites. The Fire/Fuels Section in this EA discusses the recent fire history in the project area and Map 3-2 displays the documented fires and ignitions in the project area. The more recent fires created a mixed mosaic of areas with high-severity and low- severity.

#### INSECT AND DISEASE

Fires, especially those that were large and intense, tended to leave a visible legacy of disturbance that was used to describe historical conditions, but fire is only part of the equation. Other disturbance factors (wind, insects, and disease) are more subtle and ubiquitous. They tend to not leave visible legacies. Nevertheless , their interaction with fire and each other defines historical disturbance regimes (Bassman 2011).

Historical accounts indicate that epidemic insect outbreaks have occurred over the area in the past, primarily bark beetles. The northern Rocky Mountains, including the upper Swan Valley, have been subjected to numerous outbreaks of mountain pine beetle (*Dendroctonous ponderosae* Hopkins) attacking lodgepole, ponderosa and whitebark pines. The earliest written description was provided by Ayres (Ayres 1898) for an outbreak in western white pine on the North Fork of the Flathead River. In 1909, Josef Brunner, an Agent for the USDA Bureau of Entomology reported the loss of 500 MMBF of timber to mountain pine beetle in Flathead County, elaborating on Ayres' 1898 infestation and describing an additional outbreak on the South Fork of the Flathead River (Evenden 1944). Evenden (Evenden 1944) described a large outbreak of mountain pine beetle in lodgepole and whitebark pine in western Montana that occurred over a 30-year period between 1911 and 1942. This infestation was first reported by rangers on the Flathead National Forest in 1909 and 1910. Significant attack was occurring near the south end of Swan Lake in 1911. By 1917, the outbreak was active in the upper Swan Valley; and before it abated in 1942, it had spread north into Canada and south to the Bitterroot Valley, the Bighole Basin, and east to the Big Belt Mountains.

Mountain pine beetle populations began expanding in Montana again in 1969. Infestations were detected on the Kootenai National Forest and Glacier National Park in 1972; the Lolo National Forest in 1973; and the Flathead National Forest in 1974. By 1978, the North Fork country was heavily infested with populations moving south into the Swan Valley by 1980, thence to the Bitterroot, Custer, Deerlodge, Helena, Beaverhead, and Gallatin National Forests. Populations began to diminish in the southern fringe by 1984, but continued strong on the Flathead for some time after (McGregor et al. 1985). Mountain pine beetle activity again increased dramatically in the upper Swan Valley beginning in 2004 and continuing through 2011.

Aerial detection survey records from USDA Forest Health and Protection indicate that an outbreak of mountain pine beetle occurred between 2003 and 2011 within the Beaver Creek analysis area, as is displayed below.

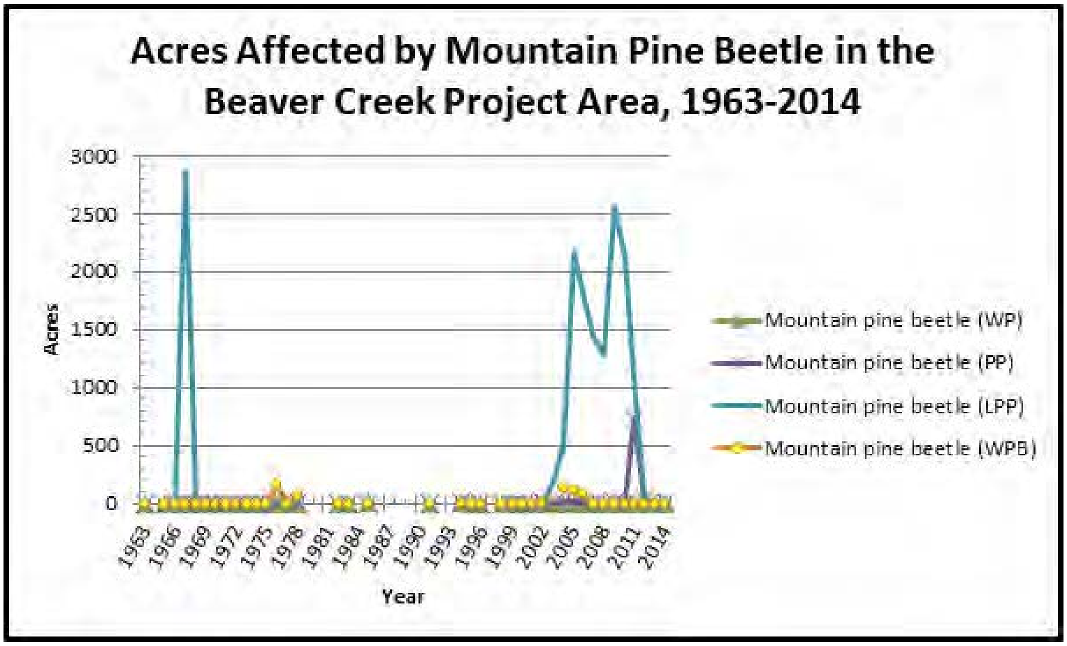



**FIGURE 18. MOUNTAIN PINE BEETLE ACTIVITY IN THE BEAVER CREEK PROJECT AREA (1963-2014).**

A well-documented outbreak of spruce bark beetle occurred in the Swan Valley following a large-scale wind event in 1949 (Swan Ecosystem Center 2004). Major outbreaks of western spruce budworm (*Choristoneura occidentalis* Freeman) occurred on the Flathead National Forest between 1949 and 1955 (peak 1950) and again between 1967 and 1983 (peak 1978), although the amount of defoliation was considerably less than in other areas of Region 1 (USDA 1986). This defoliator was again particularly active on the Flathead National Forest in 2009. Outbreaks of the Douglas-fir tussock moth (*Orgyia pseudotsugata* McDunnough) occurred in the Flathead region in 1956, 1963/1964, 1965, 1974/1975, and 1983 (Sturdevant 2000).

Aerial Detection Survey (ADS) records from USDA Forest Health and Protection reflect, within the Beaver Creek analysis area, that western spruce budworm activity peaked in the mid-1970s and is now on the increase again within the past few years (USDA 2015a).

Two major pests currently affecting forest trees are non-native and were not historically present within the Beaver Creek analysis area. Larch casebearer (*Coleophora laricella* [Hubner]) was introduced from Europe and arrived in the Swan Valley in 1968. This defoliator's population peaked in the 1970s and is now declining.

White pine blister rust (*Cronartium ribicola* [Fisch.]) was also introduced from Europe and came to western North America in 1910 on infected seedlings. This disease, alone and in combination with mountain pine beetle (*Dendroctonous ponderosae* Hopkins), has since had a dramatic effect on forest composition, substantially reducing the proportion of western white pine at mid to lower elevations and whitebark pine at higher elevations. Western white pine now occupies less than 5 percent of its original range in the Inland Empire (north Idaho, western Montana). Historically, whitebark pine was a major species on 10 to 15 percent of the landscape in western Montana and Idaho. Blister rust infects 90 percent of the whitebark pine resulting in 50 to 90 percent mortality across the Swan Range. Fire exclusion and subsequent ingrowth of shade-tolerant conifers has resulted in lost vigor, which when exacerbated by the blister rust, left many whitebark pine susceptible to periodic epidemics of mountain pine beetle (Swan Ecosystem Center 2004).

Other natural disturbance factors, such as root disease and dwarf mistletoe, cannot be detected through aerial surveys but have occurred sporadically (Swan Ecosystem Center 2004).

Additional insects and diseases affecting the project area will be discussed in greater detail in the Existing Condition Section of this report.

### HUMAN ACTIVITY

Early history of the Upper Swan Valley was dominated by American Indians. Wintering locations for the Salish, Kootenai, and Pend d'Orielle Tribes existed at lower elevations along some of the major water courses. These were occupied during less severe winters. The Hellgate Treaty of 1855 established the Flathead Indian Reservation at the lower end of the Flathead Valley. As the tribes began moving onto the reservation, they retained some hunting and fishing rights on most of their historical Tribal lands, including the upper Swan Valley. Traditional routes across the Mission Mountains dropped into the Swan Valley at several key locations and formed the basis for some of the modern trails. Burning was a traditional activity conducted to promote wildlife forage, as a hunting tool, to clear trails and campsites, and food production. Most Indian fires burned in the understory and caused comparatively little change to the forest canopy; however, there is also evidence of resulting large wildfires that caused significant impact (Swan Ecosystem Center 2004).

Most of the private non-industrial lands (residences, pastures, or small wood lots) in the Swan Valley were derived from the Homestead Act of 1862. Initially, settlement of the valley was relatively slow, owing to primitive and difficult access. Filing of homestead claims was most active between 1916 and 1920. By 1919, 70 homesteads had been established in the Swan Valley. Most of these are located in close proximity to the Swan River and Montana State Highway 83

In 1864, Congress granted lands to the Northern Pacific Railway Company as an incentive for building a transcontinental railroad. Sections of land in the Swan Valley were granted in lieu of sections already withdrawn along the planned railroad route. This action and later land exchanges resulted in the checkerboard ownership pattern that characterized the Swan Valley. Prior to the 1920s, the Northern Pacific offered some of their lands for sale to support the railroad. Beginning in the 1920s, growth tapered off until after the Depression. In the 1930s, some homesteaders sold out or abandoned their claims, causing some land to revert to government ownership. The outfitting industry was established in the Swan Valley during this time, and many dude ranches expanded operations during the summer and fall (Swan Ecosystem Center 2004).

From the 1920s through the 1940s, the Northern Pacific Railroad sold both land and timber, although only a few tracts in the upper Swan Valley. Following World War II, timber harvest increased substantially and continued through the 1970s. In 1981, PCTC was formed as a result of a series of mergers within the Northern Pacific Railroad. Plum Creek Timber Company accounted for approximately 64 percent of the private land in the Swan Valley in 2008 (Savage 2008). Plum Creek's harvest levels fluctuated over time; but by 2012, their entire former land base in the upper Swan Valley had been harvested and transferred to the Forest Service or State of Montana.

Federal land in the Swan Valley was originally part of the Lewis and Clark Forest Reserve. In 1907, the name was changed and the Forest was divided into the Flathead National Forest and the Blackfoot National Forest. Surveys of the area were begun in the early 1900s and not finalized until the 1910s. Early forest management consisted of small timber sales, which were purchased primarily for fuel wood, house logs, and other homestead improvements. Later timber sales became larger in scale, especially following World War II, when improved access and increased demand for timber combined to fuel an expanding nation (Swan Ecosystem Center 2004). Timber harvest on public lands increased until the 1980s with regeneration cuttings -- the preferred silvicultural system. By the 1990s salvage logging of wind damaged and insect or disease related mortality was the dominant or only harvest activity on NFS lands. Fire suppression began in the early 1930s and was effective. Current increased stocking levels, altered forest composition, and longer fire-return intervals are evidence of the effectiveness of fire suppression (Barrett 1998).

# EXISTING CONDITIONS

Using the methods described earlier, the existing condition of the forest vegetation within the analysis area was investigated at all scales from the landscape to individual trees. This section discusses the existing site conditions, disturbance agents, and various attributes of the forest vegetation.

## SITE CONDITIONS

A site can be defined as the environment where a tree or forest stand grows (Helms 1998). As far as tree growth is concerned, the site is controlled by the total physiologically available supply of solar energy, water, carbon dioxide, and various chemical nutrients (Smith et al. 1997). Individual sites are comprised of unique combinations of the physical environment including landform (elevation, aspect, topography), climate, and geology. Generalizations of sites can be made to characterize the landscape. The following discussion describes some of the general site conditions in the analysis area.

### LANDFORM

The elevation, topography, and aspects within the analysis are widely varied. Elevation ranges from approximately 3,440 feet up to 8,480 feet in the Mission Mountains. The lower elevations are typified by undulating topography with small southwest-northeast ridges with slopes generally less than 25 percent. Higher on the slopes of the Mission Mountains, slopes generally range from 10 to 45 percent with some sheer cliffs. All directional aspects and slope shapes (concave and convex) are present (Swan Ecosystem Center 2004). In general, the highest elevations are steep east-facing slopes, which transition into a broad expanse of relatively flat terrain dissected by numerous stream channels and small ridges.

### CLIMATE

The analysis area is at the eastern extent of the Pacific maritime climatic influence. Mean winter temperatures range from 15 to 25° Fahrenheit, and summer temperatures average in the 80s with extreme temperatures reaching 100°+. Higher elevations average 10 to 20° cooler. Precipitation in the form of rain varies between an average of 30 inches on the valley floor to over 100 inches at the highest elevations. The bulk of the precipitation usually comes from October to mid-February and again from mid-May to early-July (Swan Ecosystem Center 2004).

### GEOLOGY AND SOILS

Over time, the geology of the analysis area has been shaped by faulting and uplift followed by numerous glacial events. Geological processes have resulted in depositional, erosional, and breakland landforms. Soils are generally acidic and include fine silts, organic soils, lakebed deposits, and glacial tills derived from mostly shale and quartzite. Valley bottom soils are most productive, partially due to a 6 to 12 inch layer of ash deposited from the eruption of Mount Mazama (Swan Ecosystem Center 2004). The Soils Section of this EA contains detailed information related to soils.

The Flathead National Forest GIS library contains a land type coverage , which spatially defines areas based on soils, geology, slope, and potential vegetation as described in the Soil Survey of Flathead National Forest Area, Montana (Martinson et al. 1998).

### SITE CLASSIFICATIONS

From a silvicultural perspective, it is useful to classify sites. Classification can provide information about a particular site related to susceptibility and vulnerability of trees to damaging agents, problems with competing vegetation, and responses to various silvicultural treatments (Smith et al. 1997). In forestry, sites are typically classified qualitatively by environment or vegetation or qualitatively by their potential for tree growth.

On the Flathead National Forest, the most common way of classifying sites is by habitat type. All land areas potentially capable of producing similar plant communities at climax may be described as the same habitat type. By focusing on climax plant communities, habitat types account for successional change overtime and, thus, provide a permanent and ecologically-based system of land stratification (Pfister et al. 1977). Pfister's Forest Habitat Types of Montana is the document used to systematically classify sites into habitat types, which are named for the climax vegetation community (dominant tree species followed by indicator undergrowth species, e.g. *Abies/asiocarpa/Clintonia uniflora*).

Forest Plan Amendment 21 Appendix I (Project File Exhibit U-3) has grouped similar habitat types into coarser potential vegetation groups. Table 27provides a generalized description of the habitat types used to define the potential vegetation groups. Forest Plan Amendment 21 Appendix I includes the detailed list of habitat types by potential vegetation group. Table 27 displays the distribution of potential vegetation groups within the project area. Project File Exhibit I-1 (Appendix A) also contains detailed information related to individual stands associated with this project, including information related to habitat type.

**TABLE 27. POTENTIAL VEGETATION GROUPS AND HABITAT TYPES**

| AMENDMENT 21 POTENTIAL VEGETATION GROUPS | GENERAL DESCRIPTION OF HABITAT TYPES |
|---|---|
| Warm Dry | Ponderosa Pine and Douglas-fir/grass types |
| | Most Douglas-fir types and dry grand fir types |
| | Douglas-fir/twinflower and most grand fir types |
| Warm Moist | Grand fir/queencup beadlily types |
| | Western redcedar and western hemlock/queencup beadlily types |
| Cool Moist | Subalpine fir/queencup beadlily and Menziesia types |
| Cold Moist | Subalpine fir/beargrass and dwarf huckleberry types |
| Riparian | Western redcedar/devil's club types |
| | Subalpine fir/bluejoint types |
| Cold | Subalpine fir/ grouse whortleberry and woodrush types |
| | Whitebark pine and alpine larch types |

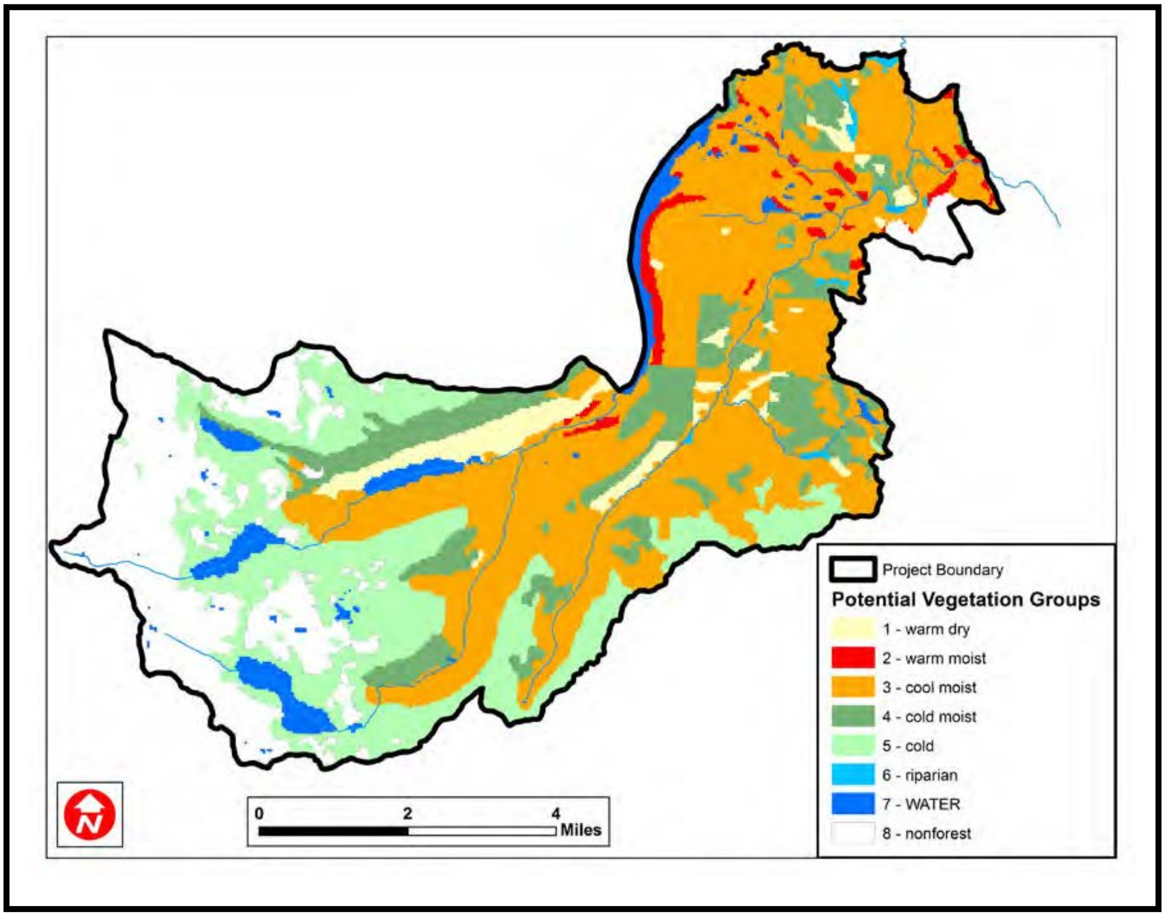



**FIGURE 19. DISTRIBUTION OF POTENTIAL VEGETATION GROUPS WITHIN THE BEAVER CREEK ANALYSIS AREA.**

# EXISTING FOREST VEGETATION CONDITIONS

As previously mentioned analysis of forest vegetation can be done at the landscape and stand level. Here, we will discuss various aspects of the existing condition of forest vegetation within the analysis area at multiple scales.

## LANDSCAPE

The Upper Swan Valley Landscape Assessment (Project File Exhibit U-1) described the general forest conditions at a landscape scale by grouping the analysis area into what was termed "Ecosystems." The assessment identified five ecosystems in the upper Swan Valley. Three of those forested ecosystems are represented in the Beaver Creek Project Area. The following are summary descriptions of those ecosystems and are described as they would be encountered traveling from east to west or upslope.

> "The warm/cool-moist valley bottoms include the undulating flat lands of the valley floor with its many wetlands. This area is forested with a large diversity of conifer and deciduous tree species. Openings in the forest are numerous, largely due to human settlement. These areas contain a mix of western larch, western white pine, lodgepole pine, Douglas-fir, ponderosa pine, Engelmann spruce, grand fir and subalpine fir on the more well drained sites. The neighboring riparian zones are bordered with cottonwood, birch and aspen. Disturbances in this area included primarily low- and mixed-severity fire, and occasionally high-severity fire. High-intensity winds have also occurred at intervals and caused extensive blowdown.

"The cool-moist midslopes include a transition between the warm-moist valley bottoms to the east and the cold-steep forested uplands to the west. Tree species in this area include Douglas-fir, lodgepole pine, western larch, western white pine, Engelmann spruce, grand fir, western red cedar and subalpine fir. Disturbances in this area included a combination of low-, mixed-, and high-severity fires. High-severity winds causing blowdown have also occurred in the area.

"The cold-steep uplands form a narrow band between the barren rocky ridges and peaks on the Mission Mountains and the more heavily forested areas on the lower slopes. Vegetation is scattered and clumped across the landscape. Trees and shrubs develop in areas where there is soil. Tree species include whitebark pine, Engelmann spruce, lodgepole pine, mountain hemlock, and subalpine fir. Disturbances in this area include a combination of mixed-and high-severity fires. Fires tended to be less frequent and usually occurred during dry periods."

## STAND

Analysis of stand-level existing forest vegetation conditions was accomplished by assessing individual stand conditions using the methods described earlier and then compiling these data and summarizing them for the analysis area. Project File Exhibit I-1 (Appendix A) has detailed information for individual stands within the analysis area. The stand-level analysis and diagnosis process that was discussed in the Methods Section primarily occurred on lands identified in the Forest Plan as suitable for timber harvest. Areas outside this land base (such as wilderness) have limited stand level-information.

## COMPOSITION

Composition refers to the proportion of various species within a stand or area. A variety of species exist within the analysis area. The spatial distribution and proportions of each species is directly related to site condition and inter-species competition. As previously mentioned habitat types are commonly used to classify sites and also provide an indication of the potential and existing vegetation, both overstory and understory. A GIS layer exists for potential vegetation groups across the Flathead National Forest. This layer (Figure 19) suggests a mid-scale representation of the distribution of potential vegetation groups within the analysis area.

Cover types are used to express the dominant species within an area based on plurality (also commonly referred to as forest type, dominance type, or existing vegetation), the specie or species presently most abundant in a given area. Again, the current composition of the analysis area is the result of past disturbances, site conditions, and the competitive advantages of individual species. Cover type information for the analysis area was summarized using 2012 VMAP data. This provides a consistent data set, in terms of classification and data acquisition, for all lands within the analysis area. Characterization of the analysis area is an appropriate base-level application of this remote sensing derived data. Field-sampled data has been used for finer/stand-level analysis. The VMAP uses the Region 1 Existing Vegetation Classification System (Barber et al. 2011) and Table 28 summarizes the cover types within the analysis area using the Dominance 40 classes found in this system. Figure 20 is a map that shows the digitized results. The non-forested class in Table 28 is an aggregate of multiple VMAP Dominance 40 classes. In addition, it should be noted that non-forested areas could include forested areas where the canopy cover of tree species is less than 10 percent, for example recently burned or regenerated areas.

**TABLE 28. COVER TYPES WITHIN THE BEAVER CREEK ANALYSIS AREA USING THE DOMINANCE 40 CLASSES.**

| VMAP DOMINANCE 40 CLASSES | GENERAL DESCRIPTION | ACRES | PERCENT ANALYSIS AREA |
|---|---|---|---|
| Non-Forested (HERB, SHRUB, SPVEG, | Aggregation of areas classified as dominated by herbs, shrubs, sparse vegetation and water | 11,498 | 33 |

**TABLE 28. COVER TYPES WITHIN THE BEAVER CREEK ANALYSIS AREA USING THE DOMINANCE 40 CLASSES.**

| VMAP DOMINANCE 40 CLASSES | GENERAL DESCRIPTION | ACRES | PERCENT ANALYSIS AREA |
|---|---|---|---|
| WATER) | | | |
| Douglas-fir Mix (MX-PSME) | Douglas-fir is the most abundant single species with at least 40% of the total tree abundance | 2,452 | 7 |
| Western larch Mix (MX-LOAC) | Western larch is the most abundant single species with at least 40% of the total tree abundance | 2,988 | 9 |
| Lodgepole pine Mix (MX-PICO) | Lodgepole pine is the most abundant single species with at least 40% of the total tree abundance | 9,992 | 29 |
| Engelmann spruce Mix (MX-PIEN) | Engelmann Spruce is the most abundant single species with at least 40% of the total tree abundance | 6,303 | 18 |
| Subalpine fir Mix (MX-ABLA) | Subalpine fir is the most abundant single species with at least 40% of the total tree abundance | 1,519 | 4 |
| Whitebark pine Mix (MX-PIAL) | Whitebark pine is the most abundant single species with at least 40% of the total tree abundance | 188 | 1 |
| Total | | 39,940 | 100 |

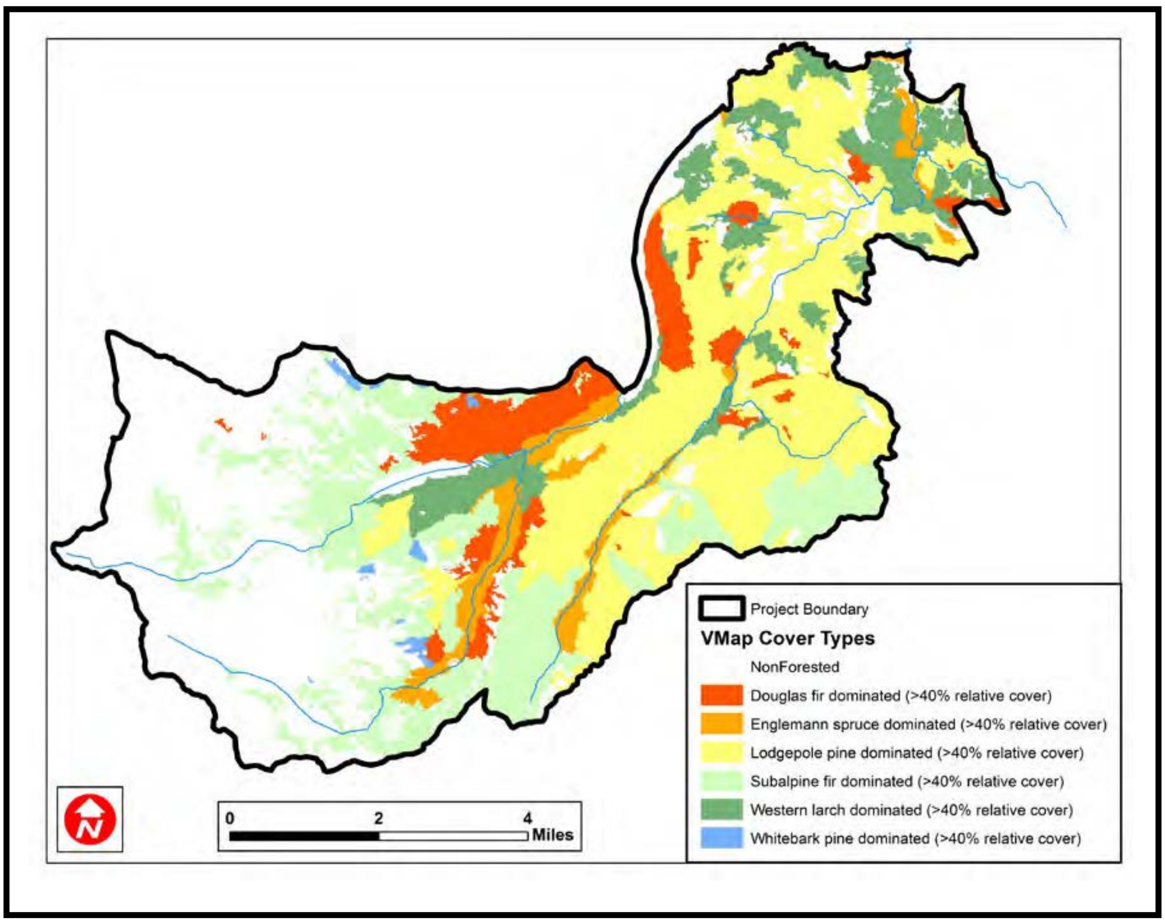



**FIGURE 20. DISTRIBUTION OF VMAP COVER TYPES WITHIN THE BEAVER CREEK ANALYSIS AREA.**

## SERAL STAGE DISTRIBUTION

Often forests are seen through our eyes as static entities. An example is a stand of trees we have visited many times, but continues to appear unaltered. This concept could be no farther from the truth. Change is constant in forest communities. Change occurs at all scales from a seedling sprouting to a wildfire consuming tens of thousands of acres of trees. This change is multidimensional and also occurs at various time scales. Often the timescale of change within a forest is comparatively long, as some trees within the analysis area have existed at the same location and similar form for hundreds of years. At a stand and landscape level, this change is often associated with many of the disturbance factors previously discussed. These disturbances often result in the establishment of a new age class or cohort.

A successive change in species dominance following disturbances is referred to as succession. Ecologists have recognized a number of successional patterns within forest communities based on site characteristics and the competitiveness of species (Oliver et al. 1996). A seral stage is a temporal and intermediate stage in the process of succession (Helms 1998). Forest Plan Amendment 21 identified three seral stages. These three seral stages were defined by tree size.

Tree size is a more commonly and easily measured attribute than tree age. It is believed, as in Amendment 21, that there is a correlation between tree size, successional development, and tree ages. Although this correlation does not fit well under certain circumstances, it is generally accepted given the disturbance regimes and patterns of forest communities in the Northern Rockies.

Three seral stages were identified in this analysis to illustrate distribution of successional development and, hence, tree size and age. These seral stages are independent of species composition. Here again, 2012 VMAP data was used to characterize tree size distribution within the analysis area. Detailed information relating to tree size classification can be found in Barber et al. (Barber et al. 2011). The three seral stages used here are similar to Amendment 21 in name and how they relate to tree sizes, but differ in their classification. Of note is the fact that Amendment 21 uses the term late seral to describe old growth. However, in the Beaver Creek analysis, old growth is defined by meeting the criteria of Green et al. (Green et al. 1995, updated 2005) as mentioned previously. Therefore, late seral in this analysis contain large tree dominated areas that do not meet the Green et al. old growth definition and areas that do meet this definition of old growth. A more detailed discussion of old growth will follow.

Table 29 displays the seral stage distribution by forested cover type within the analysis area and Figure 21 displays the results in the project area.

**TABLE 29. SERAL STAGES OF THE BEAVER CREEK PROJECT AREA.**

| SERAL STAGE | VMAP TREE SIZE | ACRES | PERCENT OF FORESTED AREA * |
|---|---|---|---|
| Early Seral | Dominant/Codominant Trees <5 inches DBH | 1,746 | 7 |
| Mid Seral | Dominant/Codominant Trees 5-15 inches DBH | 18,930 | 81 |
| Late Seral | Dominant/Codominant Trees >15 inches DBH | 2,766 | 12 |
| *Excludes non-forested areas – dominated by herbs, shrubs, sparse vegetation, or water | | | |

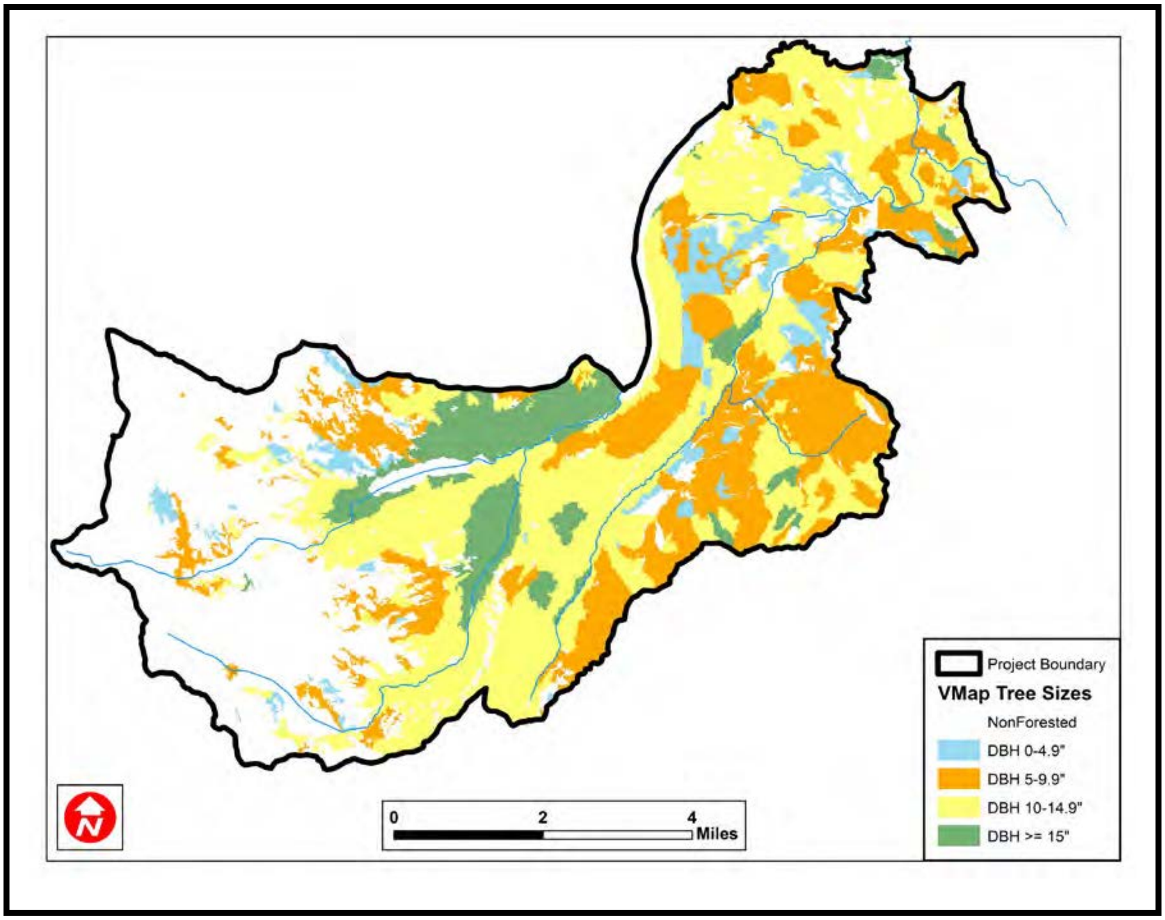



**FIGURE 21. DISTRIBUTION OF VMAP TREE SIZES WITHIN THE BEAVER CREEK ANALYSIS AREA.**

Table 30 illustrates, the early seral stages are dominated by the lodgepole pine mix. Lodgepole pine mix dominates the mid-seral stage, followed by subalpine fir; while Douglas-fir mix cover types make up the majority of the late seral stages.

**TABLE 30. COVER TYPE AND SERAL STAGES IN THE BEAVER CREEK PROJECT AREA (ALL OWNERSHIPS).**

| FORESTED COVER TYPES | EARLY SERAL ACRES | MID SERAL ACRES | LATE SERAL ACRES | TOTAL ACRES | PERCENT OF FORESTED AREA |
|---|---|---|---|---|---|
| Douglas-fir Mix | 156 | 1,102 | 1,194 | 2,452 | 10 |
| Western larch Mix | 280 | 2,517 | 191 | 2,988 | 13 |
| Lodgepole pine Mix | 918 | 8,910 | 164 | 9,992 | 43 |
| Engelmann spruce Mix | 0 | 866 | 653 | 1,519 | 6 |
| Subalpine fir Mix | 316 | 5,422 | 565 | 6,303 | 27 |
| Whitebark pine Mix | 76 | 112 | 0 | 188 | 1 |
| Total Acres/Percent Seral Stage | 1,746 | 18,930 | 2,766 | 23,442 | 100 |

The distribution of cover types and seral stages across the analysis area can be described generally. Much of the low elevation valley bottom areas are dominated by the lodgepole pine mix and western larch mix cover types. As one moves up in elevation, lodgepole pine mix cover types dominate, while the majority of the upper elevation slopes are dominated by the subalpine fir mix. Engelmann spruce mix types tend to be along stream courses. In addition, many of the non-forested areas exist at the highest elevations. In terms of seral stage (size class) distribution, mid-seral stages are spread throughout with late-seral stages mainly in the Mission Mountains Wilderness and early-seral stages dominating the old PCTC lands.

### OLD GROWTH

Old growth in this report is defined by Green et al. (Green et al. 1992) for the Western Montana Zone. Project File Exhibit I-1 (Appendix B) includes the minimum and associate characteristics used to make old growth determinations. Stand inventories and subsequent review by the District Silviculturist and Wildlife Biologist were conducted to confirm that no actions associated with this project are proposed within stands that meet the Green et al. (Green et al. 1992) definition of old growth. The Wildlife Section of this EA discusses the amount, location and spatial distribution of habitat for old growth associated species within the project area.

Statistical estimates of the amount of old growth can be confidently made at large scales. Forest Inventory and Analysis data have been used to produce statistical estimates of old growth for the entire Flathead National Forest and each fifth code watershed unit. The estimate of old growth for the Flathead National Forest is 11.0 percent with a 90 percent confidence interval of 9.0 to 13.1 percent (Bush et al. 2007). The Beaver Creek analysis area falls into the fifth code watershed labeled 1701021101. The estimate of old growth for this watershed unit is 9.09 percent with a 90 percent confidence interval of 0 to 20 percent (Bush et al. 2004). These results, the process, and its appropriate application documented by Czaplewski (Czaplewski 2004) are available on the Region 1 Forest Inventory and Analysis website (http://fsweb.r1.fs.fed.us/forest/inv/fia_data/analysis.shtml).

### FOREST STRUCTURE

Forest structure describes the vertical and horizontal distribution of components of a forest. Vertical structure describes the arrangement of trees and their crowns from the forest floor to the top of the forest canopy. This attribute can be classified as either single storied (tree crowns consisting of one main canopy layer), two storied (tree crowns forming two distinct canopy layers), or multi-storied or continuous (where tree canopies occupy three or more distinct canopy layers). Horizontal structure is often referred to in terms of density. In forestry, density can be measured in many ways, but is most commonly expressed in terms of basal area, trees per acre, or canopy cover. The amount of down woody material and the number of standing dead snags are also significant elements of forest structure which will be discussed.

Numerous combinations of forest structure exist within the analysis area and vary based on species composition, seral stage, and past disturbance. In terms of vertical structure, the following conditions exist. Most of the areas dominated by lodgepole pine and/or the early seral stage for all cover types are single storied. This is primarily due to stand dynamics in the early seral stages, and the result of stand-replacing disturbances in the lodgepole pine dominated forests. Some of the more xeric areas dominated by ponderosa pine, western larch, and/or Douglas-fir also exhibit single-storied canopies. Two-storied vertical structure exists in areas where remnant overstory trees exist above a smaller cohort. These cases are most commonly the result of mixed-severity fire regimes or past seed tree and/or shelterwood harvests. Some areas exhibit this structure due to historical non-lethal fire regimes, which favored single-storied stands creating a single-dominant overstory, but where recent fire suppression has allowed a second canopy layer to develop in the absence of fire. Multi-storied stand structures exist in many areas and especially in high elevation areas dominated by shade-tolerant species. This structure appears to be increasing across the Swan Valley landscape due to the absence of fire and proliferation of shade-tolerant under stories (Arno et al. 1997; Barrett 1998, 2002; Freedman et al. 1985). In many cases, within-stand structure contains a mosaic of these three structural conditions.

Horizontal structure is also variable across the analysis area. Many of the early seral areas have extremely high tree densities, over 1,000 trees per acre. Density is also high in many mid- and late seral areas, also as result of the absence of fire and subsequent shade-tolerant ingrowth.

One measure of density is canopy cover, which is the proportion of the forest floor covered by the vertical projection of tree crowns (Barber et al. 2011). This attribute of forest vegetation is readily measured using remote sensing technology. See Figure 22 for a graphic display of the distribution of canopy covers followed by a summary of canopy cover percentages for tree dominated areas (areas where tree canopies are greater than 10 percent of the area) within the analysis area using R1 VMAP data in Figure 22.

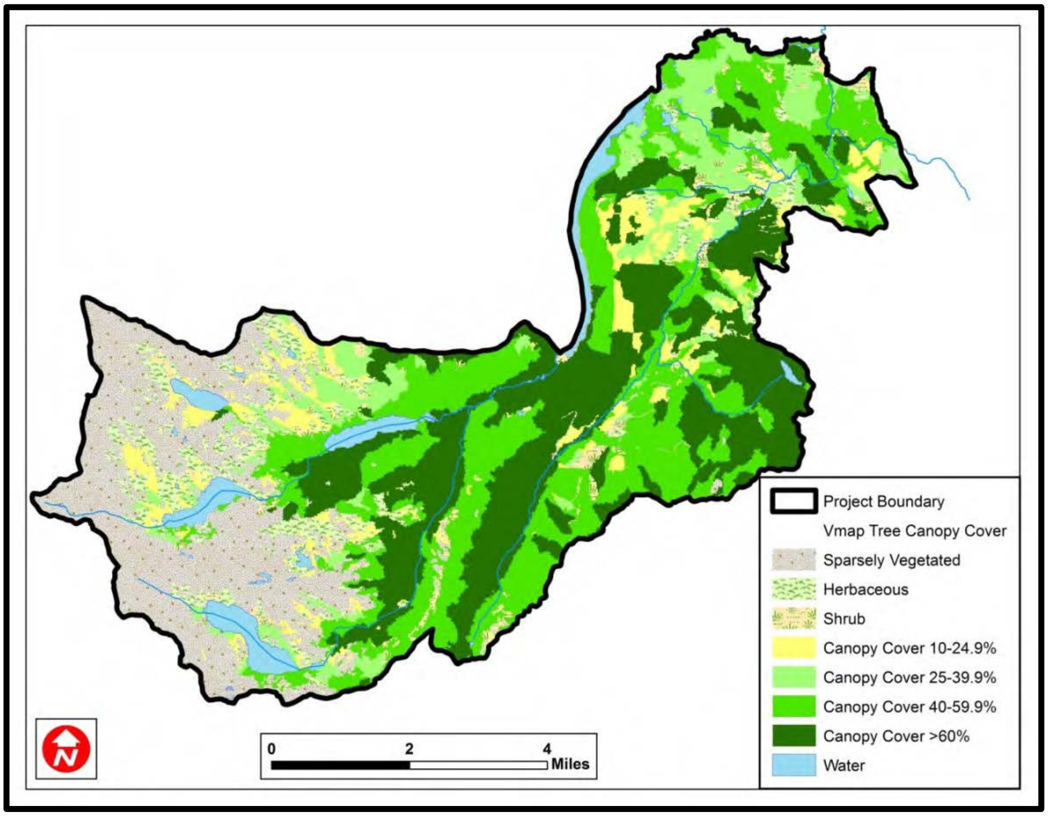



**FIGURE 22. DISTRIBUTION OF VMAP CANOPY COVER PERCENTAGES WITHIN THE BEAVER CREEK ANALYSIS AREA.**

Although highly variable, down woody material and standing dead snags exist at some level throughout most stands. Both down woody material and snags are the result of tree mortality. Tree mortality factors, such as insects, pathogens, fire, wind, and other disturbances, all contribute to the pool of dead trees available as snags and eventually down woody material.

Similar to the broad estimates of old growth mentioned earlier, statistical estimates of the number of snags per acre and the amount of coarse down woody material per acre can be made analyzing FIA data at varying spatial extents. The confidence of estimates made using FIA data is higher as more data is incorporated. In this case, the Swan River watershed was used to characterize these attributes across the landscape within which this project falls. Although this area is broader than the analysis area boundary, it allowed for the incorporation of more data and, thus, better estimates of the existing condition for snags and coarse woody material. It should be noted that these FIA data incorporate a wide range of forest conditions and sites. Table 31 summarizes the estimates of standing dead snags per acre (greater than 9 inches DBH) and coarse woody material (tons/acre greater than 3 inches DBH) for the Swan River watershed (Konen 2012).

**TABLE 31. FIA SUMMARY ESTIMATES FOR THE SWAN RIVER WATERSHED (39 FIA PLOTS).**

| ATTRIBUTE | FIA ESTIMATE OF SNAGS/TONS PER ACRE | LOWER 90 PERCENT CONFIDENCE INTERVAL | UPPER 90 PERCENT CONFIDENCE INTERVAL |
|---|---|---|---|
| Standing Dead Snags (trees per acre > 9" DBH) | 14.2 | 9.1 | 20 |
| Coarse Down Woody (tons per acre > 3" diameter) | 22.5 | 15.2 | 30.7 |

## EXISTING DISTURBANCE

Most, if not all, of the historical disturbance agents that affected the forest vegetation within the analysis area are still present today. The extent and effects of each of these agents varies through time. The following provides a snap shot in time of the existing disturbance agents observed within the analysis area. Again, Project File Exhibit I-1 (Appendix A) contains information related to disturbance agents observed within individual stands.

### FIRE

The occurrence of fires within the analysis area is well documented. The District Fire Management Staff log all confirmed fire starts on the District. They also keep records related to prescribed fire operations. See the Fire and Fuels Section of this EA for detailed information related to fires in the project area.

### INSECTS AND DISEASES

Forest insects and diseases are major disturbance processes in forests of the northern Rocky Mountains. Their effects can range from small-scale disturbances, killing individual trees, to wide-spread outbreaks causing extensive tree mortality. Native forest pests have been part of our forests for millennia and function as nutrient recyclers, agents of disturbance, members of food chains, and regulators of productivity, diversity, and density (Black 2005). Aerial detection surveys, stand inventories, and silvicultural walkthroughs have identified which species are currently present and affecting the forest vegetation. The following section identifies the species present and discusses some of the characteristics associated with them.

The most recent aerial detection survey information available was conducted by USDA Forest Health and Protection Staff and was completed in 2014. Aerial detection surveys are most useful in detecting insect and disease damage that can be easily identified from the air, such as mortality and defoliation. It is important to note that not all insect and disease agents have mortality signals that can be detected and that these surveys map and identify signatures of the previous year's activity (Forest Health Monitoring Program 2005). Figure 23 displays the major insect agents observed during the last three surveys within the analysis area.

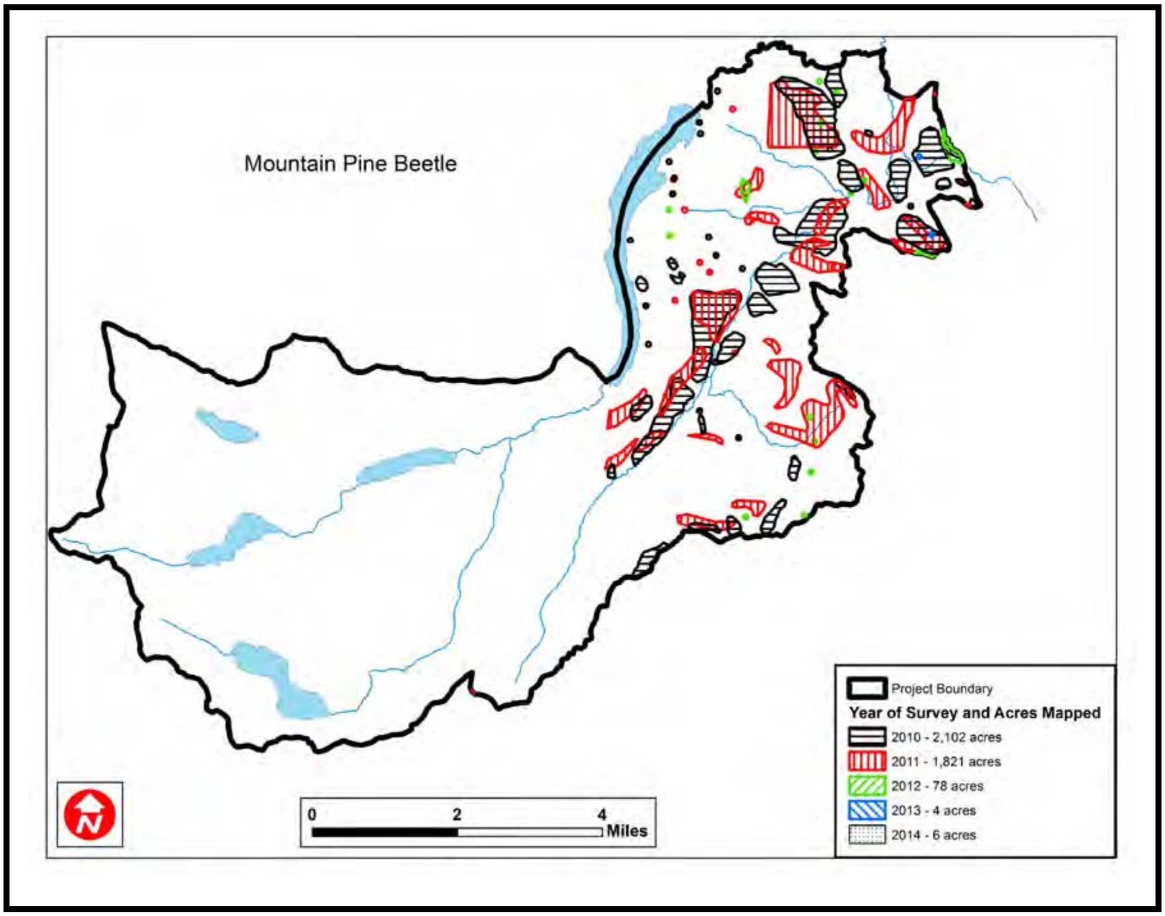



**FIGURE 23. DISTRIBUTION OF MOUNTAIN PINE BEETLE DAMAGE FROM RECENT AERIAL DETECTION SURVEYS (2010 - 2014) WITHIN THE BEAVER CREEK ANALYSIS AREA.**

Review of the stand inventories and stand-level diagnosis also revealed a number of insect and disease agents present within the analysis area. The following paragraphs identify the major insects and diseases observed and provide a short discussion of their natural history.

Miscellaneous insects and diseases observed, which are having a minimal effect on existing forest vegetation, are also mentioned. Here again, Project File Exhibit I-1 (Appendix A) contains site-specific information related to these pests.

### MOUNTAIN PINE BEETLE

Mountain pine beetle (*Dendroctonus ponderosae* Hopkins) is an aggressive bark beetle that feeds in the inner bark of host trees, often girdling and killing the tree. Hosts include most pine species with lodgepole pine, western white pine, and ponderosa pine being of concern within the analysis area. Infested trees fade within 1 year from yellow-green to red-brown. Large-scale outbreaks are common, especially in lodgepole pine, when conditions are optimal and the beetles' food supply is abundant.

Amman et al. (1977) developed a hazard rating system for lodgepole pine stands that focuses on three stand characteristics. Stands with an average age greater than 80 years, which have an average DBH greater than 8 inches, and exist within suitable climate for beetle brood development (<6,000 feet. based on latitude) can be considered highly susceptible. Currently, Forest Service Entomologists use a more detailed hazard rating system developed by Shore et al. (1992) that incorporates nearby beetle population data (Gibson 2004).

Mountain pine beetle was observed in numerous stands within the analysis area. Affects were primarily individual tree or small patches of lodgepole pine mortality. Attacks appeared to be a mix of older and current activity, with mountain pine beetle populations peaking in 2005 and 2009. These occurrences coupled with the aerial survey detection of mountain pine beetle in and around the analysis area suggest that given optimal conditions, mountain pine beetle populations have the potential to increase. The stand conditions identified as high hazard occur in many of the lodgepole pine dominated stands within the analysis area. This is primarily due to age and average tree DBH (see Table 29 and Table 30). Most of the associated elements contributing to high hazard (density, percent susceptible pine, and adequate environmental conditions) are also present.

#### WHITE PINE BLISTER RUST

White pine blister rust (*Cronartium ribicola* J. C. Fisch.) is an introduced pathogen that affects five-needled pines, primarily western white pine and whitebark pine in the project area. Blister rust was introduced in 1910 and has spread throughout most of the range of its North American pine hosts. White pine blister rust requires an alternate host, primarily currants and gooseberries (*Ribes* spp.) to complete its complex life cycle (Schwandt et al. 2013). In five- needled pines, the fungus causes branch and stem cankers that eventually lead to top kill or death of most infected trees (Hagle et al. 2003). Resistance to blister rust occurs naturally in some white pine and whitebark pine and the Flathead National Forest has a tree improvement program that collects cone and pollen from these trees to cultivate rust resistant tree stock for reforestation efforts. Silvicultural walkthroughs revealed that many whitebark pine trees larger than sapling size were infected with blister rust, but small areas of rust resistant cone bearing whitebark pine trees were identified and could be candidates for the rust resistant tree improvement program. Effects of the blister rust ranged from dead branches to tree mortality.

#### LARCH DWARF MISTLETOE

Larch dwarf mistletoe (*Arceuthobium laricis* (Piper) H. St. John) is a small parasitic plant whose principle host species is western larch. Lodgepole pine, mountain hemlock and other conifer species are secondary or rare hosts. Dwarf mistletoes are obligate parasites depending on their host to survive and are the most widely dispersed pathogen in the western United States. Effects include witches brooms, top kill, reduced height and diameter growth, and occasionally mortality. Mistletoe inflicted mortality usually does not occur until trees are mature and begin to decrease in vigor. Spread and intensification is usually slow (Forest Health Protection and State Forestry Organizations 2004). Hawksworth (1977) developed a 6-class dwarf mistletoe rating (DMR) system to quantify mistletoe infestations.

Larch dwarf mistletoe cannot be detected through aerial detection surveys but was identified in numerous stands during field reviews of the project area, with Units 36 and 84 having the most significant infestations. Although not evaluated for each tree or stand, observations indicate Hawksworth ratings ranged from 1 to 6. Some mortality was observed in overmature western larch trees. Infestation of advanced western larch regeneration growing under infested overstory western larch trees was also observed.

#### WESTERN SPRUCE BUDWORM

Western spruce budworm (*Choristoneura occidentalis* Freeman) is a destructive, defoliating insect, especially on Douglas-fir, grand fir, and subalpine fir. Multi-storied stands of Douglas-fir and true firs are impacted the most. Typically, western larch and pines are the least impacted. The larvae eat the buds and needles prior to bud break and also consume the new growth as it flushes. Heavy defoliation leads to reduced radial growth and after 3 to 5 years of continued defoliation, branches and tops can be killed as well as tree mortality (Blackford 2010).

Defoliation by western spruce budworm was observed within the analysis area, especially in the understory trees, though no tree mortality was detected during diagnosis. Since then, aerial surveys indicate the populations of spruce budworm in the project area have increased considerably.

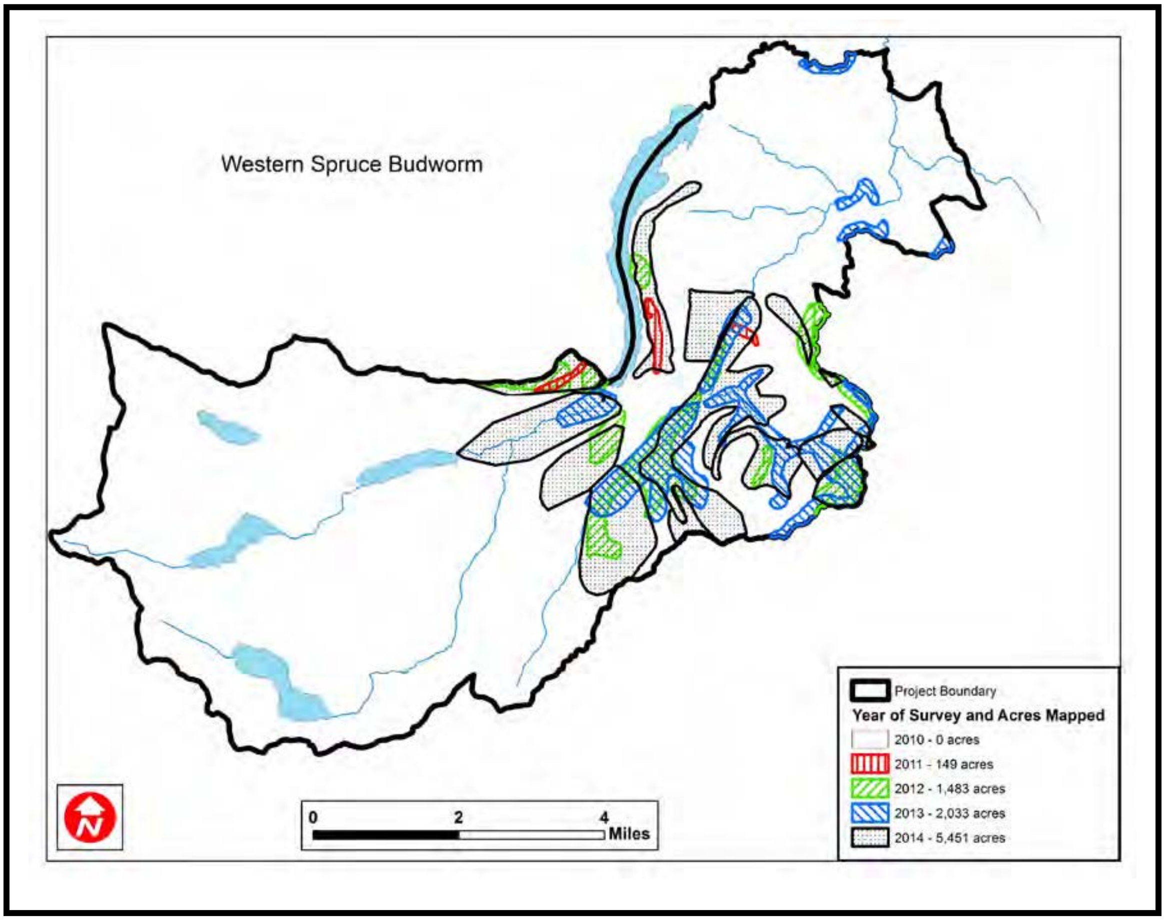



**FIGURE 24. DISTRIBUTION OF WESTERN SPRUCE BUDWORM DAMAGE FROM RECENT AERIAL DETECTION SURVEYS (2010-2014) WITHIN THE BEAVER CREEK ANALYSIS AREA.**

## ROOT DISEASE

Root diseases are the most damaging group of tree diseases. In Montana, they are most common in Douglas-fir, grand fir, and subalpine fir. Once established, they become a disease of the site and can persist for decades in roots, stumps, and killed trees. Damage can range from diffuse mortality to large and/or small root disease pockets. Tree species vary in their resistance to root diseases (Hagle 2004).

Root disease was the greatest concern that Forest Health and Protection Staff observed in the analysis area in 2012 field visit (Lockman et al. 2013). Armillaria root disease (*Armillaria ostoyae* [Romagnesi Herink]) is likely the most common species present. Douglas-fir and true firs are the most susceptible to this species with larch and then pines being least susceptible. Mortality included both mature and immature trees and was primarily confined to small pockets and individual trees. Root disease was found to be most prevalent in Units 19, 84, and 4108.

They also found annosum (*Heterobasidion occidentale* Garbelotto and Otrosina [Syn. H. annosum P ISG]) in subalpine fir, particularly in Units 263 and 4108. There are two types of annosum. S-type annosum kills Douglas-fir and true fir species. The other is P-type annosum that affects primarily ponderosa pine; it was not found during the field visit.

### Miscellaneous Insects And Diseases

A number of additional forest insects and diseases were identified in the analysis area. They are listed here as miscellaneous, because they were either observed very infrequently or their effects to forest vegetation were insignificant. Undoubtedly additional forest insects and disease occur in the project area.

- Atropellis canker (*Atropellis piniphila* (Weir) Lohman & Cash).
- Douglas-fir beetle (*Dendroctonus pseudotsugae* Hopkins).
- Douglas-fir dwarf mistletoe (*Arceuthobium douglasii* Engelm.).
- Fir engraver (*Scolytus ventralis* Leconte).
- Indian paint fungus (*Echinodontium tinctorium* [Ell. & Ev.] Ell. & Ev.).
- Larch needle cast (*Meria laricis* Vuill.).
- Lodgepole pine dwarf mistletoe (*Arceuthobium americanum* Nutt. Ex Engelm.).
- Pini (*Phellinus pini* [Thore:Fr].) A. Ames).
- Sequoia pitch moth (*Synanthedon sequoia* [Hy. Edwards]).
- Spruce Beetle (*Dendroctonus rufipennis* [Kirby]).
- Western balsam bark beetle (*Dryocoetes confusus* Swaine).
- Western gull rust (*Endocronartium harknessii* [Moore] Hirat).
- Schweinitzii root and butt rot (*Phaeolus schweinitzii* [Fries] Patouillard).

Region 1 Forest Health and Protection Staff have developed a system to assess hazard ratings for important forest insects using the FVS stand dynamics model. These systems evaluate stand conditions and assign hazard ratings at various points in time (Pederson 2006). This system was applied to some areas proposed for treatment where adequate input data exists. The results are discussed in the Environmental Consequences Section of this EA.

## Wind

Although the effects of wind to forest vegetation are constant, no evidence of recent large-scale wind events was observed. Due to observations of individual tree and small patches of blowdown, it is obvious that wind has been a disturbance factor within the analysis area.

## Forest Management

National Forest Service and private lands total approximately 34,962 acres within the analysis area, 33,152 and 1,810, respectively. The Forest Service has records of past timber harvest activity since the 1950s. A portion of current NFS lands in the project area were previously managed by PCTC. Past harvests on lands formerly owned by PCTC were determined through analyzing information previously obtained from PCTC, recent satellite imagery, and past harvest GIS layers on file at the Flathead National Forest.

Table 32 displays the timber harvest activity by decade for all lands where records are available. In addition to the past timber harvest activities, a variety of forest management practices have affected the existing vegetation within the analysis area. These activities include, artificial regeneration (planting), timber stand improvement (pre-commercial thinning, etc.), site preparation, and fuels treatments (prescribed burning, slashing, piling, etc.). Comprehensive records of these activities are only available for NFS lands and are also reported in Table 32.

Areas that were regenerated in the 1950s through 1970s typically have fully-stocked poletimber and small sawtimber stands averaging between 20 and 70 feet tall. Regeneration harvest that took place in the 1980s and 1990s has resulted in areas dominated by sapling-sized trees with average heights of 10 to 20 feet. Regeneration harvests that occurred since 2000 are comprised of seedlings generally less than 5 feet tall. Intermediate harvest treatments retain the existing stand in a modified condition. These harvested areas typically have lower densities, with more growing space available for residual trees.

**TABLE 32. BEAVER CREEK PROJECT AREA PAST FOREST MANAGEMENT ACTIVITIES, (ACRES OF NFS LANDS INCLUDING LEGACY LANDS).**

| TYPE OF ACTIVITY | DECADE MANAGEMENT OCCURRED | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1950s | 1960s | 1970s | 1980s | 1990s | 2000s | 2010s | TOTAL |
| Regeneration Harvest | 207 | 476 | 301 | 694 | 2,232 | 636 | 544 | 5,089 |
| Intermediate Harvest | 17 | 245 | 166 | 147 | 209 | 67 | 111 | 964 |
| Uneven-Aged Harvest | 0 | 0 | 26 | 59 | 0 | 0 | 0 | 84 |
| TSI Treatments | 0 | 153 | 271 | 218 | 262 | 7 | 0 | 910 |
| Reforestation | 44 | 246 | 4 | 16 | 29 | 0 | 0 | 340 |
| Site Preparation | 44 | 517 | 151 | 246 | 56 | 134 | 0 | 1,149 |
| Fuels Treatments | 44 | 679 | 151 | 296 | 525 | 207 | 103 | 2,004 |
| Insect Control | 0 | 0 | 0 | 0 | 0 | 20 | 260 | 280 |
| Invasive Weed Control | 0 | 0 | 0 | 0 | 0 | 0 | 317 | 317 |
| Disease Control | 0 | 20 | 0 | 0 | 0 | 0 | 0 | 20 |
| **Total of All Activities** | **357** | **2,337** | **1,069** | **1,676** | **3,313** | **1,071** | **1,335** | **11,157** |

### OWNERSHIP AND DEVELOPMENT

Development of forested land has been ongoing in the Swan Valley since roughly the turn of the century. Although still a rural area, an increasing amount of land is being developed primarily for residential purposes. Often this development results in areas converted into a non-forested condition. This is typically done for house lots, transportation systems, out buildings, and pastures. In 2002, it was estimated that 900 people lived in the Upper Swan Valley (Swan Ecosystem Center 2004).

Approximately 5,511 acres of former PCTC lands in the Beaver Creek Project Area were transferred to Forest Service ownership between 1998 and 2012, through the Land and Water Conservation Fund program (LWCF) and the Montana Legacy Project. The Lands Section in this EA discusses land ownership and development within the analysis area in greater detail.

## COMPARISON TO HISTORICAL CONDITIONS

Comparisons of existing conditions to historical conditions can help put management objectives and options into perspective. The previous discussion related to historical and existing forest vegetation conditions, within the analysis area and the surrounding landscape, allows us to gain that perspective. The following key points summarize the comparisons between historical and existing conditions.

### DISTURBANCE

The scale, intensity, and frequency of the forest fires, the major disturbance factor within the analysis area, have been altered from historical conditions. Fire frequency has decreased due to elimination of traditional native burning coupled with effective modern fire suppression. Many of the non-lethal and mixed-severity fire regimes are now three to six fire intervals out of balance (Swan Ecosystem Center 2004). Mehl et al. (2012) have indicated that within the Southwestern Crown of the Continent Landscape, the number of acres of lethal fires have increased significantly, while the acres of non-lethal and mixed fire have decreased compared to modeled historic range of variability (HRV). Potential increased fire intensity and shifted fire regimes have occurred within the analysis area, as well. Long-term fire exclusion and selective logging has promoted a shift toward the stand-replacement fire regime across a broad area in the Upper Swan Valley (Arno et al. 1995; Barrett 1998; Hart et al. 1994). The scale of wildfires also appears to have increased. See the Fire and Fuels Section of this EA for a more detailed discussion of fire history and current trends within the project area.

Insect and disease conditions have not changed extensively over time within the analysis area. Many of the agents that are currently present (mountain pine beetle, larch dwarf mistletoe, root diseases, western spruce budworm, etc.) were also likely historically present. The exceptions are white pine blister rust and larch casebearer, which are both introduced species. It is debatable whether current levels of mountain pine beetle are within historic ranges, though in general, it appears that they are. However, mature remnant ponderosa pine may be experiencing uncharacteristic impacts. These impacts are likely due to relatively high mountain pine beetle populations, inherent low tree vigor, and conditions favorable to mountain pine beetles (increased stand densities, shade, competition and ideal weather).

### FOREST VEGETATION CONDITIONS

When comparing the forested conditions, Ayres mapped 46 percent of the analysis area as forested, while the 1930s timber inventory displayed 80 percent, and the 2012 VMAP exercise documented 66 percent. Keep in mind that all three used different techniques and had different reasons to map vegetation. The amount of forested area within the analysis area is similar to historical conditions, with some decrease due to development and timber harvest, especially on former PCTC lands.

The approximate distribution of seral stages is dissimilar to historic conditions when comparing data from Forest Plan Amendment 21 (entire Swan Valley Subbasin) to existing conditions data as a whole within just the analysis area. The highest departure is in the montane mid-seral stage, which has increased, while late-seral stages in the subalpine and montane decreased.

As stated in Amendment 21 and the Upper Swan Valley Landscape Assessment (Project File Exhibit U-1), the amount of old growth within the entire Swan Subbasin in 1998 was below the historical range, recognizing that Amendment 21 defined late seral as old growth and this analysis did not.

The distribution of cover types appears to be similar to historical conditions. Although within historical ranges, there may be some increases in spruce/subalpine fir-dominated areas. One major exception is the dramatic decrease in the amount of whitebark pine, which has been decimated by white pine blister rust and mountain pine beetle.

The amount of area dominated by single-storied fire-resistant shade-intolerant tree species (ponderosa pine, western larch, and Douglas-fir) appears to be less than historical information indicates. This is largely due to shifts in fire regimes, the absence of fire, past timber harvest, and shade-intolerant ingrowth.

## DESIRED CONDITIONS

Desired forest vegetation conditions on NFS lands are directed by the Forest Plan. Project-level objectives consider Forest Plan direction in combination with current conditions. Stand-level desired conditions are developed by considering management direction and project purpose and need relative to site capabilities and current vegetative conditions. Regional strategies, such as the Regional Restoration Strategy and Collaborative Forest Restoration Program, can also help articulate trends and desired conditions across the larger landscape.

## FOREST PLAN DIRECTION

Amendment 21 of the Forest Plan and the associated appendices (USDA 1998) provide management objectives and guidelines relative to forest vegetation and include the following:

- Manage landscapes to attain the 75 percent range around the median amount of old growth that occurred historically, including recruitment of additional old growth where needed from appropriate mid-seral stands and prescribed treatments within existing old growth where current conditions pose a major or immediate threat.
- Maintain or actively restore landscape composition, structure, and patterns to a condition similar to that expected under natural disturbance and succession regimes.
- Manage landscape composition and patterns to reduce the risk of undesirable fire, insect, and pathogen disturbances.
- Where fuel conditions or fire regimes have been significantly altered, manage to restore the historical fire regime and reduce risk of undesirable fire events.
- Stand-level objectives for all seral stages include maintaining dominance of shade-intolerant species, such as western larch, ponderosa pine, and western white pine.

## PROJECT-LEVEL FOREST VEGETATION OBJECTIVES

Improve forest health, forest composition, spatial arrangement, structure, and ecological resilience by:

- Reducing stocking in stands where densities are high to promote tree vigor, alter species composition, and to reduce susceptibility of loss due to insect attack and disease;
- Modifying stand structure to reduce risk of loss to white pine blister rust and mountain pine beetle;
- Reducing densities and promoting diversity in young stands regenerating after prior regeneration harvests;
- Replacing (regenerating) stands heavily affected by current and past mountain pine beetle infestations with fire adapted early seral species;
- Replacing (regenerating) stands heavily infested with and badly degraded by root disease using species resistant to the extant disease;
- Maintaining and enhancing biodiversity in the project area by employing prescriptions that enhance or maintain spatial heterogeneity within individual stands and across the landscape;
- Controlling invasive plants;
- Reducing understory ingrowth in stands containing large, healthy legacy trees, especially western larch and to a lesser extent, ponderosa pine;
- Restoring health and vigor of western white pine and whitebark pine by removing competing vegetation around individual trees ("daylighting"); re-establishing both species on suitable sites using phenotypic rust- resistant planting stock;
- Maintaining large legacy trees where they occur on the landscape;

- Promoting structure and composition of stands containing old trees to place them on a better trajectory toward old growth conditions characteristic of the forest type, taking into account the contribution of the stand to landscape fire adaptation and watershed health.

### REGIONAL RESTORATION STRATEGY

Literature cited in the Northern Regional Overview, documents a downward trend in aerial extent of ponderosa pine, western larch, aspen, western white pine, whitebark pine, and many native grassland communities, and in some areas an increase in non-native invasive weeds. In many cases, these cover types were maintained by relatively frequent fire, and in some cases, fairly open forest conditions. This information could be an important project-level focus for restoring resilient desired conditions (USDA 2007a).

### COLLABORATIVE FOREST RESTORATION PROGRAM

The Beaver Creek Project Area is located within the Southwest Crown of the Continent (SWCC), identified as a priority landscape under the Collaborative Forest Restoration Program (CFLRP). The SWCC prepared the Southwestern Crown of the Continent Landscape Restoration Strategy (Project File Exhibit U-2), which identified some recommendations specific to forest vegetation management.  These recommendations include, but are not limited to: maximize retention of large trees and fully maintain or contribute to the restoration of pre-suppression old growth conditions; thinning young understory trees followed by prescribed fire; removal of small diameter trees and retention of large trees (when present); and prioritize projects within the WUI on lands considered to be at high risk for uncharacteristic wildfire and those areas of moderate risk that are adjacent to the high risk areas.

These recommendations and other public comment regarding forest vegetation resources have been considered as part of this analysis.

# ENVIRONMENTAL CONSEQUENCES

This section describes the direct, indirect, and cumulative effects of the No Action and Action Alternatives to forest vegetation.

## VEGETATION RESTORATION TREATMENT DESCRIPTIONS

Silvicultural treatments are often defined as either regeneration or intermediate treatments. Regeneration methods are those that purposefully establish a new age class. Conversely, intermediate treatments are meant to enhance growth, quality, vigor, and composition of a stand between regeneration treatments. Table 33 is a summary of treatments by alternatives. More information on the types of vegetation restoration treatments proposed can be found in Chapter 2, Vegetation Restoration Activities, and Appendix A – Vegetation Restoration Treatment Summary in this EA or in Project File Exhibit I-1.

**TABLE 33. VEGETATION TREATMENT SUMMARY BY ALTERNATIVE.**

| VEGETATION TREATMENT DESCRIPTION | ALT 1 (ACRES) | ALT. 2 (ACRES) | ALT. 3 (ACRES) |
|---|---|---|---|
| **SILVICULTURE TREATMENTS WITH COMMERCIAL COMPONENT** | **0** | **2,351** | **1,589** |
| **INTERMEDIATE TREATMENT** | | | |
| Commercial Thin | 0 | 1,015 | 801 |
| Improvement Cut | 0 | 599 | 565 |
| **REGENERATION TREATMENTS** | | | |
| Clearcut with Reserves | 0 | 16 | 16 |
| Seed Tree with Reserves | 0 | 428 | 94 |

**TABLE 33. VEGETATION TREATMENT SUMMARY BY ALTERNATIVE.**

| VEGETATION TREATMENT DESCRIPTION | ALT 1 (ACRES) | ALT. 2 (ACRES) | ALT. 3 (ACRES) |
|---|---|---|---|
| Group Selection | 0 | 333 | 110 |
| Reforestation to occur following regeneration treatments | 0 | 405 | 220 |
| **SILVICULTURE TREATMENTS WITHOUT COMMERCIAL COMPONENT** | **0** | **1,293** | **951** |
| Pre-commercial Thinning | 0 | 882 | 552 |
| Daylighting | 0 | 82 | 70 |
| Fill Planting | 0 | 329 | 329 |
| **GROUND-BASED MECHANIZED TREATMENT SYSTEM** | 0 | 2,750 | 2,005 |
| **SKYLINE HARVEST SYSTEM** | 0 | 189 | 61 |
| **PRESCRIBED FIRE** | 0 | 1,808 | 1,797 |

# ALTERNATIVE 1 -NO ACTION ALTERNATIVE
# DIRECT AND INDIRECT EFFECTS

The direct and indirect effects discussed in this section pertain primarily to effects that occur as direct or indirect results of the alternative. These may include immediate or longer-term effects.

No actions would occur under this alternative, allowing the processes of vegetation succession and disturbance to continue in a similar fashion as they currently are. Some roadside firewood gathering, Christmas tree cutting, and continued wildfire suppression consistent with Forest Plan direction is expected.

## FOREST COMPOSITION

In the short term, forest composition would continue to reflect the existing condition with the lodgepole pine mix cover type dominating the analysis area at 29 percent. Areas dominated by Englemann spruce (18 percent) would likely remain at current levels, as well.

It is possible that the distribution of susceptible pine species (ponderosa pine, western white pine, whitebark pine) and dominance of lodgepole pine would decrease over time if mountain pine beetle population levels increase again. For the time being, mountain pine beetle activity appears to have temporarily returned to endemic levels within the analysis area.

Regeneration of western larch, ponderosa pine, western white pine, and whitebark pine would remain low and inhibited by lack of disturbance and increased shade. Schmidt et al. (1976) and Shearer (1971) report that western larch is a pioneer species whose seedlings are adapted to disturbed conditions, such as those found on bare mineral soil or following severe burns, and seedling survival is poor on undisturbed litter, humus, or sod of the mature forest. Ponderosa pine regeneration is benefited by mineral soil seedbeds where competing vegetation has been reduced by burning (Shearer et al. 1970). Western white pine can become established in small forest openings, but in order for it to reach a dominant position in the tree canopy, additional disturbances are needed to open up the canopy to reach 50 to 92 percent visible sky (Jain et al. 2004). Keane et al. (2012) reported that whitebark pine is eventually replaced, in the absence of fire, by the shade-tolerant sub-alpine fir, spruce, and mountain hemlock.

Ingrowth and advanced regeneration of shade-tolerant species, such as subalpine fir, and Engelmann spruce, would continue. These species have the ability to become established and successfully compete for growing space in a shaded understory environment (Pfister et al. 1977). When studying subalpine fir habitat types (~40 percent of the analysis area) in western Montana, Arno et al. (1985) found stands dominated by shade-tolerant species in the later seral stages.

Additionally, the amount of western white pine and whitebark pine would continue to decline as white pine blister rust and potentially mountain pine beetle affect those species. Western larch would also continue to decline as western larch dwarf mistletoe increases and spreads. In addition, Douglas-fir would decline as armillaria root rot continues to spread and kills this species. The effects to species composition based on this alternative include decreased proportions of long-lived, fire-tolerant, shade-intolerant species (such as western larch and ponderosa pine) in some areas and increased representation of shade-tolerant species, such as subalpine fir and Engelmann spruce, in other areas over time. Affects may also include a decreased representation of pine species as a result of continued mountain pine beetle mortality.

## FOREST STRUCTURE

Both vertical and horizontal structure is generally expected to reflect existing conditions under the No Action Alternative with some incremental changes expected.

Single, two-storied and multi-storied stand structures are likely to persist. As stand dynamics progress over time, many of the areas currently in the early-seral stage and dominated by single-story stand structures would develop into two-storied or multi-storied stand structures. Some of the currently two-storied stand structures may also progress toward a multi-storied condition.

Shade-tolerant species would continue to occupy more of the lower, middle, and upper canopy layers as these species become established and grow.

Stand densities would remain relatively stable as only individual tree or small patches of mortality are expected. The exception is the potential for larger-scale pine mortality from mountain pine beetle. Density would also continue to slowly increase in all seral stages as trees grow larger, tree crowns expand, and shade-tolerant species become established in the understories. Trees experiencing high levels of density related competition would be less vigorous and less resilient to disturbances, especially in drought conditions (Barnes et al. 1998) and potential climate change. In addition, some non-forested areas would likely increase in density as forests become established and/or grow in size.

These effects to horizontal and vertical structure would impact the fuel arrangements and potential fire behavior, resulting in more ladder fuels and, subsequently, higher crown fire initiation probabilities and increased crown fire spread rates.

The No Action Alternative would have little effect on the existing condition of snags and down woody material in the short term. Snags would become established, fall, and be replaced over time. While natural decay processes would break down wood, cycle nutrients, and incorporate organic material into the soil. In the long term, with the potential of wildfires, snags could burn down, but replacements could be created as well.

## SERAL STAGE DISTRIBUTION

The distribution of seral stages in the analysis area is not expected to change in the short term under this alternative. A major natural disturbance event, such as insect, disease, or fire, could create increased early-seral conditions and related decreases in mid- and late-seral stages, but it is impossible to predict these disturbances. As trees grow, they would eventually shift into different seral stages, but this process often takes considerable time.

## INSECT AND DISEASE CONDITIONS

Here again, insect and disease conditions would remain similar to current conditions as a result of this alternative. Trees and stands would continue to experience the effects of the major insects and diseases previously discussed, including mountain pine beetle, western spruce budworm, white pine blister rust, western larch dwarf mistletoe, and root disease.

The continued effects of mountain pine beetle would include individual and group tree mortality. This would decrease the proportion of susceptible pine and increase surface and standing dead fuel loadings. As stand conditions change over time, the risk of larger-scale mountain pine beetle activity would increase without disturbance as smaller trees grow into larger and more susceptible trees, and stand densities increase.

Forest Health and Protection (FHP) monitors insect and disease conditions across the State of Montana. In their 2013 conditions report, they noted that the mountain pine beetle activity was returning to endemic population levels, but that Douglas-fir beetle and western spruce budworm activity was increasing or significant (USDA 2014b). In addition, FHP Staff visited the Swan Valley in 2013 and 2014. Although these visits were not specific to the Beaver Creek Project Area, the resulting reports discuss the mountain pine beetle conditions in the Swan Valley. In 2013, it was observed that mountain pine beetle was still active and Douglas-fir beetle was increasing on the Swan Lake Ranger District (Sturdevant 2014). In 2014, mountain pine beetle activity was declining and Douglas-fir beetle was still active in the southern end of the District (Sturdevant 2014).

Figure 25 illustrates that mountain pine beetle activity has temporarily subsided and populations are at endemic levels. This is in contrast to western spruce budworm activity, which is on the increase.

Though the mountain pine beetle activity appears to have subsided for the present, the hazard has not. The Forest Vegetation Simulator (FVS) was used to model and assess the mountain pine beetle hazard rating of forest stands. Susceptible stands have greater than or equal to 100 square feet of basal area (BA) and have a large percentage (≥ 50 percent BA) of large diameter (≥8-inches diameter at 4.5 feet) lodgepole pine (Randall, Steed and Bush, 2011). Twenty-nine stands were modeled and were chosen because they mostly have recent exams and are a representative sample of the stands within the analysis area. These areas were modeled for a 50-year time period starting in 2015 and had no treatments simulated.

This essentially created a condition similar to the No Action Alternative where no human disturbance occurs. This also implies that stand conditions are not affected by mountain pine beetle or other natural disturbance agents in the 50-year period. This situation is unlikely given the observations and expectations by FHP on mountain pine beetle in the analysis area, yet it does allow for analysis of stand conditions as they relate to hazard in the absence of disturbance. The results of this simulation contained a mix of Low Risk, Moderate Risk, and High Risk hazard and are displayed in Figure 25 Although some areas contain significant proportions of lodgepole pine, variation in all forest attributes exists among the stands. Results varied: nine stands maintained moderate to high hazard, three maintained low hazard, fourteen increased hazard, and three increased and then decreased in hazard over time. The latter occurred due, in one instance, to ingrowth of other tree species (Randall, Steed and Bush, 2011). The detailed results of this simulation are included in the project file for this EA.

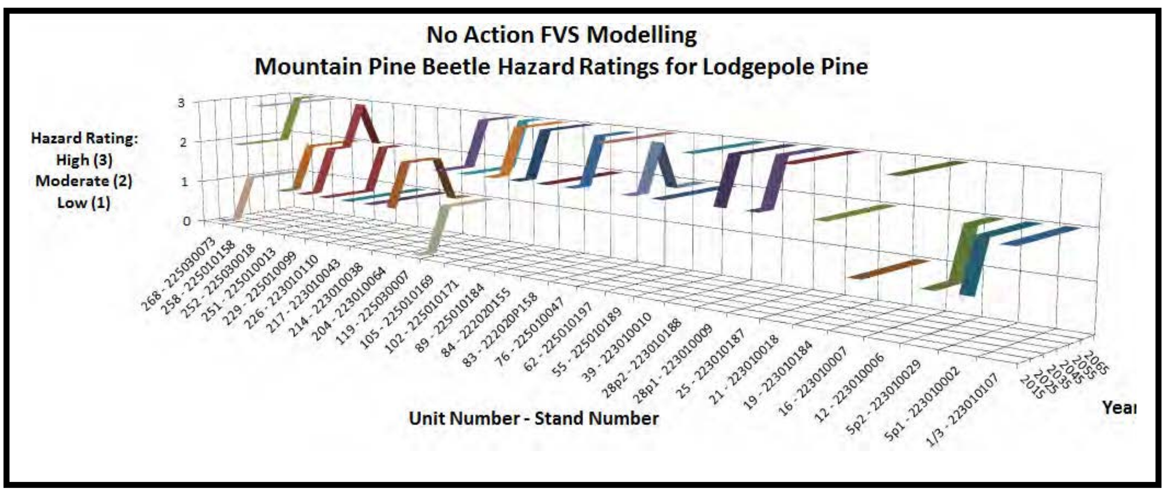



**FIGURE 25. NO ACTION FOREST VEGETATION SIMULATOR MOUNTAIN PINE BEETLE HAZARD RATINGS.**

White pine blister rust would also continue to significantly affect the forest vegetation under this alternative. Most of the white pine and whitebark pine (five-needled pine) trees within the analysis area are infected with blister rust. As the disease progresses, tree girdling and subsequent mortality would continue to occur. Natural five-needled pine seedlings would likely become infected as well due to their likely non-resistant genotype. The effects would ultimately be a continued decrease in the proportion of five-needled pine within the analysis area.

The spread and impact of larch dwarf mistletoe is predictable. The trees currently infected within the analysis area would continue to experience decreased growth and potential mortality. It has been reported that dwarf mistletoe related mortality usually takes 10+ years to occur once it has spread through the entire tree crown, and the spread of dwarf mistletoe within a stand is approximately 1 to 2 feet per year, being highest in multi-storied stands (Forest Health Protection and State Forestry Organizations 2004).

In dense, multi-storied stands where Douglas-fir, true firs, and Engelmann spruce are in the overstory and understory, the western spruce budworm would continue to thrive. It is suspected that wet and cool summers may cause budworm populations to decline as larval development and dispersal and adult dispersal are effected directly by weather (Blackford 2010).

Root disease would continue to affect areas where it is present, as it can persist on site for decades. Susceptible tree species would continue to be stressed and/or killed where affected by root disease. It has been reported that the area occupied by root disease in a stand can double every 10 years (Hagle 2004). Some lands could become essentially non-forested when susceptible species are the only species present and regenerating in a root disease area.

Tree damage, such as windthrow, stem abrasion, and branch breakage, etc., would be expected to remain at current natural levels.

## ALTERNATIVE 1 - NO ACTION ALTERNATIVE CUMULATIVE EFFECTS

Past, current, and reasonably foreseeable actions on all lands within the analysis area were evaluated when considering the cumulative effects to forest vegetation associated with the No Action Alternative. Past actions that have affected the vegetation resource include forest management and other activities within the analysis area. These activities are discussed in the Existing Conditions Section of this section and provide the baseline vegetation conditions. Given that, the following discussion focuses on the current and reasonably foreseeable activities on all lands in combination with the effects of the No Action Alternative on NFS lands. See the cumulative effects worksheet (Project File Exhibit I-1) for additional cumulative effects information.

### FOREST COMPOSITION

Cumulatively, the effects to forest composition would continue to reflect the existing condition where, lodgepole pine and Engelmann spruce cover types dominate. Western larch, subalpine fir, Douglas-fir, and whitebark pine dominated areas would continue to remain subordinate. This is based on no current or reasonably foreseeable activities (such as regeneration or intermediate harvest) that would favor these species. Continued fire suppression activities would also result in effects and forest composition trends similar to those previously described.

### FOREST STRUCTURE

The cumulative effects to forest structure are similar to the direct and indirect effects of the No Action Alternative where existing conditions would be reflected immediately, followed by increased stand density, continued multi-layer vertical structure, and accumulating fuels. This would primarily be due to continued fire suppression and relatively low levels of current or foreseeable disturbance.

### SERAL STAGE DISTRIBUTION

Given little current or reasonably foreseeable regeneration (either natural or human caused), the cumulative effects to seral stage distribution would primarily be a continued slow shift of seral stages as trees grow.

### INSECT AND DISEASE CONDITIONS

The cumulative effects to forest insect and disease conditions are similar to direct and indirect effects of the No Action Alternative without considering other current and reasonably foreseeable activities.

## ALTERNATIVES 2 AND 3
## DIRECT AND INDIRECT EFFECTS

This section discusses the effects to forest vegetation from implementation of the two action alternatives. Since the proposed actions are similar between alternatives, varying primarily by the number of acres treated, the effects discussion is combined. Where possible, the effects will be quantified for each alternative to allow for comparison. Table 33 summarizes the proposed treatments by alternative.

The direct and indirect effects to forest vegetation will be discussed relative to the measurement indicators.

### FOREST COMPOSITION

The proposed silvicultural and reforestation activities would result in effects to forest composition within the analysis area. Both intermediate harvest and regeneration harvest areas would have altered species composition following treatment, and this would persist for varying periods of time. Indirect effects are also possible through interactions of species and disturbance agents, but will not be discussed in detail due to uncertainty in disturbance timing, spatial location, or degree.

As previously stated, management direction includes emphasis on long-lived, fire-tolerant, and shade-intolerant species, where appropriate. The presence of these species suggests that site capabilities are adequate, and they are appropriate areas to apply this direction. These species primarily include western larch, western white pine, ponderosa pine, and whitebark pine. Therefore, these species would be preferred and favored for retention. Due to susceptibility to mountain pine beetle, the relatively short longevity, and fire intolerance of lodgepole pine, this species would be targeted for removal in most situations. In all harvest treatments, species that are relatively rare within the analysis area and surrounding landscape would be favored for retention either selectively or by exclusion. These include species such as aspen, cottonwood, and birch.

Where intermediate harvest is proposed, the species composition would be altered through the selection of tree species to be retained and removed. These effects would occur as long as the species favored persist and/or as long as the species removed do or do not become re-established. The intermediate treatments proposed include commercial thinning and improvement cut. Commercial thinning, improvement cut, and the matrix thinning in the group selection prescriptions would generally be thinning from below. This implies that trees in the suppressed and intermediate crown classes would be removed first, while most of the co-dominant and nearly all dominant crown class trees would be retained. Due to the differentiation in shade tolerance among species, these treatments would primarily remove shade-tolerant species, such as grand fir, subalpine fir, and Engelmann spruce that currently occupy the suppressed and intermediate crown positions. Conversely, the shade-intolerant species mentioned are currently occupying the dominant and codominant crown positions and, hence, would be favored. There are areas where shade-intolerant species occupy the majority of the stocking. In general, where western larch and lodgepole pine exist together, western larch would be the favored species for retention.

Table 34 shows the number of acres proposed for intermediate treatments under each alternative. Although the actual effect to species composition in these areas is not measurable until after treatment, this table provides a quantifiable opportunity to compare how many acres associated with each alternative would have species composition altered according to the effects discussed above.

**TABLE 34. INTERMEDIATE TREATMENTS BY ALTERNATIVE FOR THE BEAVER CREEK PROJECT.**

| INTERMEDIATE TREATMENTS WITH COMMERCIAL COMPONENT | ALTERNATIVE 2 (ACRES) | ALTERNATIVE 3 (ACRES) |
|---|---|---|
| Commercial Thin | 1,015 | 801 |
| Improvement Cut | 559 | 565 |
| Total Intermediate Treatment | 1,574 | 1,366 |

Regeneration harvests would likely have a more significant effect (in terms of species proportions and duration) on species composition than intermediate harvests. This is due to the establishment of a new age class of trees where control of species composition is possible at establishment through manipulation of seed source and artificial regeneration. Regeneration harvests associated with the action alternatives include stand clearcut with reserves and seed tree with reserves. These treatments are designed to facilitate regeneration of the desired species discussed earlier (western larch, western white pine, and ponderosa pine) by creating the conditions previously referenced by Schmidt et al. (1990). With reserves indicates that certain trees would be retained indefinitely to provide species and structural diversity. The reserves would be comprised of western larch, ponderosa pine, and western white pine species, where available. However, this does not mean that all trees of these species would be reserved in these areas.

The group selection harvest would be a combination of thinning and regeneration. This regeneration system would be implemented specifically for regenerating whitebark pine in openings and would include thinning to provide a more favorable environment for existing whitebark pine in the matrix. Keane et al. (2010b) suggested that nutcracker openings of 1 to 5 acres and even up to 30 acres be created to mimic patchy, mixed-severity fires, which are favored by nutcrackers to cache whitebark pine seeds.

Where adequate site preparation is achieved, natural regeneration would be expected to occur. A variety of species would likely become naturally established. Likely, these species would primarily be shade-intolerant pioneer species, such as lodgepole pine and western larch. Some shade-tolerant species could become established on sites where moisture and seed sources are adequate (e.g., Engelmann spruce and subalpine fir).

Artificial regeneration would focus on hand planting of western larch, ponderosa pine, and blister rust resistant western white pine and whitebark pine. Planting of ponderosa pine would be limited to those sites where it is believed ponderosa pine would be able to successfully compete with other species and would likely be limited to more xeric areas or micro environments. At elevations above 5,500 feet, planting would generally be limited to phenotypic rust-resistant whitebark pine.

Due to variations in seed source, periodicity, and unpredictability of adequate seed crops (Burns et al. 1990) and direct manipulation of species composition, artificial regeneration is planned for some areas (Table 33, Hand Planting). The actual number of acres planted would depend on post-harvest stand conditions and the results of reforestation surveys and needs. The number of acres planned for regeneration treatments by alternative are displayed in Table 35. Table 36 displays the number of acres where species conversion would occur.

**TABLE 35. REGENERATION TREATMENT BY ALTERNATIVE IN THE BEAVER CREEK PROJECT AREA.**

| REGENERATION TREATMENT WITH COMMERCIAL COMPOTENT | ALTERNATIVE 2 (ACRES) | ALTERNATIVE 3 (ACRES) |
|---|---|---|
| Seed Tree with Reserves | 428 | 94 |
| Clearcut with Reserves | 16 | 16 |
| Group Selection (approximately 20% of units regenerated and 80% commercially thinned) | 333 | 110 |
| Total Acres of Regeneration Treatment | 777 | 220 |

**TABLE 36. ACRES REGENERATED BY COVER TYPE WITHIN THE BEAVER CREEK PROJECT AREA.**

| CURRENT COVER TYPE | ALTERNATIVE 2 (ACRES) | ALTERNATIVE 3 (ACRES) |
|---|---|---|
| Lodgepole Pine Acres Regenerated | 408 | 125 |
| Subalpine Fir Acres Regenerated | 22 | 7 |
| Douglas-fir Acres Regenerated | 45 | 0 |
| Western Larch Acres Regenerated | 36 | 0 |
| Total | 511 | 132 |

Regeneration surveys would be conducted post treatment to assess regeneration success and species composition.

Stand-improvement treatments would include pre-commercial thinning and daylighting. Generally, the stands where pre-commercial thinning is proposed are dominated by lodgepole pine. Where possible, pre-commercial thinning treatments would favor long-lived, shade-intolerant, fire-resistant species. This may have none to considerable effects on species composition depending on the current composition of the stand. A variety of existing situations exist in proposed areas. Some areas have nearly pure species composition, and other areas are mixed. In general, where western larch and lodgepole pine exist together, western larch would be the favored species.

Daylighting treatments above 5,500 feet would generally focus on releasing whitebark pine by removing shade-tolerant species and lodgepole pine within approximately 20 to 30 feet of a whitebark pine. This would decrease the proportion of shade-tolerant species and lodgepole pine in relation to whitebark pine within those units. Daylighting treatments on other units would remove competition from around legacy trees, favoring western larch, ponderosa pine, western white pine, and Douglas-fir.

Fill planting would focus on hand planting of western larch, ponderosa pine, and blister rust resistant western white pine and whitebark pine. Planting of ponderosa pine would be limited to those sites where it is believed ponderosa pine would be able to successfully compete with other species and would likely be limited to more xeric areas or micro environments. At elevations above 5,500 feet, planting would generally be limited to rust-resistant whitebark pine. These treatments would increase the proportion of these preferred species over lodgepole pine and shade-tolerant species.

**TABLE 37. VEGETATION RESTORATION TREATMENTS WITHOUT COMMERCIAL COMPONENT.**

| STAND IMPROVEMENT/FILL PLANTING WITHOUT COMMERCIAL COMPONENT | ALTERNATIVE 2 (ACRES) | ALTERNATIVE 3 (ACRES) |
|---|---|---|
| Pre-commercial Thinning | 882 | 552 |
| Daylighting | 82 | 70 |
| Fill Planting | 329 | 329 |
| Total | 1,293 | 951 |

Within vegetation treatment units where underburning would occur, it would most likely kill some of the remaining seedlings and saplings and thin-barked species, such as spruce, true firs, and lodgepole pine

The direct and indirect effects to species composition from the wilderness burns proposed in both Alternative 2 and 3 would largely depend on where and how the fire burns. A variety of fire intensities are anticipated ranging from low to high intensity. All of the tree species present within the project area have differing relative fire-resistance levels. Of the major species present, western larch, ponderosa pine, and Douglas-fir are considered very resistant, whitebark pine and lodgepole pine are thought to be moderately resistant, and Engelmann spruce and subalpine fir are considered to have low or very low resistance (Fischer et al. 1987). Where high intensity fire is experienced, it is possible that all species would be killed by fire or that only the most resistant would survive. Under low or moderate intensities, more resistant species would survive and result in an associated shift in species composition. Even moderately resistant species can survive low severity fires. Barrett (Barrett 2008) confirmed this while noting live whitebark pine with multiple fire scars in the Mission Mountains. Subalpine fir is likely to be most affected by fire due to its low resistance level and crown form characteristics.

Advanced regeneration of most all species would likely be killed by all but the lowest fire intensities. This is due to their small size and associated thin bark, the presence of full crowns often reaching the ground, and the close proximity to surface flames.

There is the potential for increased representation of early seral pioneer species if stand-replacing fire intensities create ideal site preparation and conditions. Natural regeneration of primarily shade-intolerant pioneer species would be expected. This is likely to include western larch and lodgepole pine at the lower to mid elevations and lodgepole pine and whitebark pine at the upper elevations.

Fire adaptive strategies and mutualistic relationships would also promote the establishment of lodgepole pine and whitebark pine. Serotinous cones of lodgepole pine retain large numbers of viable seeds that are released when heat from fire opens the cones (Burns et al. 1990). Whitebark pine often recolonizes following fire due to seed dispersal by the Clark’s nutcracker. Essentially all whitebark pine regeneration comes from unclaimed nutcracker caches. Nutcrackers prefer open sites with many visual cues for seed caching, which are often found in burned stands after mixed- or stand-replacement fires (Keane et al. 2010a). Here whitebark pine is able to grow relatively free of competition.

Whitebark pine is rapidly declining throughout its range. This has been attributed to three major factors; epidemics of mountain pine beetle, white pine blister rust infection, and exclusion of fire and successional replacement by more shade-tolerant species, especially subalpine fir (Keane et al. 1993, 1996). Although the purpose of the wilderness burns is not whitebark pine restoration, the proposed burning parallels some recommended whitebark pine restoration treatments. Keane and Arno state that “maintenance of native fire regimes is the single most important management action to ensure conservation of whitebark pine.” In addition, Keane states “the most important management action for conserving and maintain vital whitebark pine ecosystems is to allow fires to burn in wilderness areas and play a more natural role in the ecosystem” (Fryer 2002). Kilgore and Heinselman (Kilgore et al. 1990) also feel that conservation of whitebark pine may be impossible without reintroduction of fire to wilderness areas. Planting of rust resistant whitebark pine seedlings is also felt to be critical to successful restoration of whitebark pine.

## FOREST STRUCTURE

Forest structure would be affected by the proposed intermediate harvests, regeneration harvest, and associated treatments. Table 33 above quantifies the acres of each of these treatments by alternative. This quantification can help serve as a comparison of the effects to forest structure between alternatives. Both the effects to horizontal and vertical structure will be discussed.

Intermediate harvests would modify existing forest structure primarily through density reduction. The treatment descriptions above provide a generalized description of the target residual stand density following treatment. Essentially, the number of trees that are currently growing within an area proposed for intermediate treatment would be reduced. By reducing the number of trees on a given area, the spacing between tree stems and crowns would be increased.

The post treatment within stand tree distribution would vary based on the existing stand condition, proposed treatment, and management objectives. In commercial thinning, and pre-commercial thinning areas, a variety of distributions would be expected. Variability in tree distribution can be expected in most situations, with some areas having lower densities with relatively even spacing of residual trees, and other areas having small clumps of trees with higher densities. This would largely be determined by the existing stand conditions, with species, size, and crown class being the most influential factors in reserve tree distribution. In some of the proposed commercial thinning areas, tree distributions would be expected to be relatively homogenous with trees spaced at regular intervals. This would be the case where the treatment objective is to reduce stand mountain pine beetle hazard. Sturdevant (2010) indicated that mountain pine beetle-attacked trees often occurred in clusters and that the hazard rating for stands with clumpy distributions was increased. More discussions regarding the effect to mountain pine beetle hazard are discussed below.

Vertical structure would be affected through the selective removal of crown classes. As discussed, thinning from below would target lower crown classes first. This would feature a more pronounced and defined single-storied canopy comprised of dominant and codominant trees.

Due to the increases in multi-storied vertical structure previously cited by Barrett, Freedman and Habeck, and Arno (Arno 1996; Barrett 1998; Freedman et al. 1985), an increased representation of single-storied structures would add some diversity to the landscape.

Intermediate treatments would also result in immediate larger average stand diameters. Typically, the suppressed and intermediate trees have smaller diameters than the dominant and codominant trees. By removing the smaller diameter trees, mathematical average stand diameters would increase.

By removing a portion of the density, growing space would be made available to the remaining trees. Increased growing space and decreased competitive stress for nutrients, water, and sun light would result in improved, growth, vigor, and resiliency to disturbance (Oliver et al. 1996; Smith et al. 1997). Considerable research has been conducted to explore this belief, considering variables, such as species composition, age, and geographic location. When looking at the response of trees to partial cutting in western Montana, Schwalm et al. (2002) found that height and diameter growth increased in residual trees of ponderosa pine, Douglas-fir , western larch, and lodgepole pine. Filip et al. (1989) observed increases in growth and vigor following thinning of western larch for trees both with and without larch dwarf mistletoe infection. Although sometimes small and negated by increased mortality following harvest, Dahms (1971) saw positive growth responses in older lodgepole pine. At a site on the Lolo National Forest south of the analysis area, research has indicated improved physiological performance of 300+ year old ponderosa pine and western larch following restoration cutting and burning treatments (Fiedler 2004; Harrington 2004; Sala et al. 2004).

Regeneration treatments would replace the existing forest structure as opposed to intermediate modifications. Clearcut with reserves and seed tree with reserves are proposed in both Alternative 2 and 3. These treatments would have a variable effect on the short- and long-term effects to forest structure. Although the number of reserve trees would vary by treatment (see treatment descriptions in Chapter 2), initially the treatments would result in a single-storied structure with variably distributed overstory trees. The reserve trees would exist above small seedlings and other vegetation. Over time, the seedlings would grow into saplings, then poles, then larger trees. Following this progression, a two-storied stand structure would become apparent. This condition would be less pronounced in the clearcut with reserve treatments, due to the lower number of reserve trees.

The group selection treatments and daylighting would result in effects that are a combination of both intermediate and regeneration treatments. The matrix thinning would mimic the results from intermediate treatments, and the actual groups would be essentially mini clearcuts. The daylighting would remove trees in a 20- to 30-foot radius around legacy trees, defined as a tree, usually mature or old-growth, that is retained on a site after harvesting or natural disturbance to provide a biological legacy (Helms 1998). Both of these treatments would provide for within-stand spatial heterogeneity in terms of horizontal and vertical structure.

Resiliency refers to the capacity of a community to maintain or regain normal function and development following a disturbance (Helms 1998). Forest resiliency is related to disturbance agents, forest structure, and applies to multiple scales including: the individual tree level, the stand level, and the landscape level. The effects to forest resiliency from the action alternatives will be discussed relative to fire and mountain pine beetle.

In terms of resilience to fire, forest structure is directly related to wildland fuels and potential fire behavior. Recent emphasis on fuels management has led to studies focusing on the effects of manipulating forest vegetation, fire hazard, and behavior. It has been found that reduced stand densities, retaining larger-diameter fire-resistant species, managing surface fuels, and increasing height to live crowns has had positive effects on tree and stand survivability, decreased crown fire activity, decreased surface fire potential, and decreased fire severity (Agee et al. 2005; Graham et al. 1999; Omi et al. 2002; Skinner 2002; USDA 2003). The Fire and Fuels Section of this EA contains more detail related to forest structure and fire behavior.

Standing dead trees (snags) and down woody material are significant components of the overall forest structure. These elements are specifically important to wildlife habitat and nutrient cycling. Forest Plan Amendment 21 includes standards for retention of these elements. The standards include numbers of snags and amounts of down woody material by potential vegetation group. All proposed treatments would be designed to meet these standards. Amounts of down woody material may be expressed as tons per acre. Tons per acre are a commonly and easily measurable specification. Existing snag densities and down woody amounts may be less than Amendment 21 standards due to stand conditions. Where feasible and needed to comply with Forest Plan standards, live trees would be left for snag recruitment, and activity-generated slash would be used to supplement existing down woody material. Some snags may be felled to mitigate safety hazards (See Snag and Down Wood Associated Species for more information).

Understory trees also appreciably add to the forest structure. In most situations, these trees would be cut to achieve fuel management and site-preparation objectives. This treatment is referred to as slashing. Often, smaller understory trees act as ladder fuels providing an opportunity for fire to move from the forest floor to the tree crowns. One of the primary benefits these trees would provide is to serve as hiding cover for various wildlife species. Therefore, when not acting as ladder fuels, understory trees may be left to provide hiding cover and structural diversity.

Where underburning would occur, it would most likely kill some of the remaining seedlings and saplings and thin-barked species, such as spruce, true firs and lodgepole pine.

The direct and indirect effects to forest structure from the prescribed wilderness fires would largely depend on where and how the fires burn. As mentioned in the above discussion on forest composition, a variety of fire intensities are anticipated ranging from low to high intensity. All of the tree species present within the project area have differing relative fire resistance levels. Where high-intensity fire is experienced, it is possible that all sizes of trees would be killed by fire or that only the older most fire-resistant species would survive. This would result in openings with no or only a few live trees remaining. Of greater significance is the long-term positive effect that the proposed burns would have by creating a mosaic of diverse vegetative conditions across this portion of the landscape.

Eventually the effects to forest structure from all treatments would diminish. Because trees grow over time, stand densities would increase, tree crowns would expand, advanced regeneration would become established and continue to grow taller, fuels would accumulate, and crowns would become stratified through stand dynamics. Refer to the Temporal Bounds Section of this section of the EA for estimates on how long these effects may last.

## SERAL STAGE DISTRIBUTION

Regeneration treatments would affect seral stage distribution more so than intermediate treatments. Note that seral stages for this analysis were defined by size classes outlined previously.

Intermediate harvest treatments, especially thin-from below-prescriptions, would have an effect on the age class distribution within the treatment areas. As has been previously discussed, these treatments would have effects on the average residual stand diameters and on residual stand radial growth. It is impossible to measure these increases until after harvest, but the following can be expected. It would be unlikely that immediate changes in average stand diameters would increase significantly enough to alter an area's classification into a particular seral stage. It would be likely that increases in average stand diameters, coupled with expected increases in radial growth following treatment, would reduce the time required for an area to shift from early-seral to mid-seral or from mid-seral to late-seral stages.

Regeneration harvest would immediately affect an area's classification into seral stages. This is because existing mid-seral and late-seral areas would be converted to early seral stages. It should be noted that the majority of areas proposed for regeneration are dominated by lodgepole pine (Table 35), and all of these areas have been classified as mid seral. However, some of these areas may be in later stages of succession development for the species, yet lodgepole pine diameters rarely reach the 15-inch size used to define late-seral conditions in this analysis. Table 38Table 38. Acres Converted to Early Seral Stage within the Beaver Creek Project Area. quantifies the number of acres where this conversion would occur by alternative.

The direct and indirect effects to seral-stage distribution from the prescribed fires would largely depend on where and how the fire burns. As mentioned, a variety of fire intensities are anticipated ranging from low to high intensity. All of the tree species present within the project area have differing relative fire-resistance levels. Of greater significance is the long-term positive effect that the proposed burns would have by creating a mosaic of diverse seral stages across this portion of the landscape.

**TABLE 38. ACRES CONVERTED TO EARLY SERAL STAGE WITHIN THE BEAVER CREEK PROJECT AREA.**

| EXISTING SERAL STAGE | ALTERNATIVE 2 (ACRES) | ALTERNATIVE 3 (ACRES) |
|---|---|---|
| Mid Seral | 435 | 107 |
| Late Seral | 59 | 16 |
| Total Acres Converted to Early-Seral Stage * | 494 | 123 |

*The discrepancy between the total acres in this table and Table 35 and Table 36 is due to VMap classifying small areas within the units as sparsely vegetated or the average diameter as less than 5 inches.

## INSECT AND DISEASE CONDITIONS

The effects to forest insect and disease conditions associated with the action alternatives would be discussed relative to the major insect and diseases observed within the analysis area. Tree damage (including windthrow) associated with the proposed activities would also be discussed as it can affect the insect and disease conditions. Here again, Table 33 helps to compare the effects between alternatives.

In general, proposed activities could have both positive and negative effects relative to forest insect and disease conditions. Decay associated with tree damage and increases in bark beetle populations associated with windthrow would be two potential negative effects, while increased resilience to insect and disease agents would be a potential positive effect.

Damage to trees as a result of logging would be more common in intermediate harvest than regeneration harvest, due to higher residual stand densities. This damage typically includes stem abrasion from skidding and yarding equipment, crown damage as a result of adjacent tree felling, and root damage from logging equipment. These wounds create ideal entrances for decay organisms (Hunt et al. 1962). Black (2005) also cites references to logging damage increasing tree susceptibility to insects and disease. See the Table 16 - Design Criteria for measures to address tree damage from logging during implementation.

Prescribed burning, including pile burning, associated with fuels treatments could affect insect and disease conditions. Where residual trees exist and are exposed to fire, there is the potential for tree damage and mortality (primarily in fire-intolerant species such as lodgepole pine), as a result of burning. If trees are damaged and stressed, they can become more susceptible to successful attacks from insects. This is commonly observed where Douglas-fir bark beetles and stressed residual Douglas-fir trees exist. This situation would be rare within the Beaver Creek Project Area based on residual species composition and planned treatments.

When stand density is reduced, residual trees can become more susceptible to windthrow. These effects could vary by tree species, tree size and age, residual stand density, and site. Some generalities can be made regarding the risk of damage associated with windthrow. Of the tree species likely to be reserved, western larch and ponderosa pine are considered to be more windfirm than Engelmann spruce, lodgepole pine, or Douglas-fir primarily due to rooting habits (Burns et al. 1990). Where high water tables or rocky soils exist, windthrow would be more likely due to shallow rooting depths (Koch 1996). Younger trees grown in dense stands are susceptible to windthrow when densities are reduced. Larger trees grown under low densities or where their crowns have been exposed to winds are relatively windfirm. The highest probability for windthrow associated with the action alternatives would be with intermediate harvesting of lodgepole pine dominated stands and where regeneration harvests would create leeward edges where lodgepole pine dominates (Koch 1996). Suggestions to mitigate windthrow associated with lodgepole pine have been offered by Koch (1996), Schmidt et al. (1986), and Alexander (1975).This information would be considered and incorporated where feasible during implementation of this project.

A positive general effect from the proposed treatments is related to the previous discussions regarding increased growth and vigor of residual trees following harvest and subsequent resiliency to insect and diseases. Black (2005) and Dix et al. (2006) acknowledge studies where thinning has increased vigor and, in turn, made trees less susceptible to insect attack.

#### MOUNTAIN PINE BEETLE

The effects to mountain pine beetle conditions associated with the action alternatives would primarily relate to susceptibility. Previous effects discussions of mountain pine beetle conditions for the No Action Alternative and the existing mountain pine beetle conditions are relevant to the effects for the action alternatives. It should be noted that this project was not designed to attempt to alter mountain pine beetle populations within or adjacent to the analysis area. Research has shown that once an outbreak begins very little can be done to affect beetle populations. Attempts at direct control of mountain pine beetle numbers once an outbreak begins have proven largely ineffective (Amman et al. 1998; Black 2005; Fettig et al. 2007). Population numbers appear to be dictated by the extent of suitable forest conditions, regardless of direct control efforts.

Susceptibility to attack from mountain pine beetle would be affected by the action alternatives. Stand conditions that are ideal for mountain pine beetle population growth include larger average lodgepole pine diameters, high stand density (both basal area and trees per acre), the proportion of density that is lodgepole pine, stand age, and elevation (Amman et al. 1977; Pederson 2006). Proposed silvicultural treatments would affect these attributes at varying levels. A substantial body of literature exists that supports the theory that silvicultural manipulation is an effective means of increasing resiliency, reducing stand susceptibility, and associated losses. Fettig and others (Amman et al. 1998; Dix et al. 2006; Fettig et al. 2007; Gibson 2004) summarize the literature that supports the effectiveness of silvicultural control of bark beetles. Much of the research points to two silvicultural strategies that have shown promise -- one at the landscape level and one at the stand level.

At the landscape level, heterogeneity is thought to be more resistant and resilient to insect damage. Silvicultural treatments designed to create age, size, and species mosaics could increase landscape heterogeneity and disrupt the continuity of bark beetle food supply.

At the stand level, evidence suggests that partial harvesting (thinning) could be an effective deterrent to mountain pine beetle infestation and associated losses. The specific reasons why these effects are seen in thinned stands is still uncertain, but likely related to increased tree vigor and/or stand microenvironments less favorable to mountain pine beetle. Despite this research, supporting the effectiveness of these strategies, some studies have also shown that at times mountain pine beetle populations become so large and aggressive that the effectiveness of these treatments is diminished or non-existent. In addition, effectiveness is reduced when treatments are done at a relatively small scale (e.g., single or few stands) amidst a large unmanaged landscape (Sturdevant 2010).

Intermediate harvests can be designed to alter stand conditions making them less attractive to the beetles (stand conditions, temperature, air movement, pheromone transport, etc.) (Amman et al. 1977; Dix et al. 2006; Fettig et al. 2007; Gibson 2004; Koch 1996). It has been seen that mountain pine beetle prefer larger trees; however, increased tree vigor, reduced stand density, and decreased proportions of lodgepole pine counter balance the effect of increased residual tree growth and average diameters in intermediate harvest areas.

It is possible to qualitatively discuss the effects of the proposed treatments to susceptibility by treatment and by alternative at both the landscape and stand level. Table 34, Table 36, and Table 37 can also be used to quantitatively compare effects. Regeneration treatments included in Alternatives 2 and 3 would inherently reduce stand susceptibility by removing all susceptible trees and establishing a new age class of trees. These areas would not exhibit conditions favorable to mountain pine beetle for many years, even if lodgepole pine was the primary species regenerated. Again, these treatments would also increase landscape-level heterogeneity by increasing age and size-class diversity within the analysis area.

Commercial thinning and improvement cutting treatments proposed in Alternatives 2 and 3 could reduce stand susceptibility by affecting species composition, density, tree vigor, and stand microenvironments. Where mountain pine beetle is a concern, proposed treatments would be designed to address stand hazard and create conditions less favorable for mountain pine beetle. Commercial thinning treatments in lodgepole pine dominated units would reduce stand densities to 80 square feet of basal area or less and residual trees would be relatively evenly spaced.

Schmidt et al. (2007) and Olsen et al. (1996) suggest that thinning to 80 square feet or less per acre is a way to reduce the intercompetition between trees and reduce mortality caused by mountain pine beetle and that mountain pine beetle-attacked trees often occurred in clusters and that the hazard rating for stands with clumpy distributions is increased.

Similar to the effects analysis for the No Action Alternative, FVS was used to determine post-harvest mountain pine beetle hazard rating for the stands previously modeled using the treatment descriptions to simulate the proposed activities. Activities were initiated in 2015 and then the stands were modeled for 50 years into the future. Twenty-six of the stands had the same prescription for both Alternative 2 and 3. Figure 26 displays the results of this modeling and illustrates that the hazard rating on seven of the common stands decreased after treatment and stayed at a low or moderate hazard rating, eight stands remained at a low hazard and three stands remained at a moderate hazard for the next 50 years. Two of the remaining eight stands increased from no hazard to a low hazard, one increased to a moderate hazard after 50 years and the remaining five stands did not increase to a high hazard until 30 to 50 years after treatment. It is expected that stand conditions and hazard ratings would change overtime as stands age, densities increase due to growth, and understory vegetation redevelops. Detailed information associated with this modeling is available in the project file of this analysis.

Of the three stands modelled that had different prescriptions between Alternative 2 and 3, stand 225030018 in Unit 252 had the same results between a seed tree with reserves and improvement cut, with both decreasing the mountain pine beetle hazard rating to low for the next 50 years. Both seed tree with reserves treatments in Alternative 2 for stands 225010184 and 225010189, in Units 89 and 62 respectively, reduced the hazard to a low rating while in Alternative 3, an improvement cut initially maintained the rating at moderate, but spiking in 30 years before dropping back down to a moderate rating, and a commercial thin only reduced the rating to moderate for 50 years.

It is expected that stand conditions and hazard ratings would change overtime as stands age, densities increase due to growth, and understory vegetation redevelops. Detailed information associated with this modeling is available in the project record of this analysis.

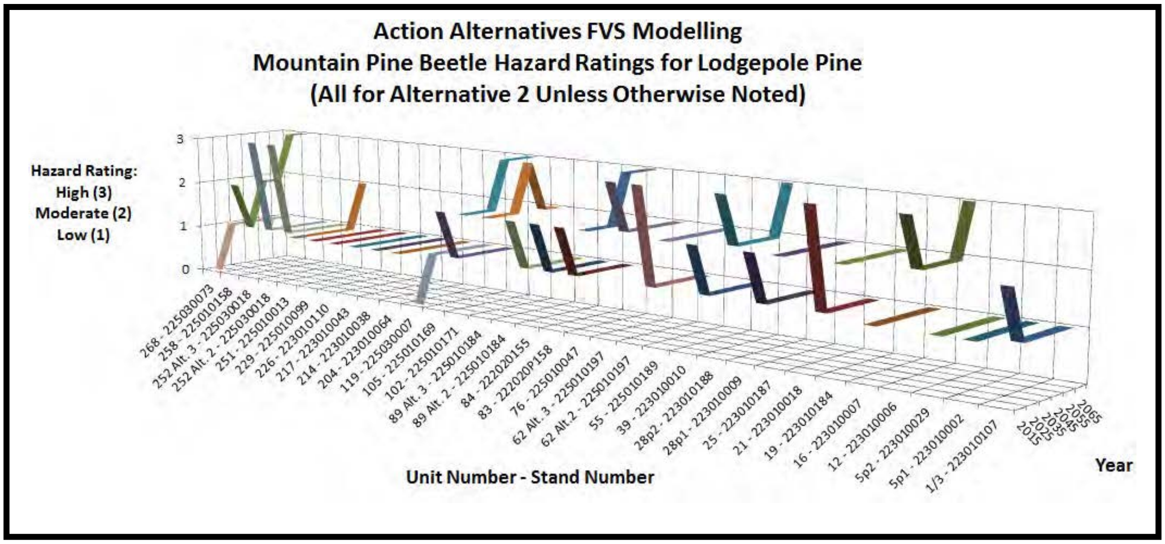



**FIGURE 26. FVS MOUNTAIN PINE BEETLE HAZARD RATINGS FOR ALTERNATIVE 2 AND 3.**

Although mountain pine beetle is an aggressive bark beetle, it is not typically attracted to fire-injured trees. Population increases following prescribed burning are not expected. It is possible that some additional tree mortality may occur within the burn areas as burning may add additional stress to susceptible species. However, large increases in mountain pine beetle numbers are not likely, as is often associated with other bark beetles, such as Douglas-fir beetle and spruce beetle. Although Douglas-fir beetle and spruce beetle were not observed in the analysis area, there is the potential for increased activity following proposed burning. Increases from low-level endemic populations or migration into the analysis area are possible if burning stresses susceptible species and creates ideal attractive conditions.

Effects to lodgepole pine would ultimately affect mountain pine beetle within the analysis area. Due to its relative low resistance to fire, it is possible that the proposed burning would kill a significant percentage of the lodgepole pine. This could in turn affect mountain pine beetle by limiting the available food supply within the analysis area and, thus, reducing mountain pine beetle occurrence. An additional potential effect would be direct fire-related mountain pine beetle mortality. If stand-replacing fire intensities burn lodgepole pine trees infested with mountain pine beetle, it is possible that the beetles within those trees would die as a result. However, this potential scenario would have no impact on overall beetle populations. Of greater significance would be the long-term positive effect that the proposed burn and expected fire effects would have by creating a mosaic of diverse vegetative conditions across this portion of the landscape.

### WHITE PINE BLISTER RUST

The effects to white pine blister rust from the action alternatives would primarily be limited to regeneration and introduction of genetically rust-resistant trees through planting. Some severely infected trees may be removed through intermediate and regeneration harvests; but for the most part, where western white pine and whitebark pine are found, they would be retained. Restoration activities for whitebark pine include prescribed fire, planting, and mechanical treatments, the latter includes creating nutcracker openings (1 to 30 acres), group selection, thinning, girdling, daylighting, and fuel enhancement treatments (Keane et al. 2012). A majority of those restoration treatments are proposed in both action alternatives. See Table 33 for acres of regeneration and planting by alternative. White pine blister rust resistant western white (below 5,500 feet in elevation) and whitebark pine (above 5,500 feet) seedlings would be included in the seedlings planted. It is hoped that over time, resistance would be maintained in the gene pool.

Thinning can greatly alter the micro-environment by increasing air movement that would lower the relative humidity and raise the temperature, thus reducing the chances for whitebark pine blister rust infection (Schwandt et al. 2013). Although thinning can mitigate blister rust impacts and reduce the risks of fire and beetle attack, it could compromise other tactics. Thinning decreases self-pruning of lower branches and, thereby, increases the frequency of lethal infection (Schwandt et al. 1994; Schwandt et al. 2013). Also, Ribes spp. may be stimulated by opening up the canopy or reduce the screening of dispersing spores (Zambino 2010).

Prescribed burning, though it would open up the canopy and provide a suitable environment for seedling establishment, could also create a more favorable environment for white pine blister rust's alternate hosts (Zambino 2010).

The effects of the proposed burning to white pine blister rust are likely less direct. Infected whitebark pine trees may be killed by fire, yet this would not eliminate the pathogen from the area since the basiodospores that infect trees are produced on alternative hosts (e.g., *Ribes, Pedicularis, Castilleja* spp.) and can travel up to 8 kilometers (Keane et al. 2012). Because the cone producing trees have survived blister rust exposure for many years, their offspring that establish post-fire would likely have a higher level of resistance than the original population. Site preparation from burning will improve opportunities for nutcracker caching of seed from these trees, and along with planting of phenotypic rust resistant seedlings, would reduce the percentage of infected trees on the site.

### LARCH DWARF MISTLETOE

The proposed actions would affect the spread and intensification of larch dwarf mistletoe in both intermediate and regeneration harvests. The impacts of larch dwarf mistletoe could be effectively reduced through silvicultural treatments that emphasize the removal or killing of infected branches or trees (Forest Health Protection and State Forestry Organizations 2004). Larch dwarf mistletoe is an obligate parasite and once host trees are killed (through cutting) the mistletoe would die. Several factors influence the spread of larch dwarf mistletoe including vertical structure and infestation levels. In general, both regeneration harvests and intermediate harvests would prioritize the removal of infested western larch and promote single-storied structures that would reduce spread when compared to multi-storied stands with no treatment (Beatty et al. 1997).

However, Jackson et al. (2006) found that overstory removal and thinning of infected western larch led to improved residual tree growth; these actions negatively affected the spread and intensification among thinned trees.

There are situations where retention of larch dwarf mistletoe infected trees would be anticipated, which could result in increased spread and intensification. This situation would likely occur in, but may not be limited to, Unit 36 where large diameter larch dwarf mistletoe infected trees exist. Here, these trees are highly valued for their structural contributions.

Infected western larch trees may be killed directly by fire, resulting in the death of the mistletoe plants on those trees. It is also possible that occurrences of larch dwarf mistletoe may increase following fire. This would be possible if post fire conditions favor the establishment of additional western larch seedlings and infected western larch survived in the overstory, which could in turn increase the chances of spreading the parasitic plant to the larch regeneration.

### WESTERN SPRUCE BUDWORM

Blackford (Blackford 2010) states, "Good budworm habitat consists of dense, multiple layers of climax host species." These species would be the true firs, Douglas-fir and Engelmann spruce, which the budworms most heavily attack. In general, both regeneration harvests and intermediate harvests would prioritize the retention of larch and pines (i.e., long-lived early-seral species), species more resistant to be attacked by budworm. The harvest treatments would also break up the horizontal and vertical continuity of the tree crowns. Thus, this would create habitat less suitable for the budworm.

Based on the previously discussed fire resistance levels of the existing tree species (Fischer et al. 1987), true firs and Engelmann spruce, as well as understory trees would be more apt to be killed by prescribed fire. This, too, would break up the horizontal and vertical continuity of the tree crowns. Thus, prescribed fire would also be more apt to create habitat less suitable to western spruce budworm.

### ROOT DISEASE

As discussed, root disease is a disease of the site that can persist for many years and has no cure. Forest management actions proposed in this project could have both positive and negative effects to root disease. Regenerating affected sites with susceptible species and partial harvests, which leave susceptible species, could intensify root disease by providing additional food bases for the disease to colonize. Managing for root disease tolerant species is one of the most effective and cost efficient means of addressing root disease (Hagle 2004). In all alternatives, root disease-tolerant western larch and pine species would be favored in both intermediate and regeneration harvest. Despite this focus, some susceptible species could be retained in intermediate harvests and naturally reproduce in regenerated areas.

The effects from prescribed burning to root diseases are expected to be minimal. Given the historical presence of fire and the considerable age achieved by root diseases, it is likely that they typically survive forest fires. Some limited direct effects may be seen in the first few inches below the ground surface. It is more likely that fire can facilitate the spread of root diseases as inoculum spread from fire burned trees (Hagle 2004). Alternatively, the proposed fires could create conditions favorable for early seral species such as western larch and/or pines. These species are generally less susceptible to root diseases than more shade-tolerant species (e.g., true firs), thus reducing the impacts of root diseases.

### COMPARISON OF EFFECTS ON FOREST VEGETATION BETWEEN ALTERNATIVES 2 AND 3

With the exception of a few units, the prescriptions are the same between common unit numbers in Alternatives 2 and 3, though the size of units may be smaller in Alternative 3 to improve wildlife connectivity. In Units 57, 62, 89, 99, 100, 114, and 252, the two alternatives have different proposed treatments. In Alternative 2, these units have regeneration treatments (seed tree w/reserves or group selection) proposed. In Alternative 3, intermediate vegetation treatments (commercial thinning or improvement cut) are proposed. These units are dominated by small diameter, lodgepole pine averaging 90-100 years old.

The regeneration treatments proposed in Alternative 2 would remove most if not all the lodgepole pine while retaining long-lived, fire-resistant, shade-intolerant species, such as western larch, ponderosa pine, western white pine, and sometimes Douglas-fir, for seed sources and/or structural diversity. Whitebark pine would also be retained in the case of group selection treatment. Regeneration would replace the lodgepole seed stock with western larch, ponderosa pine, western white-pine and occasionally Douglas-fir to improve the stands resiliency to fire and disease.

**FIGURE 27. UNIT 27 OF SUMMIT MOUNTAIN PINE BEETLE SALVAGE (2010)**

The intermediate treatments proposed in Alternative 3 would retain lodgepole pine since there are not enough trees of other species to retain and still maintain a stocked stand. These intermediate treatments, while providing some hiding cover and habitat connectivity, would limit the ability to restore the landscape to stands more resilient to fire, insect, and disease. The remaining lodgepole, once thinned would remain susceptible to mountain pine beetle infestation and would have an increased risk of blowdown because of shallow rootedness of lodgepole pine. This is evidenced by units in the 2009 Summit Mountain Pine Beetle Salvage Project being blown down following harvest. Figure 13 below shows Unit 27 of Summit Mountain Pine Beetle Salvage project where a commercial thin prescription was implemented in a lodgepole pine stand and the blowdown that occurred. The Summit Mountain Pine Beetle Salvage Project is located across the Swan Valley from the Beaver Creek Project and has similar settings, such as lodgepole pine dominated stands and similar elevations.

## ALTERNATIVES 2 AND 3 – ACTION ALTERNATIVES CUMULATIVE EFFECTS

Past, current, and reasonably foreseeable actions on all lands within the analysis area were evaluated when considering the cumulative effects to forest vegetation associated with the action alternatives. Past actions that have affected the vegetation resource include forest management and other activities within the analysis area. These activities are described in detail in the Existing Conditions Section of this section and provide the baseline vegetation conditions.

As with the cumulative effects discussion for Alternative 1 - No Action Alternative, when considering the cumulative effects of the action alternatives, the direct and indirect effects previously discussed would apply, in combination with current and reasonably foreseeable activities. The activities that discernibly affect forest vegetation are identified in the cumulative effects worksheet (Project File Exhibit I-1).

## FOREST COMPOSITION

The cumulative effects to forest composition from the action alternatives, current, and reasonably foreseeable overstory removal harvest and continued fire suppression only differ in scale from the effects described in the direct and indirect effects discussion.

Some cumulative effects to forest composition could be expected from future forest management on private lands. It is difficult to predict the effects of these treatments to forest composition because prescriptive parameters are unknown. It is possible that these treatments could increase representation of a single species or group of species by favoring them for removal or retention. Again, however, this is unknown at this time.

## FOREST STRUCTURE

The cumulative effects to forest structure are similar to the direct and indirect effects of the action alternatives. Continued fire suppression, relatively low levels of current or foreseeable forest management, and land development are the only activities that could cumulatively affect forest structure.

Timber management on private lands would likely decrease densities, modify average stand diameters, modify vertical structure, and alter fuel arrangements. Prescriptive specifics are not known so it is difficult to predict effects more precisely.

## SERAL STAGE DISTRIBUTION

Aside from the proposed actions, little current or reasonably foreseeable regeneration (either natural or human caused) is expected.

## INSECT AND DISEASE CONDITIONS

Again, the cumulative effects to forest insect and disease conditions are similar to direct and indirect effects of the action alternatives when considering other current and reasonably foreseeable activities.

There are possibly some exceptions to this. Depending on stand and insect and disease conditions, private forest management treatments could have either positive or negative effects. A possible positive effect is creating conditions that are not favorable for insect population growth or the spread of diseases depending upon if resistant species are retained on site. Potential negative effects are increased risk of windthrow, increased residual tree damage, and increased mortality from root rot diseases if susceptible species are retained on site. This is hard to assess not knowing these conditions or the management emphasis of the treatments.

## CUMULATIVE EFFECTS FROM ALL PAST, CURRENT, AND FUTURE ACTIONS

Cumulatively, all past actions affecting forest vegetation established the current existing conditions for the Forest Vegetation Resource as described in the Affected Environment Section. This condition was determined by analyzing remote sensing data, GIS datasets, historical accounts, agency databases, ecological evidence, and site visits.

The effects to forest vegetation from current and foreseeable activities, including the proposed action, were incorporated into the cumulative effects analysis. Here again, these effects were assessed by review of databases, GIS, and remote sensing data, stand dynamics models, professional judgment, personal knowledge, site visits, and relevant research and reports.

The findings of this analysis conclude that all past, current, and reasonably foreseeable activities within the Beaver Creek Project Area would not cumulatively alter the findings of effects to forest vegetation disclosed in the Beaver Creek Landscape Restoration EA. Although some current and reasonably foreseeable activities would measurably affect forest vegetation; they were not of sufficient magnitude to create noticeable changes, negative trends, or threats to the overall Forest Vegetation Resource.

# EFFECTS OF A FOREST PLAN AMENDMENT TO ASSIGN MANAGEMENT AREAS TO ACQUIRED LANDS

The Beaver Creek Project includes a Forest Plan Amendment to assign interim management areas (MAs) to approximately 5,457 acres of former PCTC lands acquired by the U.S. Forest Service to be managed as part of the Flathead National Forest. These interim management areas will be in effect on acquired lands until the ongoing Forest Plan Revision effort is completed, anticipated in 2 years.

Alternative 1- No Action Alternative proposes not to assign management areas to acquired lands although forest-wide standards and guidelines will continue to apply to all NFS lands on the Flathead National Forest.

Alternative 2 proposes to assign 55 acres of acquired lands to MA 2, 8 acres of acquired lands to MA 5, 2,312 acres to MA 11C, 320 acres to MA 12, 2,033 acres to MA 15, 712 acres to MA 15C, and 17 acres to MA 17. These proposed MA assignments were made in consideration of the characteristics of the acquired parcel and the management direction on surrounding lands. Table 11 describes the management emphasis for each of these MAs, but lands assigned to MA 5, MA 11C, MA 15, MA 15C, and MA 17 are considered suitable for timber production, while MA 2 and MA 12 are considered unsuitable for timber production although management activities may occur to benefit other resources.

Alternative 3 proposes different management area assignments to reflect public concern about the scenic integrity of lands on the east side of Lindbergh Lake. To accomplish this, Alternative 3 assigns MA5 instead of MA15 on approximately 502 acres of acquired land on the east side of Lindbergh Lake to maintain or enhance the scenic quality of these lands when viewed from Lindbergh Lake. Although MA5 will allow for timber harvest to occur on these lands, it will emphasize the maintenance of a natural appearing landscape where management activities are not evident.

Acquired lands within the project area will continue to be managed for the following desired future conditions under Alternative 1, 2, and 3:

- Manage landscapes to attain the 75 percent range around the median amount of old growth that occurred historically, including recruitment of additional old growth where needed from appropriate mid-seral stands and prescribed treatments within existing old growth where current conditions pose a major or immediate threat.
- Maintain or actively restore landscape composition, structure, and patterns to a condition similar to that expected under natural disturbance and succession regimes.
- Manage landscape composition and patterns to reduce the risk of undesirable fire, insect, and pathogen disturbances.
- Where fuel conditions or fire regimes have been significantly altered, manage to restore the historical fire regime and reduce risk of undesirable fire events.
- Stand-level objectives for all seral stages include maintaining dominance of shade intolerant species such as western larch, ponderosa pine, and western white pine.

Forest wide standards and guidelines put in place to protect other resources apply under all alternatives. The interim management areas proposed under Alternative 2 and 3 will provide guidance for the restoration activities proposed on acquired lands until the Flathead Forest Plan Revision is completed.

- **Forest Structure** – Assignment of management areas under Alternative 2 or 3 will allow for improvement of forest structure on lands previously managed for industrial timber production. This will likely improve tree vigor, fuel arrangement, and allow for gradual improvement of forest resiliency. The difference between Alternative 2 and 3 is that Alternative 3 will potentially lead to increased stand density on these lands above Lindbergh Lake if the MA direction associated with Alternative 3 remains in place longer than is anticipated with the revised forest plan process. This increased stand density could have reduced resiliency to insect, disease, and the effect of fire.
- **Forest Seral Stage** – Distribution of seral stages under Alternative 2 and 3 would be similar to the existing condition with eventual shifts into mid- and late-seral conditions on lands managed as MA5 because timber management will become less of an emphasis than scenic quality.
- **Forest Composition** – Assignment of management areas under Alternative 2 and 3 will allow for diversification of species composition in the project area where there is a lack of fire resilient species on acquired lands due to past management practices. The difference between Alternative 2 and 3 is that Alternative 3 will potentially lead to decreased proportions of long-lived, fire-tolerant, shade-intolerant species (primarily western larch and ponderosa pine) in areas assigned MA5 designation, if the MA direction associated with Alternative 3 remains in place longer than is anticipated with the revised forest plan process.
- **Forest Insect and Disease Conditions** – Assignment of management areas under Alternative 2 and 3 will allow for restoration activities to occur to address the forest insect and disease concerns described in this report.

The MA assignments proposed in Alternative 2 and 3 are consistent with the existing condition of these lands and the management direction assigned to adjacent lands and will not preclude future MA assignment under the Flathead Forest Plan Revision effort.

The cumulative effects of this forest plan amendment are very limited due to the geographic scope and expected duration of the amendment. At the Flathead National Forest scale, this amendment is only addressing management area direction on less than 1 percent of the NFS acreage on the Flathead National Forest. Additionally, the duration of this amendment is expected to be short-term since forest plan revision is ongoing with a decision expected in 2017. When the revision effort is completed, new management areas will be assigned across the entire Flathead National Forest, including the Beaver Creek project area, and will supersede any of the interim management areas proposed in this amendment. Reasonably foreseeable activities identified on the lands associated with the amendment is very limited as identified in Table 17 in Chapter 3 of this EA. If future land management activities occur on these lands they will be subject to forest-wide direction found in the Flathead National Forest Land and Resource Management Plan, federal and state laws, and other Forest Service regulations, as they are now, and will be guided by the proposed management area direction. Future land management activities such as timber harvest, road work, changes to public access etc. would be subject to site-specific NEPA analysis in the future.

# REGULATORY FRAMEWORK AND CONSISTENCY

## NATIONAL FOREST MANAGEMENT ACT (NFMA)

The NFMA and accompanying regulations require that several specific findings be documented at the project level and include the following:

## SUITABILITY FOR TIMBER PRODUCTION

The NFMA requires no timber harvesting shall occur on areas classified as not suited for timber production, except salvage sales, sales necessary to protect other multiple-use values, or activities that meet other objectives on such lands if the forest plan established that such actions are appropriate.

The silvicultural diagnosis process and the Forest Plan were used to determine that all areas associated with this project are suitable for timber harvest using the following criteria:

- Meet the definition of forestland.
- Technological feasibility exists to protect soil productivity and watershed protection. Forest Plan standards, project design criteria, and applicable BMPs will be used to protect these resource values.
- There is reasonable assurance that lands can be restocked within 5 years of final harvest.
- None of the areas considered for harvest have been withdrawn from timber production.

As stated earlier, all areas proposed for treatment are within MAs where timber harvest is allowed per Forest Plan direction.

## MAINTENANCE OF THE DIVERSITY OF PLANT AND ANIMAL COMMUNITIES

Forest Plan (including Amendment 21) goals, objectives, standards, and guidelines address maintaining a diversity of vegetation and habitats across the forest to meet a variety of wildlife species and to provide for sustained yield of timber products. In addition to applying this Forest Plan direction, project designs prescribed by the Project Wildlife Biologist and Botanist also address plant and animal community needs.

## APPROPRIATENESS OF EVEN-AGED MANAGEMENT AND OPTIMALITY OF CLEARCUTTING

The NFMA directs that clearcutting be used only where "it is determined to be the optimum method." Other even-aged methods can be used where "determined to be appropriate." As stated in the Treatment Description Section of this EA, the silvicultural diagnosis process was used to evaluate and determine that clearcutting is the optimal treatment to meet management objectives where proposed. Other even-aged methods are proposed as they are most compatible with the disturbance regimes (refer to Disturbances – Fire earlier in this section) found in the analysis area and the adapted silvics of desired shade-intolerant species.

## NATIONAL FOREST MANAGEMENT ACT FINDINGS FOR VEGETATION MANIPULATION

All proposals involving vegetation manipulation of tree cover for any purpose must comply with the following requirements.

- Best suited to the multiple-use goals stated in the Forest Plan for the area with impact. All proposed treatments are consistent with multiple use Forest Plan direction and address the project purpose and need.
- Assure that the lands can be adequately restocked within 5 years. Previous regeneration harvests in the analysis area have been successfully stocked within 5 years. Regional reforestation indices also support that reforestation techniques have been successful and the 2005-2014 average 3-year survival of trees planted on the Flathead National Forest is 71.7 percent.

- Not chosen because they would give the greatest dollar return. Although timber harvest associated with this project would generate revenue, all treatments have been designed to meet project objectives not revenue generation.
- Be chosen after considering the effects on residual trees and adjacent stands. The effects to residual trees and adjacent stands were considered in the interdisciplinary development of this project. Residual tree protection measures are included in the design criteria of this EA.
- Be selected to avoid permanent impairment of site productivity and to ensure conservation of soil and water resources. The Soils and Aquatics Sections of this EA include protection and enhancement designs sufficient to ensure conservation of the resources.
- Be selected to provide beneficial effects to water quality and quantity, wildlife and fish habitat, regeneration of desired tree species, forage production, recreation uses, aesthetic values, and other resource yields. Following Forest Plan and MA direction, an ID Team considered all of these resources in the context of the surrounding landscape and the project as documented in the EA.
- Be practical in terms of transportation and harvesting requirements and total costs of preparation, logging, and administration. Standard ground-based and skyline logging systems and log hauling is prescribed for this project and has been determined to be practical for this project and a sale feasibility analysis has been conducted.

## FLATHEAD NATIONAL FOREST PLAN DIRECTION

As discussed in the Desired Conditions Section of this report, all planned activities are consistent with forest-wide and MA direction.

## NORTHERN REGION DIRECTION ON HARVEST OPENING SIZE

Forest Service Manual 2470, Section 2471.1, Region 1 Supplement 2400-2001-2 generally limits the size of harvest openings created by even-aged silvicultural methods (clearcut and seedtree harvests) to 40 acres or less. To exceed this size, Regional Forester approval is required except where natural catastrophic events have occurred. The Beaver Creek Project proposed action (alternative 2) would create 6 openings greater than 40 acres, some represented by a single harvest unit, others created from two or more units that are connected to each other. Openings would range from 41 to 103 acres (refer to Table 39 below). These openings would not be devoid of trees. They would contain from 5 to 15 trees per acre, scattered or clumped depending upon existing tree distribution. Table 39 below and Exhibit E-24 in the project file lists the nine proposed harvest units that form these openings and the rationale for the unit design, as well as a map of their location.

**TABLE 39. UNITS THAT CREATE OPENING SIZES EXCEEDING 40 ACRES.**

| UNIT | ALT. 2 TOTAL OPENING ACRES | ALT. 3 TOTAL OPENING ACRES | PROPOSED TREATMENT[1] | RATIONALE FOR EXCEEDING 40 ACRES AND OTHER NOTES[2] |
|---|---|---|---|---|
| 21 | 103 | | ST/R | Heavy past mortality to MPB; ongoing risk high. DMT in LP. Protect adjacent young sapling stands as well as patches within unit. Within WUI - Adjacent to PVT land. Concern with fire hazard and fuel loadings associated with stand conditions and past/ongoing mortality. Along gated/closed roads. RHCA buffer will break up the opening and with stand type refinements for sapling patches there will be a reduction in acres. Treat larger area now to reduce frequency of future entries. |
| 21 | | 67 | ST/R | Heavy past mortality to MPB; ongoing risk high. DMT in LP. Protect adjacent young sapling stands as well as patches within unit. Within WUI - Adjacent to PVT land. Concern with fire hazard and fuel loadings associated with stand conditions and past/ongoing mortality. Along gated/closed roads. RHCA buffer will break up the opening and with stand type refinements for sapling patches there will a reduction in the acres. Treat larger area now to reduce frequency of future entries. |
| 62 | 44 | | ST/R | Past and present mortality to MPB; ongoing risk high. LP has ~ 10-20% crowns and therefore unlikely to release. Some DMT in WL. Within WUI - Adjacent to PVT land. Concern with fire hazard and fuel loadings associated with stand conditions and past/ongoing mortality. Will need temporary road to access. Treat larger area now to reduce frequency of future entries. Implementation will likely reduce opening to less than 40 acres and RHCA buffer will break up opening. |
| 89 | 41 | | ST/R | Past and present mortality to MPB; ongoing risk high. LP ~ 100 years old and likely will not release or stand very long. Within WUI. Concern with fire hazard and fuel loadings associated with stand conditions and past/ongoing mortality. Along gated/closed roads. Treat area now to reduce frequency of future entries. Implementation will likely reduce opening to less than 40 acres. |
| 99<br>100<br>105 | 67 | | ST/R | Past mortality to MPB; ongoing risk is high. Some DMT in DF, WL and LP. AO in DF. Concern with fire hazard and fuel loadings associated with stand conditions and past/ongoing mortality. Along gated/closed road. Treat larger area now to reduce frequency of future entries. |
| 252 | 100 | | ST/R | Past mortality to MPB; ongoing risk is high. Concern with fire hazard and fuel loadings associated with stand conditions and past/ongoing mortality. Will need temporary roads to access. Treat larger area now to reduce frequency of future entries. |
| 259<br>260 | 70 | | ST/R | Past mortality to MPB; ongoing risk is high. Mature LP starting to die and fall over. Concern with fire hazard and fuel loadings associated with stand conditions and past/ongoing mortality. Will need temporary road to access for skyline operation. Treat larger area now to reduce frequency of future entries. Accessible for WbP plantings. |
| **Total Acres** | **425** | **67** | | |

[1] ST/R = Seedtree with Reserves
[2] Abbreviations: DF = Douglas-fir; LP = lodgepole pine; WL = western larch; AO = Armillaria root rot; DMT = dwarf mistletoe; MPB = mountain pine beetle; PVT = private; RHCA = riparian habitat conservation area; WUI = wildland urban interface

Many of the openings would be irregularly shaped or elongated, which reduces the potential impact of the opening to wildlife or visual appearance. All openings will meet grizzly bear hiding cover requirements such that no point in the units is greater than 600 feet to cover. All openings consist of lodgepole pine dominated forests that have been impacted by MPB or are at risk of infestation. These stands are deteriorating and restoring a vigorous new stand on the site is desirable to meet project objectives. Without treatment these areas would likely become forest openings in the future due to high mortality from MPB or windthrow.

Half of the openings are in the (WUI and reducing excessive existing or potential fuel loadings caused by high stand densities or high tree mortality rates is a primary reason for the treatments. Some of these units are very near or immediately adjacent to private lands and concerns about high fire hazard influenced the design of the units.

Alternative 2 contains six units greater than 40 acres and Alternative 3 contains one unit greater than 40 acres. Refer to Project File Exhibit I-9 for the maps and lists of units associated with these openings.

Regional direction requires a minimum 60-day public notice of openings over 40 acres in size. This will be accomplished through the public review of both the Beaver Creek Project EA and EA. Also, as required, at least 45 days before the NEPA decision is signed, the Flathead National Forest Supervisor will submit a recommendation to the Regional Forester for exceeding specified opening size limits. The necessary approval from the Regional Forester will be received prior to signing the NEPA decision.

# INVASIVE PLANT SPECIES

## INTRODUCTION

The introduction of non-native invasive plant species continues to reduce the ecological integrity and economic productivity of natural systems and agriculture on a worldwide basis. In the United States, it has been estimated that invasive species (both plant and animal) create more than $138 billion in losses each year nationally (USDA 2001c). Non-native invasive plant species, also called noxious weeds, invasive plants, or invasive species, have disrupted natural processes on nearly 100 million acres in the United States and are spreading at an estimated rate of 14 percent per year (USDA 2001c). On NFS lands, an estimated 6 to 7 million acres are infested and increasing 8 to 12 percent per year (USDA 1995a). These are plant species that are not native to a particular place and are disrupting the natural processes of that place (i.e., displacing native plants or animal species, degrading natural communities, changing hydrology, changing microclimatic features, increasing soil erosion, etc.). Non-native invasive species generally have no natural control in the place to which they are introduced, allowing them to spread aggressively and out-compete native plants and reduce overall native community biodiversity.

Forest Service Policy (EO 13112; FSM 2900) identifies prevention of the introduction and establishment of non-native plant species as an agency objective. This policy directs the Forest Service to:

- Determine the factors that favor establishment and spread of invasive plants,
- Analyze invasive species risks in resource management projects, and
- Design management practices that reduce these risks (USDA 1995a, 2001a, 2011a).

The desired condition inferred from EO 13112, FSM 2900, and the 2001 Flathead National Forest Noxious and Invasive Weed Control Environmental Assessment (NIWC EA) (Project File Exhibit U-5) and Decision Notice (NIWC DN) (Project File Exhibit U-6) is the prevention of new infestations (within the area where activities would occur or from the use of travel routes associated with those activities) and to manage the infestations currently established on the forest through control measures.

## ANALYSIS AREA

### SPATIAL BOUNDS

The spatial boundary of the analysis area for invasive species is the activity area that includes the boundary of the project area, the broadcast burn units, and those haul routes that lead into the project area. A baseline of existing infestations in the project area is provided. Analysis is based on the project's influence and impacts on the risk of introduction, spread, and establishment of invasive species within the project area. A 0.25 mile buffer on roads and treatment units is based on the average skid distance logging equipment can potentially move vegetation and soil.

### TEMPORAL BOUNDS

Project activities leading to soil disturbance and increased light would increase the risk of invasive plant introduction, spread, establishment, and persistence. Some shade-tolerant species, such as hawkweed, could persist indefinitely even after the canopy closes. The risk of invasive plant introduction and spread could occur immediately after activities begin, or until 5 to 10 years (average seed viability) after activities cease. The risk of invasive plant establishment and persistence could occur up to 50 years after implementation is complete, depending on native vegetation recovery. After 50 years, in the longest example, the overstory and understory tree and shrub canopy cover conditions would shade the ground and greatly reduce the risk of establishment and persistence by most invasive species (Kuropat 2009).

It is assumed that after the project is completed, the risk of introduction and spread due to project activities would be low. It is also assumed that after the canopy closes the risk of establishment and persistence would be low.

## INVASIVE SPECIES MANAGEMENT

The Flathead National Forest implemented the NIWC DN (Project File Exhibit U-6), which evaluated the effects of treating invasive plants. The objective of the NIWC DN was to implement an adaptive and integrated pest management strategy to control and reduce the presence of invasive species on the Flathead National Forest. Currently, inventory and treatment is prioritized by the Forest Weed Coordinator. The NIWC DN outlines factors for prioritization (Project File Exhibit U-6, pp. 6 - 7).

Methods used to prevent invasive species from being introduced and spreading into new areas include closing infested areas to travel, washing vehicles and equipment upon entering or leaving an area, and using weed-free seed and straw mulch for re-vegetation. Methods to control the spread of invasive species include prevention, treatment, and containment. Treatments, such as manual, mechanical, biological, and chemical methods, are generally limited to localized areas and Montana State listed invasive species (Montana Department of Agriculture 2013). Containment combines prevention and treatment with the objective of limiting spread of an existing infestation and reducing the acres of existing infestations by treating around the perimeter of the infestation.

Project activities require the use of roads that are on the landscape but are not needed for the long term, or after project activities cease. These roads are considered temporary and in the Beaver Creek Project Area some of these roads would be new construction and some would be built on historic templates. Temporary roads are authorized by contract, permit, lease, other written authorization, or emergency operation not intended to be a part of the forest transportation system and not necessary for long-term resource management (USDA 2002a, 2010). Use of temporary roads is only for short term, non-recurrent purchaser use and generally not needed for future recurrent management (USDA 2014a). The historic road prisms in this project area are generally roads that were once part of a transportation system that were previously decommissioned or were roads that were constructed for an unknown management purpose and were not fully rehabilitated after activities.

The seeding of temporary roads as a conservation measure to reduce invasive species infestations has been occurring on the Flathead National Forest for the past 30 to 40 years. Desirable non-native mixes of grasses and forbs have primarily been used. Native grasses and forbs have been used only recently. Observations of some of the temporary roads constructed in the last 30 to 40 years indicate some success in the prevention of infestation in the road corridors. Sun-loving species, such as knapweed, are not as abundant as the native and non-native grass and forb seed mixes on these old roads. However, shade-tolerant species, such as hawkweed, Canada thistle, and oxeye daisy are often abundant along these old temporary roads. There is no information on the circumstances of how these old roads were built or rehabilitated to make inferences on how invasive species became established in these old road beds. When temporary roads are rehabilitated and returned to the land base, any infestations that occurred during construction become inaccessible for inventory and treatment efforts, leaving those infestations to spread from the former road prism. Observations of historic roads built over 50 years ago indicate that plant communities on some roads may recover with the encroachment of forest vegetation in the abandoned road template. Prevention measures were most likely not implemented during these older harvest operations. The Flathead National Forest now implements an integrated invasive species management process, which includes prevention methods, such as equipment cleaning and spraying prior to and post operations to reduce seed set.

## DATA SOURCES, METHODS, AND ASSUMPTIONS USED

The Flathead National Forest uses the Montana Noxious Weed List (2013) to identify which invasive species to manage across the Forest, as well as a weed risk assessment (WRA) project in the Northern Region coordinated between TNC and the Forest Service (The Nature Conservancy et al. 2003). The WRA identified species that pose a threat to native vegetation in addition to Montana's state weed list.

As project areas are surveyed during each field season, new infestations are inventoried. Data for the Beaver Creek Project invasive species analysis were primarily collected by surveys in 2013 and 2014 across 5,072 acres in the project area (100+ percent of the proposed harvest units, not including the broadcast burn-only units). The data are entered into the Natural Resource Management (NRM) database, an agency-wide corporate database for storing, managing, and retrieving data on soils, geology, geomorphology, vegetation, wildlife, and climate. From this database, the Forest Botanist can retrieve invasive plant infestation data to create a GIS layer for environmental analyses. There are still infestations that have not been entered into the NRM database; however, NRM has been updated with known infestations located between 2005 and 2014, which includes the project area.

## MEASUREMENT INDICATORS

All soil disturbing activities provide some level of risk for invasive species spread and establishment. Any habitat has a low risk of invasion, regardless of activities occurring in that area. Since this low risk is always present, this report only analyzes those areas that are at risk of spread, introduction, establishment, and/or persistence of invasive species through project-related activities.

**Direct effects** are the risk of spread/introduction of invasive species within the project area. These effects are the expansion or dispersal of current infestations as a result of project activities. They are measured by:

- The proximity of known infestations (within 0.25 mile) to proposed activities. Sites closer to known infestations and seed sources are more likely to become infested.
- The amount of travel through infestations spreading seed directly adjacent to infestation. This measure pertains to project-related activities and cannot be related to non-project traffic such as recreational vehicles or passenger cars, etc.

**Indirect effects** are the risk of establishment/persistence of invasive species within the project area. These effects are the likelihood that habitat becomes more suitable for the establishment and/or persistence based on project actions. They are measured by:

- The acres of harvest types affecting light availability by changing canopy cover. Sun-loving invasive species are able to establish and persist longer in units with increased light, and shade-tolerant invasive species would either be maintained or adapt to closing canopies.
- The acres of soil disturbance, based on harvest activity and miles of road projects. Disturbed areas are more likely to be colonized by invasive species.

As stated above, the **direct effects** in this analysis are measured by the proximity of known infestations to activities, and the amount of travel through infestations. These measures are closely related since travel through infestations can both spread and introduce invasive species. Vehicle travel through infestations can spread invasive plant seed along road corridors from short to long distances. Invasive plant seed can be introduced from a nearby infestation or a distant source, in soil clinging to off-road vehicles, passenger vehicles and logging equipment, or transported by other sources (i.e., birds, animals, wind) (Taylor et al. 2011; Von der Lippe et al. 2007). Wind-dispersed seeds can be moved by fast-moving vehicles without having to be physically attached. It is difficult to quantify the amount of traffic on highways, town roads, and NFS roads, although improved roads generally have more traffic than the unimproved roads.

The direct effects of road use are qualitatively analyzed based on maintenance level (ML). The maintenance level of a road indicates the type of traffic it can accommodate (USDA 2005). For example, ML 5 roads “provide a high degree of user comfort and convenience” and are normally paved surfaces like highways. Maintenance Level 4 roads “provide a moderate degree of user comfort and convenience at moderate travel speeds” and can generally accommodate two lanes of traffic. The road surface is generally aggregate, but sometimes paved. Maintenance Levels 4 and 5 are better road surfaces that accommodate almost any vehicle. These roads would have the greatest amount of traffic and, thus, the higher risk for invasive plant introduction and spread. Maintenance Level 3 roads are open, aggregate roads that can accommodate most passenger vehicles, although “user comfort and convenience are low priorities.” Maintenance Level 2 is “for use by high clearance vehicles. Passenger car traffic is not a consideration.” These roads have a low volume of traffic. The lowest level, ML 1, is reserved for closed roads that can have any drivable surface but are not open for any use unless needed for project work or emergencies. The majority of these roads are not accessible during times of the year when the weather makes them dangerous or impassible, such as deep snow or during spring break-up when the roads are extremely muddy. However, even with low traffic flow, the risk of picking up invasive plant seed is higher, since most of these roads are overgrown or brushed-over with vegetation. The majority of the roads in the project area are ML 1.

Close proximity of infestations can increase the risk of introduction and spread. The risk of introduction is greater when project activities are located near an existing seed source. For example, invasive species like Canada thistle have wind-dispersed seeds, which can easily establish in freshly disturbed soil. The closer the infestation is to the disturbance, the greater the quantity of seed and the higher the rate of establishment.

Indirect effects are measured by changes in habitat that make it more suitable for invasive species to establish and/or persist. They can be measured by the amount of soil disturbance and the availability of light after vegetation removal. Measures of indirect effects can be related to the proximity of infestations since the risk of establishment and persistence in an area is higher if there is a nearby seed source.

Soil disturbance does not necessarily lead to increased rates of spread of invasive species, but can create favorable conditions for establishment of invasive plants (Christen et al. 2006). The removal of native vegetation and the compaction of the soil, which restricts native plant growth, allow invasive species to invade unchallenged (Trombulak andFrissell 2000). Soil disturbance prepares the ground for colonizing plant species by removing the native vegetation and duff layer and exposing mineral soil. If seeds are introduced, they can germinate more readily in disturbed soil than if the soil surface was intact (Silveri et al. 2001). If an area is already infested, disturbing the soil can expose dormant seeds, allowing them to germinate. Activities associated with timber harvesting, road construction, maintenance and reclamation, temporary road construction, and fire suppression all disturb the soil.

The soil disturbance estimates in this analysis are based on detrimental soil disturbance surveys collected by the Forest Soil Scientist; however, all soil disturbance that expose fresh soil or the dormant seed bank is considered at risk for infestation. Although measurements of non-detrimental soil disturbance are not available, detrimental disturbance calculations provide a minimum estimate of disturbance for each alternative. Where there is detrimental disturbance, it is assumed that there is an associated and relative amount of non-detrimental disturbance. See Soils Section in this EA for more information. When referring to soil disturbance in this invasive plants analysis, the author is generally referring to all soil disturbance.

Light availability is a crucial factor in plant growth. An increase in the amount and duration of light availability can increase the risk of establishment and persistence of certain “sun-loving” species. Invasive species like spotted knapweed thrive in open conditions. Some species, such as hawkweed, thrive in both sun and shade. Other species like Canada thistle can survive on the forest edge without penetrating into deep shade. Depending on the species and the harvest activity, an area can either be susceptible to an infestation or can resist an infestation.

Light conditions can be measured by the acres of thinning and regeneration harvest types. Clearcut and seed tree harvests allow more light onto the forest floor, increasing the risk of spread, establishment, and persistence. Only when the canopy closes would sun-loving invasive species be unable to thrive. If the light conditions are increased near an infestation of sun-loving species, the risk of spread is higher than in a clean area, and light conditions may encourage establishment into suitable habitat. Once an infestation is established, it may persist for a long time, provided that vegetation conditions remain favorable. However, as vegetation conditions change, the infestation may die back. For example, tansy ragwort may invade a burned area and establish, but once the canopy recovers, the infestation would not persist. Forest edges created by the more intense harvest types would have a risk of establishment/persistence by edge species or species that can survive in both shady and sunny environments. Acres of harvest types and the proximity and/or presence of infestations will help to determine risk of introduction/spread and risk of establishment/persistence.

## RISK DETERMINATION CRITERIA

The determination of risk of weed spread, introduction, establishment, and persistence is based on several criteria. There is no National, Regional or Forest guidelines that describe risk to a project area. The following tables define some criteria for low, moderate, and high risk.

Before defining risk criteria, it is imperative to understand what factors contribute to invasive plant infestations in a project area. As discussed above, there are four functions of weed movement where effects can be identified. For each function, there are a variety of factors that contribute to that function.

Determining the risk of weed introduction, spread, establishment and persistence requires criteria that come from the proposed project activities. Below are primary risk criteria for each level determination. However, there may be more criteria that factor into a determination that may be specific to a particular project. The final determination will be identified and justified at the end of the invasive plant species analysis.

**TABLE 40. FACTORS CONTRIBUTING TO WEED MOVEMENT IN A PROJECT AREA.**

| Introduction | Spread | Establishment | Persistence |
|---|---|---|---|
| Proximity to main roads | Amount and timing of activity | Substrate preparation | Silviculture prescription |
| Number of roads and amount of traffic | Proximity to infestations | Soil disturbance | Soil disturbance |
| Type/amount of machinery | Type/amount of machinery | Proximity of infestations | Re-establishment of native vegetation |
| Location and amount of recreation | Amount of activity in infested units | Removal of native vegetation<br>Timing of activity<br>Revegetation activity | Weed control efforts (including biocontrol) |

**TABLE 41. DEFINITIONS OF RISK CRITERIA BASED ON CONTRIBUTING FACTORS.**

| LOW | MODERATE | HIGH |
|---|---|---|
| Little to no soil disturbance by machinery; hand methods. No temp roads. | Soil disturbance by machinery; skyline, tractor, skidding. Few temp roads to be recontoured. Detrimental disturbance <7%. | Soil disturbance by logging activities, skidding long distances, temporary roads built/opened with some or no rehab in frozen conditions or not; no recontouring. |
| Planned revegetation (trees and shrubs) | Planned revegetation (trees and shrubs) | No revegetation or only seeding of roadsides. |
| No or few NFS main roads near or in the project area | One NFS main road nearby or accessing project area | Many roads, both closed and open; multiple main roads accessing area |
| Little or no traffic (closed roads or admin use only) | Traffic common (roads are open) | Traffic regular and with speed; illegal motorized use is known in the area |
| Little or no recreation (no developed sites); little used trails or dispersed sites. | Recreation, such as non-motorized trailheads, boat access, dispersed camping; some private lands nearby | Recreation, such as popular trailheads (horse and/or motorized use), dispersed and developed campsites, boat access; large amounts of nearby private lands with easy access to NFS lands; industrial timber lands intermixed in the project area. |
| Very few existing infestations or none near activities | Infestations are common and within 0.25 miles of proposed activities | Densely infested along trails, roads, in proposed areas, on privately owned or industrial timber lands |
| Winter/Spring activities | Timing of activities not modified | Timing of activities not modified or planned for late summer/fall |

# AFFECTED ENVIRONMENT

## HISTORICAL CONDITION

During the mid to late1800s, non-native invasive species rapidly established in the northwest United States due to settlement related to agriculture, importing of goods at main sea ports, timber production, and livestock grazing (Parks et al. 2005). Exotic seed and plant material were transported with grain and feed, as well as dumped with ballast water along the shore at major port entries. However, mountainous regions have relatively fewer invasive species than lowland regions, owing to the large amount of public land and reduced access to these areas. As a result, there are not as many people settling in these areas and the rate of introduction and spread are not as high as in more populated areas. However, invasive species have become established in these relatively isolated areas and often dominate landscapes. Locally, the rate of establishment and spread has been influenced by timber harvest, road building, grazing, and recreation. Most of these activities began on a large scale in the 1960s on the Flathead National Forest. Some roadless areas remain relatively invasive-free because of healthy undisturbed native plant communities where few vectors exist to spread invasives.

The Flathead National Forest has been less affected than many other public lands since most invasive species are best adapted to grasslands, shrub lands, and warmer/drier forest types than those that exist here. However, the Forest has many roads, landings, clearings, gravel pits, trails, campgrounds, private inholdings, and other areas that are disturbed and highly susceptible to infestation.

## EXISTING CONDITION

Invasive species considered in this analysis are those listed as noxious by the State of Montana, as well as other non-native species determined to be highly invasive by the Forest (Montana Department of Agriculture 2013). Currently, there are about 10,433 separately recorded invasive plant infestations on the Flathead National Forest, comprised of 30 invasive species on approximately 26,000 infested acres. The majority of these sites are in road corridors, gravel pits, and log landings. In the Swan Valley, many infestations were found on the acquired PCTC lands.

The main vector for spread are vehicles, (road maintenance equipment, logging vehicles, and passenger cars, and trucks), although the seeds of many species are also wind or animal dispersed. Eighteen of these species occur in the project area (Table 42). The most abundant invasive species in the project area are spotted knapweed, oxeye daisy, hawkweed complex, and Canada thistle. Please refer to Project Exhibit J-2 for species descriptions.

**TABLE 42. NON-NATIVE INVASIVE PLANTS FOUND WITHIN THE BEAVER CREEK PROJECT AREA.**

| SPECIES | COMMON NAME | SITES | INFESTED ACRES |
|---|---|---|---|
| Achilea nobilis | noble yarrow | 1 | T |
| Artemisia absinthium | common wormwood | 2 | T |
| Bromus tectorum | cheatgrass | 1 | T |
| Centaurea stoebe | spotted knapweed | 90 | 105 |
| Cirsium arvense | Canada thistle | 67 | 25 |
| Cirsium vulgare | bull thistle | 22 | 6 |
| Cynoglossum officinale | hound's-tongue | 7 | 1 |
| Hieraceum spp. | hawkweed | 40 | 32 |
| Hypericum perforatum | common St. John' s wort | 15 | 6 |
| Leucanthemum vulgare | oxeye daisy | 65 | 77 |
| Linaria vulgaris | yellow toadflax | 1 | T |
| Phalaris arundinacea | reed canarygrass | 9 | 1 |
| Potentilla argentea | silvery cinquefoil | 3 | 1 |
| Potentilla recta | sulphur cinquefoil | 16 | 3 |
| Ranunculus acris | tall buttercup | 2 | T |
| Tanacetum vulgare | common tansy | 7 | 1 |
| Tragopogon dubuis | yellow salsify | 1 | T |
| Total | | 349 | 258 |
| T=Trace not included in total, Infested acres are rounded to the nearest integer | | | |

The Swan Lake District has 38 percent of the infestations on the Forest (4,564 sites, 10,067 infested acres, 26 species). Much of the infested acreage is due to the patchwork of mixed ownership in the Swan Valley. Much of the land has, until recently, been owned by PCTC. The project area has less than 1 percent of the infestations on the Forest and less than 3 percent of the District's infestations.

Almost all of the infestations in the project area are on roadsides or are associated with roads. There are also many infestations that are in openings or under canopy cover. Many invasive species are sun-loving species. The exceptions are the hawkweed complex and Canada thistle, which can thrive under shaded conditions, as well as in sunny areas. Invasive species usually establish in disturbed areas where native plants are slow to re-establish. These disturbed areas are associated with road corridors, landing sites for timber harvesting, gravel pits, skid roads, and mechanical site preparation treatment on well drained or shallow soils, burned areas, and utility and railroad corridors. Historic road prisms which are on the landscape but not in the road system are often infested but are not inventoried or treated for weeds (unless found in a project area) due to the lack of documentation and accessibility. See Project Exhibit J-6 for infestation locations.

# ENVIRONMENTAL CONSEQUENCES

The action alternatives propose various amounts of harvest prescriptions and temporary road construction (Table 13). Of the two action alternatives, the Alternative 2 proposes the most vegetation management and temporary road construction, which would have a higher risk of weed introduction and movement across the project area than Alternative 3.

## ALTERNATIVE 1 – NO ACTION ALTERNATIVE
## DIRECT AND INDIRECT EFFECTS

There would be no activities and, therefore, no direct or indirect effects that would change the existing condition. Non-native invasive species would continue to persist at their current rates and could increase through natural means of spread (animals, wind, water) or by humans (vehicles, ATV/OHVs, road maintenance), but not as a result of the No Action Alternative.

Alternative 1 carries the least amount of risk for invasive species introduction, spread, establishment and persistence, since there would be no entry into forested stands and no additional areas of ground disturbance. However, invasive species currently present within the project area could potentially spread into disturbed and undisturbed sites. Invasive species are well adapted to disturbed soils and open bare ground. Open roads serve as corridors for spread. Once seeds are dispersed to a new site, the habitat and local disturbance patterns can influence the establishment and persistence of invasive species. Because the No Action Alternative does not propose entry into recently disturbed areas and no additional ground disturbance related to this project, the risk of introduction, spread, establishment, and persistence for invasive species in the project area would be the lowest of all alternatives.

## ALTERNATIVE 1 – NO ACTION ALTERNATIVE CUMULATIVE EFFECTS

Since there would be no direct or indirect effects from Forest Service actions that could contribute to invasive species introduction or spread, there would be no cumulative effects from this project. Ongoing actions, such as annual road maintenance (mowing, grading, etc.), would still have the potential to affect invasive species. All infestations within the project area are eligible for treatment under the current invasive species control decision (USDA 2001b).

There are many areas of disturbed soils (roads, trails) and open bare ground across the Swan Lake Ranger District, which can provide habitat for invasive species. Most notably are the former PCTC lands, acquired through the Land and Water Conservation Fund (LWCF) and the Montana Legacy Project (referred to as Legacy Lands). Approximately 5,457 acres of former PCTC lands in the project area changed ownership between 1998 and 2012. Much of this land lacks adequate tree stock, but is abundant with invasive plants. There are large areas of private land in the project area that have also contributed to a changed landscape.

Past ground-disturbing activities, such as timber harvest and road construction and maintenance, have contributed to the spread of invasive species in the area. Recreational and economic land uses (hunting, hiking, fishing, logging, firewood gathering, etc.) have also contributed to the spread of invasive species, since users and their vehicles can be vectors for seed spread. Wildlife has likely contributed to weed spread in the past by transporting seeds across the landscape. All these activities are likely to continue into the future.

For all alternatives including the No Action Alternative, there is the potential for wildland fire. A wildland fire within the project area could increase the risk of spread, establishment, and persistence of invasive species weeds in the project area. Wildland fire would expose bare ground that may be susceptible to invasive species establishment. The areas that would have a higher risk of spread following a wildland fire are adjacent to roads, recreation trails, and suppression activities.

## ALTERNATIVES 2 AND 3 DIRECT AND INDIRECT EFFECTS

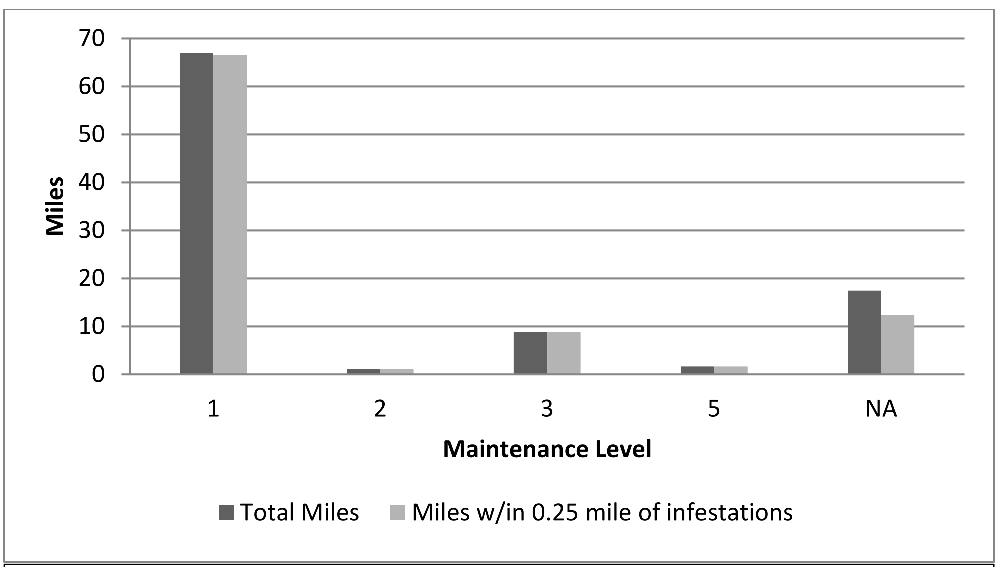
Chapter 2 (Table 13) describes the actions proposed for each alternative. Each action alternative contains various amounts of similar actions, such as timber harvesting, temporary road construction, and resource enhancement projects. Below is a description of the direct and indirect effects of those action alternatives in regard to invasive species.

## PROXIMITY OF KNOWN INFESTATIONS

All units proposed for vegetation management in all action alternatives contain known infestations or are within 0.25 miles of an infestation (Project Exhibit J-6). The broadcast burn units in the wilderness are the only units not documented as not infested or near infestations. There is likely more than one occurrence of a species and more than one species in a unit. Most of these infestations occur in old road beds or active road corridors at the edge of the units, but many infestations occur within unit boundaries away from roads, either in openings or under canopy (Project Exhibit J-6). When vegetation recovers after activities cease, it can be assumed that any existing infestations of sun-loving invasive species would recede over time. Many invasive species, like spotted knapweed, cannot survive under closed canopies. However, some species like hawkweed and Canada thistle can grow under the canopy and would need treatment to control their spread. Infested open areas within units would most likely persist after activities cease unless controlled.

The infested units have a high risk of spread when heavy equipment moves through them, disturbing the soil and removing canopy cover. Units that are not currently infested but have infestations within 0.25 mile of their unit boundary puts these units at a high risk of introduction, most likely by equipment or machinery transporting seed from another unit or nearby infestations along the road. Alternative 2 proposes over 1,000 acres more of harvesting than Alternative 3, which would have less risk of introduction and spread.

Nearly all of existing road corridors (system and non-system roads; Forest Service and other ownership) in the analysis area either contain or are within a 0.25 mile of an infestation (Figure 28). The private roads have not been inventoried since they are on private lands, although they are still in the project area. There are likely more road prisms on the ground than in the GIS layer, and there are likely more infestations along roads that have not yet been inventoried. For example, weed infestations may be present where temporary roads have been constructed and rehabilitated.




Maintenance Level (ML): 1 – Basic Custodial Care (Closed); 2 – High Clearance Vehicles; 3 – Suitable for Passenger Cars; 4 – Moderate Degree of User Comfort; 5 – High Degree of User Comfort (i.e. Hwy 83); NA – Not Applicable (historic, decommissioned, or private roads not assigned a ML)

**FIGURE 28. TOTAL MILES OF EXISTING ROADS AND MILES OF EXISTING ROAD WITHIN 0.25 MILES OF AN INFESTATION IN THE BEAVER CREEK PROJECT AREA.**

## AMOUNT OF TRAVEL THROUGH INFESTATIONS

Travel through infestations is difficult to quantify, even without considering non-project activity like passenger vehicle travel, bicycles, horses, OHV use, and wildlife vectors. Seeds could be transported in soil clinging to equipment and could later drop into an un-infested or “clean area,” spreading or introducing an invasive species. The ML of a road can indicate the type of travel a certain road can accommodate. The higher clearance of a vehicle that is necessary to pass over a road could indicate less traffic over that road surface. Maintenance Level 1 does not have traffic, as is the case with some ML 2 roads. Maintenance Levels 3 through 5 would presumably have more traffic since they are easier to travel. To reduce spread and introduction, if feasible, contractors should harvest clean units prior to infested units. In many cases, invasive species, such as knapweed, could encompass all the travel routes in the area, which then invade roads that are required for project activities. In these cases, the infestation is so severe that there is no practical way to treat it or avoid it. The majority of the roads in the project area are ML 1 (Figure 28). Although they are not currently traveled, they are likely infested from past activities. Alternative 2 proposes to use approximately 38 miles of ML1 roads, 1 miles of ML2, and 8 miles of ML3, while Alternative 3 proposes to use approximately 31 miles of ML1 roads, 1 mile of ML2 roads, and 8 miles of ML3 roads for project activities. Opening these roads to project activities would increase the amount of travel through infestations, spreading seed along the travel route.

Some the proposed temporary road templates would be constructed on existing road templates that are not part of the NFS road system. These existing road templates are already infested. In areas of new road construction, there are infestations within 0.25 miles of proposed construction, especially on parent roads. There would be a high risk of moving seed from the infested parent roads down the proposed temporary roads and introducing invasive species to natural areas. All temporary roads would be rehabilitated after harvesting; however, the amount of time that these roads are open allow for weeds to establish and spread. The infestations would likely be spreading and inaccessible for treatment by the time that temporary roads would be rehabilitated (up to five years after construction). The main vector for introduction in the action alternatives would be vehicle use and the movement of equipment from site to site. The timber sale contract specifies that all off-road equipment would be cleaned before entering NFS lands to prevent new invasive species from entering the forest but it does not specify cleaning equipment between units or operating in clean units before operating in infested units. The use of dedicated skid trails would minimize the risk of spread across units by keeping soil disturbance to dedicated tracks. Alternative 3 has fewer miles of temporary road proposed than Alternative 2 resulting in Alternative 3 having less of a risk of weed introduction and spread than Alternative 2.

## SOIL DISTURBANCE

Soil disturbance indirectly affects establishment of invasive species by providing suitable habitat. Invasive plant seeds spread by equipment from unit to unit ideally could be limited by cleaning machinery between unit operations. Drifting seed establishes easier on disturbed soil than on intact soil. Project activities could detrimentally disturb up to 262 acres in Alternative 2 and 209 acres in Alternative 3 (See the Soil Section in this EA for more information). These estimates measure only detrimental disturbance. In regard to invasive species, all soil disturbance creates a suitable substrate for seed germination. Since it is infeasible to measure all soil disturbance for each unit and associated activities, it is assumed that the proposed activities have an associated amount of general soil disturbance along with the detrimental soil disturbance measures, which allows for the comparison of relative disturbance between alternatives.

The use of dedicated skid trails would minimize the risk of introduction and spread, as well as reduce the amount of soil disturbance across the treatment area. Excavator piling would cause ground disturbance and expose bare soil. Burning these piles would reduce native vegetation competition in those areas and expose mineral soil to create suitable conditions for invasive species. Burn piles often have high incidence of invasive species infestations due to initially removing native vegetation and the slow response of native plants to re-colonize. Although severe burning sterilizes the soil of most of its nutrients, native vegetation seems to colonize “red soil" (severely burned soil) as well as it colonizes unburned soil (Hebel et al. 2009). However, while invasive species establishment is greatly reduced in nutrient-poor areas compared to greater nutrient sources, they still out-compete native vegetation and establish and persist for long periods of time. Chipping, lopping, and scattering fuel material across the unit would carry less risk for the establishment and persistence of invasives than burning slash piles. Alternative 3 would have less soil disturbance as a result of project activities and, therefore, would have a lower risk of establishment for invasive species than Alternative 2.

Temporary roads would be built for unit access, and portions of the existing road network would be used to implement this project, in both action alternatives. These activities include new temporary road construction and reclamation, road maintenance and BMPs, and reconstructing historical road corridors for temporary access. These activities would create new ground disturbance for potential weed establishment, as well as disturb existing weed infestations along the existing templates. Alternative 2 proposes more temporary road than Alternative 3 (Table 13). Regardless of proposed rehabilitation activities, these road activities would disturb soil and existing infestations, which would change the landscape in those areas for the long term. Seeding, where necessary, would minimize the risk of establishment of invasive species (See Design Criteria, Table 16). Native or desired non-native species would compete with invasive species on disturbed soils of the rehabilitated temporary roads. Soil compaction and disturbance of native vegetation would still occur in the initial construction, despite rehabilitation. Over the long-term, the temporary roads would most likely have a mix of the seeded re-vegetation species, colonizing species from the surrounding vegetation, and invasive species.

Both action alternatives propose 4.5 miles of decommissioning of forest system roads. Road decommissioning options range from no ground-disturbing activities (passive restoration) to culvert removal and water bar construction (active/passive restoration). Refer to the Transportation Section for more details on road decommissioning methods. Decommissioning, although in the long term is beneficial to the landscape, can cause the movement of weeds on the landscape when the road template is disturbed. Passive restoration does not use equipment and has no soil disturbance, yet the road bed may be weedy and through decommissioning becomes inaccessible for weed treatment. Culvert removal and water bar construction keeps the template undisturbed for the most part, but again, makes the road bed inaccessible for weed treatment. The most useful decommissioning in regard to weed management is treating weeds ahead of implementation and then fully rehabilitating the road template, which may include recontouring, with extensive revegetation (generally with grass seed). Long-term access is not required for weed treatment in this scenario because of the de-compaction of soil, use of adjacent topsoil to inoculate the soil with biota, and providing native plant cover by seeding or planting, thereby preventing weed species from establishing or overwhelming the site. As long as native vegetation can dominate the weeds, treatment is not necessary. This scenario also provides the best chance of tree growth and fully integrating the prism back into timber production.

Intermittent Stored Service (ISS) is similar to decommissioning in regards to weed control and access. These roads stay on the system but have culverts removed and drainage features installed to protect the road surface from water damage. Without access, these roads may not be treated until the next time they would be opened for forest management. Prior to storage activities, these templates would be treated to reduce the seed set of weeds before ground disturbing activities and then seeded with an approved grass seed mix before installing barriers to provide ground cover. There is the same amount of roads proposed for ISS in both alternatives.

## LIGHT AVAILABILITY

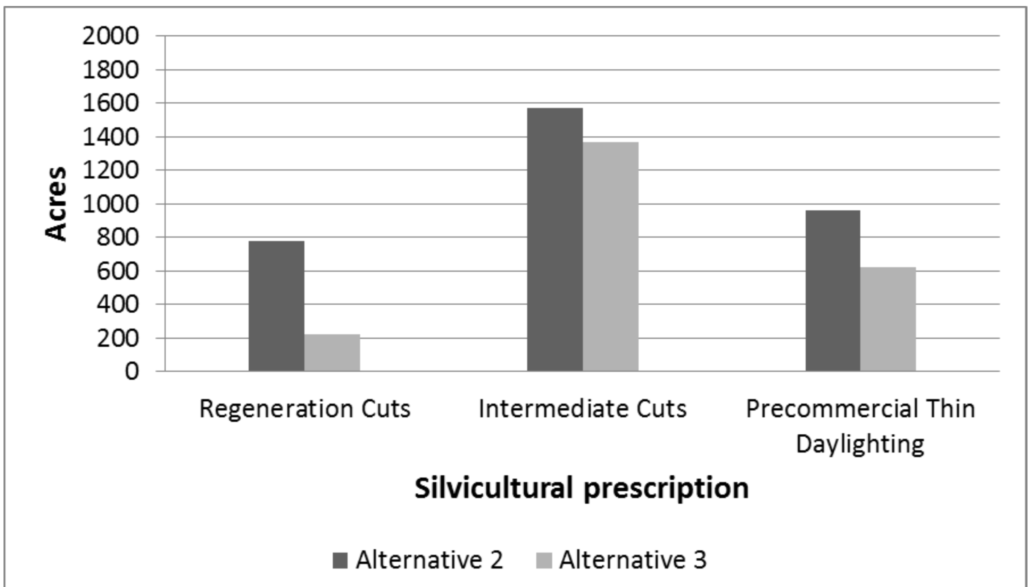
The short-term effect of logging would be that more light is let into the understory allowing the establishment of sun-loving invasive species due to the increase availability of suitable habitat. Eventually, as the overstory in a unit recovers following thinning harvests, invasive species requiring more open conditions may not survive, and the risk of establishment would be short-term. However, the longer the overstory remains open, as it would after regeneration harvests, the longer the habitat remains suitable for sun-loving species, and the longer the risk of establishment and persistence exists.

The amount of light reaching the forest floor can be controlled by the amount of canopy cover which is altered by canopy cover. Regeneration harvests such as clearcut, seed tree and group selection open up the canopy and leave less than 30 percent canopy (Project Exhibit J-7). Figure 29 shows how many acres each alternative would increase available light to the forest floor by harvest type. Regeneration harvests increase the risk of spread of invasive plants and allow introduced sun-loving and edge species to persist until the canopy closes. Regeneration units with nearby infestations would have a high risk of spread and establishment. Although the treatments in this project would contain reserves or leave trees, reserve and leave trees would not provide enough overstory to shade the ground and influence the understory.

Intermediate treatments like commercial thinning and improvement cuts leave 70 percent or less of the canopy, with an average of 40 percent canopy cover retained (Project Exhibit J-7). Commercial thinning does not have as high of a risk of sun-loving species spreading through the units as regeneration harvests; however, there is still a moderate risk of introducing and spreading sun, shade, and edge-tolerant species. Alternative 2 would have the greater increase in light availability of the two action alternatives.

While the closure of overstory could limit the duration of the risk of establishment and persistence for some sun-loving species, it could elevate and prolong that risk for shade and edge-tolerant species, such as hawkweed and Canada thistle, since these species could quickly colonize an area before the native vegetation has a chance to recover after activities cease. Currently, all harvest units within the project area are infested with at least one of these edge species or within a 0.25 mile of these species (Project Exhibit J-6).

Pre-commercial thinning and daylighting are considered intermediate treatments (Refer to Chapter 2), but they are also non-commercial treatments. Although they can be accomplished via mechanized equipment, they are often accomplished through hand treatments.




Remaining canopy cover by prescription: Regeneration Cuts include: Clearcut <5%; Seed Tree 5-10%; Group Selection 0-70% (average 30%). Intermediate Cuts include Commercial Thin 25-70% (average 40%), Improvement Cut 20-65% (average 40%); Pre-Commercial Thin 5-45%; Daylighting 40-65% (average 50%).

**FIGURE 29. HARVEST TYPES (RELATIVE LIGHT AVAILABILITY COMPARISON).**

Other activities, like tree planting, could also contribute to the risk of introduction and spread. Associated vehicles and personnel can be vectors for introduction and spread. However, planting activities would be short-term with minimal impact to the soil. In addition, planting conifers would assist in regeneration of native vegetation and reduce the risk of establishment and persistence of sun-loving invasive species when the canopy cover becomes established. The action alternatives each have an amount of revegetation (i.e., fill planting) (Table 13) that are not associated with commercial harvest activities. Revegetation would help fill in canopy cover and provide shade to the understory, reducing the risk for invasive plants to persist.

### Aquatic Restoration Activities

There are aquatic restoration activities proposed as part of both action alternatives. They have effects related to proximity, travel, and soil disturbance, to some degree.

In Alternative 2, one concrete fish barrier and a culvert replacement are proposed along the same stretch of a perennial tributary to Beaver Creek (See Chapter 2 and Chapter 3 - Aquatic Resources). Both of these activities would require travel through infestations and moving soil. In the case of the concrete fish barrier, an access route would be built for installation and then rehabilitated. Although there would be seeding, mulching, de-compaction and woody debris over the access route, NFS road 91202, which will be used to access the construction site, is heavily infested with several species. There would be a high risk of introduction and spread into the area disturbed by the construction of the barrier. The risk of establishment and persistence would depend on rehabilitation efforts. The second site (culvert replacement) is not currently infested, although there are infestations along the road to the site. There would be a moderate risk of weed infestation to that site, depending on revegetation efforts. Alternative 3 does not propose the construction of a concrete fish barrier and instead proposes a culvert replacement in a different location to serve as a fish barrier (see Aquatics Section of this EA for more details).

Both action alternatives propose a culvert replacement on NFS road 11636 to act as a fish barrier. The entire length of NFS road 11636 is heavily infested with spotted knapweed and oxeye daisy, along with a smattering of other invasive species. Existing infestations would be disturbed and moved around, possibly making the infestation denser. However, providing a culvert and consequently a road crossing over the tributary could allow access for weed treatment if the road remains accessible.

Another culvert replacement is proposed in both action alternatives on NFS road 906 to relieve chronic culvert blockage and the subsequent ponding, which is affecting the road's stability. Although this road is infested, those infestations are not very dense and have likely been knocked back since they were first inventoried. This is due to the forest weed program's efforts to treat major NFS roads. This road is open year round and is easily accessible to treat weeds, which means that any new or denser infestations as a result of replacing the culvert would be treated within a year of work.

## Alternatives 2 and 3 – Action Alternatives Cumulative Effects

Past, present, and reasonably foreseeable actions within the project area that have affected or would affect invasive species include timber harvesting, wildland fires and fire suppression, road construction, road maintenance and closures, recreation, forest products gathering, invasive species control, land development, special use permits, range/agriculture and other activities. The earliest activities considered in this analysis occurred in the 1920s and, until recently, past activities incorporated few or no actions to prevent the introduction and spread of invasive species. In general, past, present, and reasonably foreseeable activities with the greatest amount of ground disturbance, accompanied by a source of invasive plant seed, had and have the greatest risk of invasive plant introduction, spread, establishment, and persistence.

It is unknown when non-native invasive species became established within the analysis area. The earliest inventory date on the forest in the NRM Database is 2003, and the earliest chemical treatment record is from 1991, but there have been invasive species on the Flathead National Forest for much longer. Previous activities (timber harvest, road construction and maintenance, recreation, land development, agriculture, etc.) most likely contributed to the establishment and spread of invasive species. Since the establishment of invasive species is unknown and cannot be inferred from existing records, all infestations have been integrated into the existing condition.

## PROXIMITY OF KNOWN INFESTATIONS

The project area contains less than 1 percent of infestations across the Forest and less than 3 percent of the Swan Lake Ranger District's known infestations (Table 43). In relation to the rest of the Swan Valley, the Beaver Creek Project Area is relatively low in weed infestations. This is likely due to the large area of wilderness in the project area. There are areas of dense infestations where treatment options are limited or areas which are inaccessible. With more road templates built and harvesting equipment used in this project and future projects, infestations would continue to spread into adjacent natural areas. Infestations occurring in the project area could spread outside the project area to other parts of the District due to project activities. Seed would most likely drop closer to the project boundary than farther away, since equipment would travel over rough roads shaking loose mud and plant material. The two ML 3 roads in the project area would be the main haul routes, which are already treated for weeds under a previous decision (Project Exhibit J-8). Treatment units that would be accessed by currently closed roads may or may not be accessible weed treatment prior to activities.

**TABLE 43. NON-NATIVE INVASIVE SPECIES FOUND FOREST-WIDE IN THE BEAVER CREEK PROJECT AREA. (T=TRACE NOT INCLUDED IN SUMS)**

| SCIENTIFIC NAME | COMMON NAME | FOREST ACRES | DISTRICT ACRES | PROJECT ACRES |
|---|---|---|---|---|
| **PRIORITY 1A – NOT PRESENT IN MONTANA** | | | | |
| Centaurea solstitialis | yellow starthistle | 0 | 0 | 0 |
| Isatis tinctoria | dyer's woad | 1 | 0 | 0 |
| **PRIORITY 1B – LIMITED PRESENCE IN MONTANA** | | | | |
| Chondrilla juncea | rush skeletonweed | 0 | 0 | 0 |
| Cytisus scoparius | Scotch broom | 0 | 0 | 0 |
| Lythrum salicaria, L. virgatum | purple and wandlike loosestrife | 0 | 0 | 0 |
| Polygonum cuspidatum, P. sachalinense, P. polystachyum | Japanese knotweed complex | 1 | 0 | 0 |
| **PRIORITY 2A – COMMON IN ISOLATED AREAS IN MONTANA** | | | | |
| Berteroa incana | hoary alyssum | 4 | 1 | 0 |
| Echium vulgare | blueweed | 0 | 0 | 0 |
| Hieracium aurantiacum | orange hawkweed | 2,846 | 432 | 8 |
| Hieracium caespitosum, H. floribundum, H. piloselloides, H. pratense | yellow hawkweed complex | 1,835 | 496 | 24 |
| Iris pseudacorus | yellowflag iris | T | T | 0 |
| Lepidium latifolium | perennial pepperweed | 0 | 0 | 0 |
| Ranunculus acris | tall buttercup | 36 | 17 | T |
| Senecio jacobaea | tansy ragwort | 520 | 1 | 0 |
| **PRIORITY 2B – ABUNDANT AND WIDESPREAD IN MONTANA** | | | | |
| Butomus umbellatus | flowering rush | 0 | 0 | 0 |
| Cardaria draba | whitetop | 0 | 0 | 0 |
| Centaurea repens | Russian knapweed | 0 | 0 | 0 |
| Centaurea diffusa | diffuse knapweed | 0 | 0 | 0 |
| Centaurea stoebe | spotted knapweed | 6543 | 3244 | 105 |
| Cirsium arvense | Canadian thistle | 3576 | 1460 | 25 |
| Convolvulus arvensis | field bindweed | 5 | 4 | 0 |
| Cynoglossum officinale | hound's-tongue | 266 | 141 | 1 |

**TABLE 43. NON-NATIVE INVASIVE SPECIES FOUND FOREST-WIDE IN THE BEAVER CREEK PROJECT AREA. (T=TRACE NOT INCLUDED IN SUMS)**

| SCIENTIFIC NAME | COMMON NAME | FOREST ACRES | DISTRICT ACRES | PROJECT ACRES |
|---|---|---|---|---|
| Euphorbia esula | leafy spurge | 2 | 0 | 0 |
| Hypericum perforatum | St. John's-wort | 2,500 | 441 | 6 |
| Leucanthemum vulgare | ox-eye daisy | 4,582 | 2,319 | 77 |
| Linaria dalmatica | Dalmatian toadflax | 5 | 2 | 0 |
| Linaria vulgaris | yellow toadflax | 133 | 15 | T |
| Myriophyllum spicatum | Eurasian water milfoil | 0 | 0 | 0 |
| Potamogeton crispus | curlyleaf pondweed | 0 | 0 | 0 |
| Potentilla recta | sulphur cinquefoil | 519 | 290 | 3 |
| Tanacetum vulgare | common tansy | 326 | 161 | 1 |
| Tamarix spp. | salt cedar or tamarisk | 0 | 0 | 0 |
| **REGULATED PLANTS – NOT LISTED AS NOXIOUS IN MONTANA** | | | | |
| Bromus tectorum | cheatgrass | 30 | 12 | T |
| Hydrilla verticillata | hydrilla | 0 | 0 | 0 |
| Eleagnus angustifolia | Russian olive | 0 | 0 | 0 |
| **ADDITIONAL INVASIVES OF CONCERN FOR THE FLATHEAD NATIONAL FOREST** | | | | |
| Achillea nobilis | noble yarrow | 15 | 3 | T |
| Arctium minus | common burdock | 1 | 1 | 0 |
| Artemisia absinthium | common wormwood | 274 | 99 | T |
| Campanula rapunculoides | creeping bellflower | 1 | 1 | 0 |
| Carduus nutans | musk thistle | T | T | 0 |
| Cirsium vulgare | bull thistle | 879 | 185 | 6 |
| Euphorbia species | spurge (all) | 0 | 0 | 0 |
| Phalaris arundinacea | reed canarygrass | 763 | 677 | 1 |
| Potentilla argentea | silvery cinquefoil | 82 | 47 | 1 |
| Tragopogon dubuis | yellow salsify | 346 | 18 | T |
| **TOTAL** | | **26,090** | **10,067** | **258** |

## AMOUNT OF TRAVEL THROUGH INFESTATIONS

The continued use of roads in the project area increases the risk of introduction and spread of invasive species over time. Although vehicles traveling unpaved roads seem to have a higher risk of transporting seed from one site to another than those traveling paved roads, it is difficult to quantify how often the roads are traveled, the amount of seed that could be collected, and the distance that seed is transported. Unpaved roads (ML 1-4) tend to have vegetation growing along the sides or in the middle that hang directly over the road bed that can be brushed by vehicles. Paved roads have shoulders that are graveled and do not support much, if any, vegetation. To get a better idea of use, road ML can indicate the type of use. For the most part, passenger vehicles do not drive off of the pavement and, therefore, generally do not travel through infestations. However, these vehicles create wind at high speeds, which is a vector for spread. Unfortunately, there are no preventative measures to reduce the risk of spread except for public education; the Forest has an active invasive species management program that chemically treats high traffic areas and works to educate the public.

The majority of roads in the project area are closed to vehicles (historical roads and ML 1 roads). Very few roads are open to motorized use (approximately 9 miles) and are either ML 2 or ML 3. Almost all of the roads in Maintenance Level 1, 2, and 3 have an infestation on at least a part of the road corridor, if not entirely along the road corridor, or are within 0.25 miles of an infestation (Figure 28).

This project proposes to build and rehabilitate both new temporary roads and historical road templates for temporary roads in the action alternatives. The historical road template has been left behind from previous actions such as other vegetation management projects, and have not been accessible to weed treatment since they were closed and most of them have infestations somewhere along their templates (Project Exhibit J-6). The use of these templates and subsequent rehabilitation would create ground disturbance that could result in additional infestation if not treated.

### SOIL DISTURBANCE

Soil disturbance estimates (found in Chapter 3 - Soil Resource) for past actions are based on the same type of activities proposed in this project. They are a minimum estimate of past soil disturbance and not meant to be an exact quantification of past projects. Combined previous management activities have detrimentally disturbed less than 1 percent of the soil on NFS lands (Chapter 3 - Soil Resource). All action alternatives could detrimentally disturb approximately one percent of NFS lands in the project area. The NFS lands in the project area have been disturbed by other means, mostly through timber management and road construction, which means that those disturbed areas contain suitable conditions for infestations.

There have been two timber projects on Legacy Lands since they were transferred to the Forest Service, Beaver Highway and Two Bears, totaling 544 acres of harvest. There are currently no planned harvests on Legacy Land other than the Beaver Creek Project.

Both of the action alternatives would have approximately the same amount of cumulative soil disturbance, although Alternative 3 would have slightly less associated disturbance when combined with past activities. The risk of establishment and persistence would be moderate to high because of widespread infestations in primary access corridors that could spread into activity areas. Project design features such as equipment cleaning, road rehabilitation, seeding and timing of activities reduce some of these risks, which is why the risk is moderate to high instead of only high risk.

Wildland fire suppression activities, such as dozer lines, hand-dug fire lines, vehicle traffic, helicopter landing sites, etc., contribute greatly to soil disturbance in the immediately affected areas (Zouhar et al. 2008). These activities carry a high risk of introduction and spread for invasive species based on the urgency of the activities and low priority of invasive species management compared to protecting life and property. Once fire operations cease, there is a high risk of establishment and persistence in these freshly-disturbed areas that are now open to more light. Fire suppression has occurred since c.1900 and will likely continue to occur in the future due to the wildland-urban interface. There is no way to predict where or when these events would occur.

### LIGHT AVAILABILITY

Past harvesting in the project area increased the amount of acres with more light availability by 33 percent (Table 44). Generally, acres that are opened up by activities are more susceptible to the persistence of sun-loving invasive species than if no activities occurred. Eventually, if the canopy is allowed to close, most infestations would be shaded out. This project area has the unique circumstance of including 5,457 acres of land formerly owned by PCTC. The majority of those lands have been heavily harvested by PCTC, with little weed control pre- or post-harvest. The Beaver Creek Project would increase light availability from seven to ten percent depending on the alternative.

| TABLE 44. CUMULATIVE EFFECTS SUMMARY OF LIGHT AVAILABILITY IN THE PROJECT AREA.* | | | | |
|---|---|---|---|---|
| | ALTERNATIVE 2 | | ALTERNATIVE 3 | |
| | ACRES | PERCENT | ACRES | PERCENT |
| LIGHT AVAILABILITY (INCREASE IN ACRES) | | | | |
| Past** | 10,385 | 33 | 10,385 | 33 |
| Present | 3,315 | 10 | 2,209 | 7 |
| Reasonably Foreseeable | 0 | 0 | 0 | 0 |
| * Percentages (percent) are of the total amount of NFS land in the project area.<br>**Some of these acres could be located on the same site with multiple harvest entries in different time frames; providing totals would not be an accurate reflection of the existing condition. | | | | |

Known fire history includes fires from 1919 to present, although they have been occurring long before humans were in the area. The Fire/Fuels Section of Chapter 3 provides more information about past fire in the project area but fire suppression has limited the number of wildfires since 1919. The most recent wildland fire was the Lindbergh Lake Fire, which covered 65 acres in 2008. The Lindbergh Lake Fire was a mosaic burn and not high-severity. There is the chance of high-severity fire in the project area. Generally, high-severity wildland fires completely burn up native vegetation, including the overstory, and create suitable conditions for invasive species to establish in these areas with high light availability.

Increasing light availability in the project area carries a moderate risk of establishment and persistence of invasive species, since there are areas that have been opened up before and invasive species are already present in the project area. The areas proposed for regeneration harvest would have the highest risk of weeds infesting the units and, as a result, hindering future vegetation growth.

## FOREST PRODUCTS

Public use of forest products (firewood, post and pole, mushrooms, berries, etc.) could contribute to the cumulative effects to invasive species. While obtaining forest products, forest users could introduce and/or spread weed seed in their collection areas. Popular collection sites would have the most impact with repeated entries. The project area is adjacent to other ownerships and access to NFS lands is frequent. Temporary roads would be rehabilitated following project activities and public access on those roads would be prohibited during project activities. Collection of forest products occurs often and would continue to occur in the project area.

## INVASIVE SPECIES CONTROL

The Flathead National Forest has an integrated weed management program that identifies and controls infestations across the forest. Prevention of new infestations and controlling spread of existing infestations are the goals of invasive species management in the project area. Herbicide is the most commonly used treatment to kill invasive species, which also can affect native plant species. The forest also uses biological control on tansy ragwort, spotted knapweed, and Canada thistle. Some of these species-specific organisms have spread on their own, as well as with human help, into the project area. The Swan Lake Ranger District has been able to benefit from the Collaborative Forest Landscape Restoration Act, since 2010 by receiving supplemental funding for restoration activities on the Swan Lake Ranger District. Weed spraying through contracts has been a part of this program. With CFLRP, the Swan Lake Ranger District has been able to control many more infestations in less time than the forest program would have been able to afford. Many of the roads in the Beaver Creek Project Area have already been treated through this funding source.

Without prevention measures, inventories, and treatment, the risk of spread would be greater in this project area and would further affect suitable habitat than if those measures were not adopted. The project's Design Criteria (Table 16) would contribute to preventing new invasive species establishment as a result of project activities; due to the amount of existing infestations on the roads to be used for activities, there would still be a moderate to high risk of spread. Future spraying of haul routes and other roads in the project area would decrease infestations on a short-term basis; to benefit from these treatments, more long-term integrated management would be necessary, which the CFLRP funding has helped to get a start on some of the roads in the project area.

## RECREATION

Recreation across NFS lands has increased over the past few years and will continue to influence the spread of invasive species on the forest and in the project area; however, the amount of ground disturbance and travel through infestations from hiking and camping, compared to large-scale vegetation management, is much less and is generally limited to established roads, trails, campgrounds, and a few dispersed locations. Dispersed camping, hiking, biking and horse trails, motorized trails, lake and river access points, and other areas frequented by recreationists all require construction and maintenance. People and associated activities are vectors contributing to the introduction and spread of invasive species within the project area.

Trail construction and maintenance increase the risk of introducing invasive species by recreationists to natural areas. These linear, non-vegetated features create edge effects into the adjacent understory, providing suitable conditions for invasive species, as well as travel corridors, allowing them to move into the understory. Other recreation activities, such as off-trail hiking, hunting, trapping, outfitters and guides, berry picking and collection of other forest products, and horse riding, could also provide vectors for the spread of invasive species. Although it does not seem that snowmobiling or cross-country skiing would affect invasive species, they can be a vector and spread invasive species by travelling over seed stalks during mild winters. There are three trails and one trailhead in the project area that are maintained by the Forest Service. Parts of the trails have been inventoried for weeds and they are mostly weed-free for those sections.

## LAND DEVELOPMENT AND EXCHANGES

Past development and clearing on private lands most likely have introduced and spread invasive species; however, since there is no historical data regarding invasive species on private or public lands, it is difficult to analyze those actions. Much of the native vegetation has been removed on private lands. These areas have been used for development and were often cleared of trees or drained. Continued development of non-NFS lands would reduce native vegetation, alter hydrologic regimes, and increase the likelihood for new invasive species establishment.

As was mentioned earlier in this report, the Forest Service has acquired a total of 5,457 acres of former PCTC lands in the project area through LWCF and the Montana Legacy Project. Much of PCTC's management consisted of regeneration harvests with little or no weed treatment or prevention. This management has the left the Forest Service with the difficult problem of controlling thousands of acres of weeds. This land has been inventoried recently for invasive species and rare plants. Now, the Flathead National Forest is determining the best approach to manage these infestations, and CFLRP will be instrumental in weed control in the project area.

## RANGE AND AGRICULTURE

There is one range allotment in the project area, the Holland Cattle and Horse allotment. It allows 50 cow/calf pairs from June through September. This time period is prime weed season for flowering and seeding. Livestock grazing has been known to cause soil compaction and vegetation trampling (Belsky et al. 1997). With such low livestock numbers allowed in the allotment, the impacts to forested land are low; however, livestock tend to gather in riparian areas and along roadsides, concentrating impacts to those areas. When livestock enter the understory, their grazing can affect the vegetation by removing tree and shrub seedlings and providing suitable conditions for weed seed. This allotment is permitted for continued use.

A small amount of private land in the project area has been converted to agricultural practices. Depending on the crop (likely hay in this case), pesticides could be used for weed control or the land owners may not control weeds. Reed canarygrass was introduced to the Swan Valley for agricultural purposes and has since altered many wetlands by creating a monoculture and excluding native species. Effective methods for reed canarygrass control have not been tested yet, except for wetland restoration efforts such as plugging man-made drainage features.

### OTHER ACTIVITIES

As with many other activities, special use areas, such as access roads and utility corridors, increase the risk of introducing and spreading invasive species, as well as removing native vegetation. There are several road easements, many utility permits for fiber optics, phone and power lines, and various other special use permits listed in Project Exhibit J-1.

### CONCLUSIONS

As observed on the ground, as well as through databases and GIS, this project area is densely infested with weeds. Much of the project area is wilderness and not inventoried. Eradication of invasive weeds is infeasible, and control is extremely difficult with a mix of private and public land ownership, ongoing vegetation management activities, and forest recreationists contributing to the weed problem. The risk of invasive species spread, introduction, establishment, and persistence as a result of project actions would be moderate to high in both action alternatives of the Beaver Creek Project, although Alternative 3 has a lower risk than Alternative 2. Alternative 2 would carry the highest risk of introduction, spread, establishment, and persistence due to more soil disturbance (more temporary roads, skid trails and equipment), as well as travel through infestations, proximity to known infestations and increased available light (more harvesting). Due to ongoing vegetation management in the project area and inaccessible roads in the interim, there would be an ongoing invasive species problem in the project area.

## EFFECTS OF A FOREST PLAN AMENDMENT TO ASSIGN MANAGEMENT AREAS TO ACQUIRED LANDS

The Beaver Creek Project includes a Forest Plan Amendment to assign interim management areas (MAs) to approximately 5,457 acres of former PCTC lands acquired by the USDA Forest Service to be managed as part of the Flathead National Forest. These interim management areas would be in effect on acquired lands until the ongoing Forest Plan Revision effort is completed, anticipated in 2 years.

Alternative 1 - No Action Alternative proposes not to assign management areas to acquired lands although forest-wide standards and guidelines would continue to apply to all NFS lands on the Flathead National Forest.

Alternative 2 proposes to assign 55 acres of acquired lands to MA 2, 8 acres of acquired lands to MA 5, 2,312 acres to MA 11C, 320 acres to MA 12, 2,033 acres to MA 15, 712 acres to MA 15C, and 17 acres to MA 17.  These proposed MA assignments were made in consideration of the characteristics of the acquired parcel and the management direction on surrounding lands. Table 11 describes the management emphasis for each of these MAs, but lands assigned to MA 5, MA 11C, MA 15, MA 15C, and MA 17 are considered suitable for timber production, while MA 2 and MA 12 are considered unsuitable for timber production although management activities may occur to benefit other resources.

Alternative 3 proposes different management area assignments to reflect public concern about the scenic integrity of lands on the east side of Lindbergh Lake. To accomplish this, Alternative 3 assigns MA 5 instead of MA 15 on approximately 502 acres of acquired land on the east side of Lindbergh Lake to maintain or enhance the scenic quality of these lands when viewed from

Lindbergh Lake. Although MA 5 will allow for timber harvest to occur on these lands, it will emphasize the maintenance of a natural appearing landscape where management activities are not evident.

The effects of the Forest Plan Amendment to invasive plant species within analysis area under Alternative 1 – No Action Alternative are minor because the Forest Plan standards and guidelines relative to management of invasive plant species apply to all lands managed by the Flathead National Forest even if management areas are not assigned. The effects of the Forest Plan Amendment under Alternative 2 and 3 are also minor in scale because although they allow for timber management to occur on some lands they would maintain consistency with the forest-wide standards and guidelines that are in place to address invasive species over time. These MA assignments are consistent with the existing condition of these lands and the management direction assigned to adjacent lands and will not preclude future MA assignment under the Flathead Forest Plan Revision effort.

The cumulative effects of this forest plan amendment are very limited due to the geographic scope and expected duration of the amendment. At the Flathead National Forest scale, this amendment is only addressing management area direction on less than 1 percent of the NFS acreage on the Flathead National Forest. Additionally, the duration of this amendment is expected to be short-term since forest plan revision is ongoing with a decision expected in 2017. When the revision effort is completed, new management areas will be assigned across the entire Flathead National Forest, including the Beaver Creek project area, and will supersede any of the interim management areas proposed in this amendment. Reasonably foreseeable activities identified on the lands associated with the amendment is very limited as identified in Table 17 in Chapter 3 of this EA. If future land management activities occur on these lands they will be subject to forest-wide direction found in the Flathead National Forest Land and Resource Management Plan, federal and state laws, and other Forest Service regulations, as they are now, and will be guided by the proposed management area direction. Future land management activities such as timber harvest, road work, changes to public access etc. would be subject to site-specific NEPA analysis in the future.

# REGULATORY FRAMEWORK AND CONSISTENCY

Management direction for noxious and invasive weed control on the Flathead National Forest is set at the National and Forest levels. Forest Service policies were developed in response to Federal laws guiding implementation of noxious weed control actions. These policies were set forth in Amendment 2000-95-5 of FSM 2080 Noxious Weeds Management and had been tiered to in the Forest Plan. Forest Service Manual 2900 - Invasive Species Management was issued in 2011 and supersedes FSM 2080; however, it has not yet been incorporated into the Forest Plan. The Flathead National Forest will comply with both the Forest Plan and FSM 2900. Treatment and monitoring of known infestations in the project area would be implemented under the authority and guidance of the NIWC DN (USDA 2001b). These documents were designed to meet Forest Service policies for invasive species control and associated legal requirements. The proposed project incorporates and is consistent with the NIWC DN (USDA 2001b) (Project File Exhibit U-6). Design Criteria and management requirements for actions proposed under this project follow the FSM for invasive species management.

# THREATENED AND SENSITIVE PLANT SPECIES

## INTRODUCTION

Under provisions of the Endangered Species Act (ESA) 1973, federal agencies are directed to conserve endangered and threatened species, and to ensure that actions authorized, funded, or carried out by these agencies are not likely to jeopardize the continued existence of threatened or endangered species, or result in the destruction or adverse modification of their critical habitats.

Water howellia (*Howellia aquatilis*), a vascular plant species in the family *Campanulaceae*, was listed as threatened under the ESA by the USFWS on July 14, 1994 [FR 59(134): 35860-35864]. No critical habitat has been identified for the species. A draft recovery plan was issued, but no recovery plan has been finalized. Recently, the USFWS has released a 5-year review of the status of water howellia and has found that the threats to water howellia identified at the time of ESA-listing have been removed or largely minimized and has recommended it for delisting (USDI 2013c). On November 15, 2016, the Flathead National Forest received a letter from the USFWS (Project File Exhibit J-97) stating that "the Service is initiating the process to decide whether to delist the water howellia (Howellia aquatilis)."

Spalding's catchfly (*Silene spaldingii*), a vascular plant species in the family *Caryophyllaceae*, was listed as threatened under the ESA by the USFWS on November 9, 2001 [FR 66(196): 51598-51606]. Although the USFWS intends to identify critical habitat for this species, critical habitat designation was precluded at the time of listing due to a lack of funding. A recovery plan was finalized in 2007 (USDI 2007b).

Whitebark pine (*Pinus albicaulis*), a tree species in the family *Pinaceae*, was listed as a candidate species under the ESA by the USFWS on July 19, 2011 [FR 76(138): 42631-42654]. Whitebark pine was analyzed by the USFWS in 2010 as a candidate for listing. Their 12-month finding states that whitebark pine as a species is declining based on synergistic threats from habitat loss due to climate change, past and ongoing fire suppression, predation by mountain pine beetles, and the deadly pathogen, white pine blister rust (USDI 2011b). Timber harvesting was analyzed as a possible threat although it was dismissed due to the minimal amount of harvesting of whitebark pine, which is not a commercial species. However, the USFWS also states in their finding that the entire range of whitebark pine is not threatened by extinction and that there are many other species ahead of whitebark pine waiting for federal listing. They cite budgetary and personnel constraints preventing them from listing the species. The USFWS determined that whitebark pine federal listing is warranted but precluded, which makes the species a candidate for federal listing as threatened or endangered. As a result, Region 1 Regional Forester added whitebark pine to the Regional Forester's Sensitive Species (RFSS) list (USDA 2011b). Since it is listed as a Regional Forester's Sensitive Species, it is analyzed in the BE for the Beaver Creek Project with other RFSS plants.

Forest Service Sensitive Species Policy (FSM 2670) directs national forests to assist states in achieving conservation goals for endemic species; complete BEs of programs and activities; avoid and minimize impacts to species with viability concerns; analyze the significance of adverse effects on populations or habitat; and coordinate with states and USFWS. The FSM (2670.15) further defines sensitive species as those plant species identified by the Regional Forester for which population viability is a concern, as evidenced by significant current or predicted downward trend in numbers, density or habitat capability that would reduce a species distribution.

In addition to federally listed threatened and sensitive plant species, the Flathead National Forest also has an obligation to protect Montana state listed rare plants.

# ANALYSIS AREA

## SPATIAL BOUNDS

### THREATENED SPECIES

The action area for this project is based to the area of the project's influence/impacts on known occurrences or potential habitat for water howellia. Water howellia occurs in glaciated ponds and old oxbows, which limits the analysis area to the direct, indirect, and cumulative impacts from project activities to these habitats. The action area for the direct and indirect impacts to water howellia is the project area that includes each pond and the surrounding catch basin of the pond. Because the Swan Valley meta-population is the only location for water howellia in Montana and is the largest globally-known meta-population, the cumulative effects analysis area includes the entire meta-population for water howellia in the Swan Valley. Potential effects to a single pond occurrence or potential habitat may have cumulative effects on the entire meta-population and potentially affect species viability.

# REGIONAL FORESTER'S SENSITIVE SPECIES

The analysis area for this project is based on the area of the project's influence/impacts on documented occurrences or suitable habitat for TES plant species. The analysis area is confined to the project area and includes all treatment units and road systems with activities related to this proposed project.

## TEMPORAL BOUNDS

The temporal bounds could be up to 100 years after project implementation (Kuropat 2009). The recovery of individual plants and populations after a disturbance event is species-specific and could depend on the disturbance type and its effects to the microsite, the tolerance of the species to disturbance, and the species' methods of reproduction (i.e., rhizomes, taproots, bulbs, and corms). Following project implementation, vegetation conditions could be suitable for some TES plant species to become established immediately, while other species could take between 50 and 100 years to return to the tree and shrub canopy cover conditions that are suitable habitat.

# DATA SOURCES, METHODS, AND ASSUMPTIONS USED

Data sources used in this analysis include field survey data, the Montana Natural Heritage Program's (MNHP) Element Occurrence Database, and the Forest Service Natural Resource Management database.

A habitat suitability analysis was conducted to evaluate the potential for additional sensitive plant occurrences within the action areas. Sensitive and rare plant species are grouped in habitat guilds (Project Exhibit J-4). Known vegetation types and elevation ranges of the project area were considered in evaluating suitable habitat for rare plants. All proposed units were evaluated for potential habitat and those identified areas were surveyed for threatened, endangered, and sensitive (TES) plants and invasive species.

Surveys for TES plants within the project area were conducted primarily during the 2013 and 2014 field seasons across 5,072 acres (100+ percent) of the proposed harvest units, not including the broadcast burn units. Project effects and design features for invasive species management will be analyzed separately.

# AFFECTED ENVIRONMENT

# THREATENED PLANT SPECIES

## WATER HOWELLIA (HOWELLIA AQUATILIS)

Water howellia occurrences are distributed throughout the Pacific Northwest in scattered clumps across Montana, Idaho, Washington, and California. There are 218 known occurrences in Montana, all in the Swan Valley (Table 45). This is 72 percent of the known 304 global occurrences. Water howellia habitat has been subject to various management activities including dredging, draining, road construction, logging, and grazing (Shelly 1988, USDA 1997). Reed canarygrass (*Phalaris arundinacea*), an introduced species, has threatened some populations across its range, while not impacting other populations (Lesica 1997; USDI 2013). The National Heritage Program Network has ranked this species as G3, meaning that it is at a moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors (NatureServe 2014). The Montana Natural Heritage Program (MNHP) has ranked the species as S2, which means at risk because of very limited and potentially declining numbers, extent and/or habitat, making it vulnerable to global extinction or extirpation in the state (MNHP 2014). Water howellia is currently listed as threatened by the USFWS.

**TABLE 45. GLOBAL ELEMENT OCCURRENCE BREAKDOWN OF WATER HOWELLIA BY OWNERSHIP (USDI 2013).**

| STATE | OWNERSHIP | # OF OCCURRENCES* |
|---|---|---|
| Montana | Forest Service | 186 |
| Montana | Forest Service / Private | 5 |
| Montana | Private | 23 |
| Montana | State | 4 |
| Idaho | Private | 6 |
| Washington | U.S. Fish and Wildlife Service | 37 |
| Washington | U.S. Department of Defense | 23 |
| Washington | State | 3 |
| Washington | Bureau of Land Management | 1 |
| Washington | Private | 8 |
| California | Forest Service | 7 |
| Oregon | Metro | 1 |
| | TOTAL | 304 |

* Updated January 2014 (Flathead National Forest records, MNHP, and USFWS 5 year review).

Baseline conditions were prepared for only the Swan Valley metapopulation. Because water howellia ponds are located in the valley floor in gentle rolling terrain, past activities, such as road construction, timber extraction and other development have occurred frequently in areas where ponds occur. A summary of these human influenced conditions, adjacent to and within a 300-foot buffer surrounding water howellia ponds, is displayed in Table 46.

**TABLE 46. EXISTING CONDITION OF 218 KNOWN OCCURRENCES IN THE SWAN VALLEY (INTERPRETED FROM AERIAL PHOTOS).**

| LOCATION | NUMBER |
|---|---|
| Timber Management (within 25 years) * | |
| Adjacent to pond (to the edge of pond) | 72 |

**TABLE 46. EXISTING CONDITION OF 218 KNOWN OCCURRENCES IN THE SWAN VALLEY (INTERPRETED FROM AERIAL PHOTOS).**

| LOCATION | NUMBER |
|---|---|
| Within 300 feet of pond (not to edge of pond) | 58 |
| No activity within 300 feet of pond | 88 |
| Roads | |
| Open road within 300 feet of pond | 53 |
| Closed road within 300 feet | 71 |
| No activity within 300 feet of pond | 94 |
| Reed Canarygrass (*Phalaris arundinacea*) | |
| Present within ponds** | 27 of 62 ponds (monitored annually from 1998 to 2007) |
| Livestock use in Ponds | |
| Observed within ponds** | 0 detected since monitoring began; 6 detected prior to 1998 |

*Harvest is only noted as occurring if it is evident from an aerial photo. A light or partial cut that is undetectable from the photo was not recorded as recent harvest. If the area was previously harvested but the canopy has recovered enough to where harvest activity is undetectable on the photo, then it is not considered recently harvested.
** surveyed in 2007

The Forest Service acquired 47,000 acres of PCTC land in the Swan Valley. Many of the PCTC water howellia populations are now on NFS lands. The majority, if not all of the former PCTC water howellia populations, had clearcutting up to the edge of the ponds, only complying with state-required stream management zones (SMZ), yet these ponds still contain water howellia. Now that these populations are on NFS lands, they can be protected by a 300-foot buffer as required in the Forest Plan.

## ASSOCIATED PLANT COMMUNITY

Water howellia is an aquatic plant restricted to small pothole ponds, or oxbows, long since isolated from the flowing surface waters of the adjacent river. These wetland habitats are generally shallow (~3 feet deep), but the species has occasionally been observed in water up to approximately 6 feet in depth. The ponds typically occur in a matrix of dense forest vegetation, and are nearly always surrounded in part by a small ring of deciduous vegetation. The bottom surfaces of the wetlands usually consist of firm consolidated silts and clays overlain by 0 to 24 inches of organic sediments. These ponds are generally filled by snowmelt run-off and spring rains, later drying out to varying degrees by the end of the growing season, depending on annual patterns of temperature and precipitation. Water howellia occurs between elevations of 10 feet in Washington to 4,500 feet in Montana; all Montana occurrences lie between 3,100 feet and 4,500 feet, and are found only in the Swan River Valley from just south of the community of Swan Lake, south to the Clearwater/Swan Divide. In the Swan Valley, 216 ponds and 2 old river oxbows are known to contain water howellia.

In Montana, most water howellia occurrences are in glacially-formed ponds surrounded by diverse coniferous forests. These forests are of mixed species, including: grand fir, subalpine fir, tamarack, Engelmann spruce, lodgepole, white pine, ponderosa pine and Douglas fir. The broadleaf deciduous tree most frequently associated with the pond margins is cottonwood, but aspen is often present. In the northern end of the Swan Valley, paper birch is found near some pond margins. Shrub species bordering the ponds include: alder, red-osier dogwood, common juniper, alder-leaf buckthorn and, most commonly, Bebb willow. Aquatic herbaceous species commonly associated with water howellia are blister sedge, two-headed water-starwort, water horsetail, variable leaf pondweed, white water crowfoot, hemlock water-parsnip, and small bur-reed.

## CONSERVATION STRATEGY AND RECOVERY GOALS

A conservation strategy for water howellia was completed in 1994 and adopted into the Flathead National Forest Plan in 1997 (USDA 1997). In this conservation strategy, management prescriptions guiding the conservation of the species on NFS lands are provided. This conservation strategy specifically recommended a 300-foot buffer to avoid impacts from land management activities to water howellia, which was incorporated into the Flathead Forest Plan as Amendment 20.

A draft recovery plan was prepared (USDI 1996), but was not finalized. Because no final document has been issued, there are currently no recovery goals officially identified for the species.

In 1998, a 10-year monitoring plan was initiated by the Flathead National Forest to detect changes in species distribution and abundance and was completed in 2007. This study assisted in evaluating if current management prescriptions for water howellia are sufficient for continued viability of the Swan Valley metapopulation. Approximately 65 occupied ponds were monitored annually over the 10-year period, and all populations, in both disturbed and undisturbed settings, persisted over that time. Yearly fluctuations in precipitation and temperature are the primary factors affecting annual population levels (USDA 2008). The report showed a general increasing trend in the number of populations in the Swan Valley, which could be attributed to an increasing population or improved survey methods. The study indicated that water howellia populations rely heavily on prior year precipitation, which in turn affects ponds' annual hydrologic fluctuations. It was also found that reed canarygrass has increased slightly over the study time period, but it had not displaced water howellia in the monitored ponds.

The USFWS concluded their 5-year review of water howellia in 2013 (USDI 2013c). Their conclusion was that the threats identified at the time of listing have been mitigated through regulatory mechanisms such as the conservation strategy and incorporation of mitigation measures, such as the 300-foot buffer, into land management planning and project-level decisions. Reed canarygrass threatening ponds has been successfully treated in some states and does not seem to be invading other habitat as previously thought. Land management activities have been removed or minimized for most of the howellia population, due to large buffers. Grazing has been removed from howellia habitat, as well. Other threats, such as climate change and small, isolated populations, may either benefit water howellia or threaten it. In addition to management changes to howellia habitat, there have been almost 200 additional populations documented since the time of listing, including sites previously believed to be extirpated in Oregon and California. Because of all of these factors, the USFWS is recommending delisting water howellia, while maintaining current conservation measures. On November 15, 2016, the Flathead National Forest received a letter from the USFWS (Project File Exhibit J-97) stating that "the Service is initiating the process to decide whether to delist the water howellia (Howellia aquatilis)."

## OCCURRENCES AND SURVEYS

General surveys for water howellia in the Swan Valley have been conducted since 1987 and have continued to 2014. The Flathead National Forest, with the cooperation of MNHP and TNC, has surveyed the majority of identifiable potential water howellia ponds in the Swan Valley. Specific surveys for the Beaver Creek Project Area occurred in 2013 and 2014. Each pond has been classified as occupied, unoccupied suitable habitat, or unsuitable habitat for water howellia. There are 12 occupied and 16 unoccupied suitable ponds (Table 47) within the project area, which will be buffered to 300-feet for all vegetation treatment units in the selected alternative, with the exception of ponds near existing roads where harvest is proposed on the opposite side of the road to the buffer (Table 47).

**TABLE 47. WATER HOWELLIA OCCUPIED AND UNOCCUPIED PONDS WITHIN THE BEAVER CREEK PROJECT AREA.**

| ELEMENT OCCURRENCE # | NEAR UNIT / ROAD |
|---|---|
| 45 | Units 19, 419, 21, 210; Roads 9651, 11636 |
| 46 | Unit 200; Road 10589 |
| 47 | Road 10589 |

**TABLE 47. WATER HOWELLIA OCCUPIED AND UNOCCUPIED PONDS WITHIN THE BEAVER CREEK PROJECT AREA.**

| ELEMENT OCCURRENCE # | NEAR UNIT / ROAD |
|---|---|
| 48 | Unit 28; Road 10589 |
| 49 | Unit 28, 31, 430, 431; Road 10589 – on private land |
| 50 | NA – on private land |
| 51 | NA – on private land |
| 107 | Unit 5; Road 91163 |
| 131 | Unit 5; Road 9557 |
| 153 | Unit 5 |
| 163 | Units 3, 5 |
| 213 | Units 28, 202; Roads 10589, 9651 |
| u-001 | Unit 28 |
| u-003 | Unit 28; Road 10589 |
| u-017 | Unit 5; Road 9557 |
| u-028 | NA – on private land |
| u-029 | Unit 21; Roads 10742, 10574 |
| u-055 | Units 42, 220, 221, 222, 4222; Roads 906, 9652 |
| u-058 | Unit 229; Road 906 |
| u-060 | Units 3, 5, 204 |
| u-062 | Units 40, 44; Road 906 |
| u-063 | Road 906 |
| u-078 | Road 10574 – on private land |
| u-079 | NA – on private land |
| u-080 | NA – on private land |
| u-081 | NA – on private land |
| u-082 | NA – on private land |
| u-083 | NA – on private land |

**U-#** = unoccupied pond; **NA** = pond is within the project boundary but is not associated with any project activities

## SPALDING'S CATCHFLY (*SILENE SPALDINGII*)

There are no known occurrences of Spalding's catchfly within the project area or within the Flathead National Forest. In addition, no grassland habitat with potential for Spalding's catchfly was identified during 2013/2014 field surveys or identified in aerial photos in the Beaver Creek Project Area. Spalding's catchfly will not be analyzed further.

# REGIONAL FORESTER'S SENSITIVE SPECIES

Little is known about the historical condition for sensitive plants in the Flathead National Forest and in the project area. Botanical surveys were not initiated in the area before the onset of the Forest's Botany program in 1991. There are 51 recognized RFSS for the Flathead National Forest (USDA Forest Service 2011); (Project Exhibit J-10). The MNHP (Montana Natural Heritage Program 2015) and NRM databases were queried to determine known sensitive plant occurrences within the analysis area. There are several known RFSS populations within the project boundary (Project Exhibit J-4).

**TABLE 48. RARE PLANTS IN THE PROJECT AREA.**

| | | HABITAT GUILDS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SPECIES | NUMBER OF OCCURRENCES | AV | F | W | R | MCT | MC | MMC | GO | MS | CRS | S | A | D |
| common camas Camassia quamash | 17 | | | X | X | | | | | | | | | |
| English sundew Drosera anglica | 5 | | X | | | | | | | | | | | |
| crested shieldfern Dryopteris cristata | 1 | | X | X | X | | | X | | | | | | |
| slender cottongrass Eriophorum gracile | 1 | X | X | X | | | | | | | | | | |
| Howell’s gumweed Grindelia howellii | 1 | | | | | | | | X | | | | | X |
| adder's tongue Ophioglossum pusillum | 1 | | X | X | | | | | | | | | | |
| whitebark pine Pinus albicaulis | 2 | | | | | | | | | | | X | | |
| pod grass Scheuchzeria palustris | 4 | | X | X | | | | | | | | | | |

AV=Aquatic and vernal pools; F=Fens and fen margins; W=Marshes, seeps, springs, and wet meadows; R=Riparian; MCT= Vernally moist cliffs or mossy talus; MC= Mid-elevation moist coniferous forests; MMC=Margins of moist coniferous forests; GO=Dry grasslands & openings in ponderosa pine and dry Douglas-fir forests; MS=Mid-montane/Subalpine grass/forb; CRS=Canyon walls, crevices, rock outcrops and slides S=Subalpine forests; A=Alpine; D= Disturbed areas

### SUITABLE HABITAT

The project area contains habitat types for sensitive plants associated with riparian, seeps, springs, wet meadows, marshes, aquatic and vernal pools, mid-elevation moist coniferous forest and margins, dry grasslands and openings associated with Douglas fir and ponderosa pine forests, subalpine and disturbed habitat groups listed in Project File Exhibit J-4.

# THREATENED PLANTS

## ENVIRONMENTAL CONSEQUENCES

### ALTERNATIVE 1 – NO ACTION ALTERNATIVE
### DIRECT, INDIRECT, AND CUMULATIVE EFFECTS

In consideration of the No Action Alternative, threatened and sensitive plants will be considered together as the direct effects of Alternative A are the same to both. This alternative proposes no ground-disturbing activity. Therefore, there would be no direct effects to threatened or sensitive species as a result of this project. There would be no cumulative effects to threatened or sensitive species as a result of this project.

# WATER HOWELLIA

## ALTERNATIVES 2 AND 3 – ACTION ALTERNATIVES DIRECT AND INDIRECT EFFECTS

Of the 12 occupied water howellia ponds within the project area, there are 10 occupied ponds that are near project activities (either near timber harvest or haul routes). Two occupied ponds are on private land and would not be affected by this project. The 10 occupied ponds would have a 300-foot buffer from harvest units and would not have any ground-disturbing activities within 300 feet. Only 1 of those occupied ponds has an existing haul road bisecting its 300-foot buffer, with a harvest unit on the opposite of the road from the pond. The road affected the hydrology of this pond long ago, before the species was listed. Mitigating activity in those areas would not benefit or impact pond hydrology due to the road fill between the pond and the remainder of the buffer zone. Six of 12 occupied ponds occur 300 feet or nearer to project-related existing access roads or haul routes to which BMPs would be applied.

There are 16 unoccupied suitable ponds in the project area, of which 6 are 300 feet from harvest units. Only one of those unoccupied ponds has an existing haul road bisecting its 300-foot buffer, with a harvest unit on the opposite of the road from the pond. The road affected the hydrology of this pond long ago, before the species was listed. Mitigating activity in those areas would not benefit or impact pond hydrology due to the road fill between the pond and the remainder of the buffer zone. Four unoccupied suitable ponds occur 300 feet or nearer to existing access roads or haul routes in which BMPs are being applied (Table 48).

One of the five threats to water howellia that was identified when it was listed was land management. Below are the possible effects that could occur to water howellia if there were no project design features of a 300-foot no-ground-disturbance buffer and adapted road maintenance BMPs to roads that were in on the landscape prior to listing. With the incorporation of these design features, any effects to water howellia are highly unlikely to occur, and if they were to occur, the effects would be immeasurable. Long-term monitoring of occupied ponds in both managed and unmanaged sites has shown that populations have persisted in ponds directly adjacent to or within 300 feet of past management activities and roads (USDA 2009).

### TIMBER HARVESTING

Harvesting in the surrounding uplands of water howellia ponds may impair natural vegetation recovery and alter the hydrologic processes (Lindenmayer et al. 2006) of occupied and unoccupied howellia ponds within proximity to treatment units. Changes to the hydrologic processes of ponds may result in either a decrease or increase in pond inundation levels. Removal of surrounding upland trees may decrease evapotranspiration from the surrounding upland vegetation and may result in increased inundation of ponds from runoff. Also, increased canopy openings near ponds may increase evaporation of ponds, potentially reducing water levels earlier in the growing season. Reproductive success of water howellia is directly linked with the fluctuation of water levels both annually and from year to year (Lesica 1990). Water howellia produce seeds underwater early in the growing season when ponds fill up; they also produce seeds later in the season via above-water flowers. It then requires annual drying of ponds for fall germination on exposed pond substrate; however, repeated annual premature drying of ponds may reduce the ability for water howellia to replenish the seed bank from year to year. In addition, prolonged inundation of ponds in a given year may reduce fall germination and result in reduced seed bank replenishment during the subsequent growing season. The longevity of seed bank viability is not well understood. Some studies indicate that seed can retain viability for up to 2 years (Mantas 2000; Shelly 1994).

In addition, harvest activities may increase groundwater and sediment flow in some of the micro-catchments containing water howellia. This may have effects on seed germination if enough sediment were to accumulate and deeply bury the existing seed bank. Increased siltation may also result in shifts in the pond's vegetation composition, supporting emergent vegetation in place of submergent vegetation types (USDI 1996).

To mitigate these potential effects and in accordance with the Flathead's Forest Plan Amendment 20, all occupied and unoccupied suitable ponds will be avoided with a 300-foot no-ground-disturbance buffer around the ponds, except in the case where a permanent road crossing is within the 300-foot buffer and a harvest unit occurs on the opposite side of the road from the pond. In those cases, the buffer area on the side of the road away from the pond would be available for project activities. The hydrology of the ponds was affected long ago by these roads before the species was listed. Mitigating activity in those areas would not benefit or impact pond hydrology due to the road fill between the pond and the remainder of the buffer zone.

The buffer zones will extend out 300 feet starting at the edge of the concentration of facultative wetland plants that are influenced by the hydrology of the wetland. Buffer zones would prevent effects of potential hydrologic alterations and/or siltation within the micro-catchment basins of ponds.

## INVASIVE SPECIES

Project activities near occupied and unoccupied ponds have the potential for depositing or dispersing invasive plant seed. Invasive species within occupied ponds may affect water howellia by competing for light, nutrients, space, and water. Reed canarygrass (*Phalaris arundinacea*) is known to occur in several of the original monitored water howellia ponds in the Swan Valley. This grass is highly competitive in wet habitats and can form a monoculture which displaces native plants (Apfelbaum et al. 1987). Reed canarygrass seeds are not typically windblown and spread would most likely occur with a vector source (such as recreationists, wildlife, birds) spreading seeds from pond to pond or through water courses that connect ponds. Currently, one occupied pond and one unoccupied pond in the project area are infested with reed canarygrass. Potential for spread of reed canarygrass from infested ponds to "clean" ponds would be low since there are no activities planned in the buffered area surrounding infested ponds. The risk of infestation is further reduced by washing equipment prior to entry onto National Forest Lands.

## ROADS

Alternative 2 includes 4.7 miles of new temporary road construction and Alternative 3 includes 2.5 miles of temporary road, which are not within the buffers of the occupied or unoccupied ponds. There would be approximately 0.15 miles of road construction to realign a system road and allow for decommissioning of unneeded road outside of any pond buffers. Existing system roads would be used for haul routes. These roads would need to be maintained to standard to prevent further resource damage on the landscape, which would be accomplished through state Best Management Practices (BMP). Road BMPs without appropriate design could cause siltation into ponds, which could result in the burying of water howellia seeds too deep for germination, or shifting the pond's vegetation composition supporting emergent vegetation in place of submergent vegetation types (USDI 1996). However, the BMPs associated with these roads in the project area would be adapted in the project design features to ensure no sediment or other deposition occurs in the nearby ponds. If ground-disturbing BMP-related activities occur within 300 feet of these ponds, natural filtration zones, sediment retention structures, or straw bales would be applied to prevent sediment deposition into these ponds. Road dips would be constructed as to drain road runoff away from the ponds. There are some ponds within a short distance of roads that would be used for project activities (Table 49).

**TABLE 49. WATER HOWELLIA OCCUPIED AND UNOCCUPIED SUITABLE PONDS NEAR HAUL ROUTES AND ACCESS ROADS WITH BMPS.**

| ELEMENT OCCURRENCE # | NEAR ROAD |
|---|---|
| 45 | 9563 |
| 46 | 9651, 10589 |

**TABLE 49. WATER HOWELLIA OCCUPIED AND UNOCCUPIED SUITABLE PONDS NEAR HAUL ROUTES AND ACCESS ROADS WITH BMPS.**

| ELEMENT OCCURRENCE # | NEAR ROAD |
|---|---|
| 47 | 10589 |
| 48 | 10589 |
| 49 | 10589 |
| 213 | 10589 |
| u-003 | 10589 |
| u-055 | 906, 9652 |
| u-058 | 906 |
| u-063 | 906 |

There are 4.5 miles of road decommissioning in Alternative 2 and 3. None of these roads occur within 300 feet of occupied or unoccupied suitable ponds. Since there would not be any decommissioning within 300 feet of occupied or unoccupied ponds, there would not be any impacts to those ponds.

## ALTERNATIVES 2 AND 3 – ACTION ALTERNATIVES CUMULATIVE EFFECTS

Land ownership in the Swan Valley is divided into a checkerboard pattern. The Forest Service acquired PCTC lands, which has reduced the landowner checkerboard pattern in the Swan; however past management activities from PCTC are still evident on the landscape. Past, present, and foreseeable actions on non-NFS lands in this project area include: timber harvesting, land development, road construction and maintenance, dispersed recreation, invasive species control, and fire suppression (see Table 17 for a list of known activities in the project area). These actions may have historically affected water howellia and may continue to have effects; these effects are discussed below.

### TIMBER HARVESTING AND ROAD CONSTRUCTION/MAINTENANCE

It is possible that past road construction/maintenance and timber management may have increased groundwater and sediment flow in some wetlands. This may affect seed germination as discussed in the direct and indirect effects section for water howellia. Increased siltation may result in shifts in the wetland vegetation composition, supporting emergent vegetation in place of submergent vegetation types (USDI 1996).

Cumulative effects would only occur if water howellia habitat was impacted as a result of the selected action. Any potentially affected occupied or unoccupied suitable ponds would be buffered by a 300-foot no-ground disturbance buffer. On Forest Service projects, hauling and associated road maintenance on roads with nearby ponds prevents sediment from reaching those ponds through BMPs. There may be discountable effects associated with road use, but these effects would not meaningfully contribute to cumulative effects to water howellia habitat.

Because all of the ongoing projects in the Swan Valley such as Glacier Loon, Cold Jim, and Chilly James projects, will implement the 300-foot no-ground disturbance buffer for occupied and unoccupied suitable ponds and will implement BMPs on road nearby ponds, they will not contribute to negative cumulative effects of the Swan Valley meta-population.

Non-Forest Service projects do not provide the same protections for water howellia. Prior to the Legacy land acquisitions, a review of aerial photos indicate PCTC did not buffer howellia occupied or unoccupied suitable ponds by 300 feet; it appears they used a state SMZ, which is considerably less than 300 feet. The Nature Conservancy who acquired the PCTC lands, and then transferred these lands to the Forest Service, had been logging these lands in accordance with timber reservation rights included in the deeds. It appears that TNC has been observing the 300-foot no ground disturbance buffer (Mantas 2012). It is unclear whether that buffer was also applied to unoccupied suitable ponds. Two sales have been implemented by TNC since these lands were transferred: Beaver Highway (2011 – 341 acres) and Two Bears (2012 – 203 acres). There are no documented howellia ponds (occupied or unoccupied) in the Two Bears sale area. One occupied howellia pond occurs partially in the Beaver Highway sale area. The sale map excludes the pond from the sale unit with a wetland exclusion zone, but there is no evidence that a 300-foot buffer was implemented. Previous communication with TNC implied that occupied howellia ponds would be buffered by 300-feet in the Glacier Loon Project Area; however, it is unknown if that protection was applied to TNC sales in the Beaver Creek Project Area.

Other road maintenance includes the State of Montana maintenance of nearly 2 miles of Highway 83. The remainder of the 9.6 miles of other road ownership is under private ownership and maintained by those owners.

## LAND DEVELOPMENT

There are several parcels of private land in the Beaver Creek Project Area. Development of lands may have reduced potential habitat in the past by altering hydrologic regimes and increasing the risk of new weed establishment. Water howellia that occurs on private land is not federally protected, and private ownership may have led to removal of populations or degradation of habitat. Wetlands have been drained in two sections of the project area, but not near documented occupied or unoccupied water howellia ponds. There is no historical data to determine if water howellia occurred in these areas prior to draining. There are two private parcels with one occupied pond each, and one of those parcels also supports seven unoccupied suitable ponds in addition. Both of these sections have conservation easements.

## RECREATION

Areas frequented by recreationists may contribute to the cumulative effects on water howellia. Some occupied water howellia ponds are located near roads, trails, or other areas frequented by recreationists. There is one private trail (historic Jocko/Gray Wolf trail) near unoccupied suitable water howellia ponds in the project area on private land. Maintenance is unknown but pothole ponds are not conducive to trail building or alterations, so those ponds are likely unaffected by this trail. Hunting and driving are likely the most frequent recreational activities in the project area near howellia ponds. There are trails heading into the Mission Mountains Wilderness, but there is no suitable habitat for water howellia nearby. Trash and dumping at these ponds have not been observed.

## INVASIVE SPECIES

The risk of infestation of invasive species resulting from past, present, and foreseeable activities, including this project, may contribute to the cumulative effects on known and potential occurrences of water howellia. Reed canarygrass is known in approximately 25 percent of the occurrences in the Swan Valley. Past activities may have contributed to the spread of reed canarygrass to these ponds. Now that the problem has been identified, the Forest can better manage activities that may affect reed canarygrass spread in the Swan Valley. Areas within the project would be monitored for invasive weeds and management of invasive species would occur in compliance with the Flathead National Forest Noxious Weed and Invasive Weed Control DN and FONSI (USDA 2001b).

Ponds adjacent to areas of invasive species control on state and private lands may be at risk of exposure to herbicide. The effects of chemical controls conducted by state and private lands near water howellia ponds are unknown. However, use of pesticides near water is highly regulated by the Environmental Protection Agency with chemical labels dictating acceptable use of chemicals near water, as well as regulated by the State of Montana in regards to the certification and licensing process for pesticides. The effects of herbicides at or near water howellia ponds on the Flathead National Forest were analyzed in the Flathead's Noxious and Invasive Weed Control Environmental Assessment and Decision Notice. This Decision Notice requires that threatened and sensitive plant species surveys be conducted prior to chemical treatment of a site. No chemical controls have been conducted at or near howellia ponds on the Flathead National Forest.

# ENVIRONMENTAL CONSEQUENCES

## ALTERNATIVES 2 AND 3 – ACTION ALTERNATIVES DIRECT AND INDIRECT EFFECTS

### KNOWN OCCURRENCES

There are known occurrences of rare plant species within proposed treatment units, as well as rare plant populations within the project boundary that are not within proposed treatment units (Table 46). The species which would not be affected by this project are adder's tongue (*Ophioglossum pusillum*), English sundew (*Drosera anglica*), crested shieldfern (*Dryopteris cristata*), slender cottongrass (*Eriophorum gracile*), pod grass (*Scheuchzeria palustri*s) and many of the populations of common camas (*Camassia quamash)*.

#### HOWELL'S GUMWEED (*GRINDELIA HOWELLII*)

The Howell's gumweed population along Montana Highway 83 (Swan Highway) may be affected by harvest activities. There are harvest units directly off of the highway and in the occupied sensitive species site that could affect individuals through soil disturbance and increased light availability. Effects include removal of gumweed and associated native vegetation via equipment movement as well as soil disturbance that would provide habitat for invasive species; yet simultaneously providing habitat for the gumweed. Increased light availability would also provide habitat for weeds, as well as gumweed. Project design features would mitigate impacts to the population; however, individuals may be affected. Individual plants were not found during surveys. This may be due to ecological succession of the stand and lack of disturbance, or possibly due to weed control efforts by the state along Montana Highway 83. If plants are found, the sites would be flagged prior to implementation to be avoided during operations. There are other populations of Howell's gumweed nearby, which have been observed over the past several years. Since plants were not found during surveys, and there are several other populations nearby, this project *may affect individuals, but is not likely to result in a trend toward federal listing or loss of viability*.

#### WHITEBARK PINE (*PINUS ALBICAULIS*)

Whitebark pine grows in high elevation forests across the northern Rocky Mountains, including the Flathead National Forest and the Swan Lake Ranger District. Whitebark pine has experienced a dramatic population decline throughout its range in the western United States over the past few decades, primarily due to white pine blister rust, in addition to other factors. There are many surviving populations of this species scattered across the forest. All healthy and reproducing populations are avoided during vegetation management activities; unless it is to specifically benefit the species. As a result, there are many cone-producing or cone-bearing individuals on the forest.

In this project area, some vegetation treatment units have been specifically designed to benefit the whitebark pine trees found in the units. Healthy cone-bearing whitebark pine trees have also been located in prescribed burn Unit 309, along Lindy Ridge.

Alternative 2 and 3 propose to daylight whitebark pine trees of those trees (clear vegetation around them) to protect them from beetle infestation, as well as create openings (via group selection) for planting rust-resistant stock. Although some individuals may be removed through activities associated with timber harvesting, the cone-bearing or mature trees would be completely avoided due to their reproductive capacity and resistance to white pine blister rust.

Prescribed burning in Unit 309 is proposed to reduce hazardous fuels levels in an area where there is a high likelihood of a wildland fire leaving the Mission Mountains Wilderness and threatening private residences. To address this hazardous fuels condition such that land managers can allow fires to play a natural role in the Mission Mountains Wilderness, prescribe burning is being proposed below and along Lindy Ridge next to and within the Mission Mountains Wilderness. Field review has documented whitebark pine along Lindy Ridge, within the boundaries of prescribed burn Unit 309. . Trees that were found were living cone-bearing trees, some of considerable age and size. Burning in whitebark pine habitat can impact individuals by burning them (whitebark pine has thinner bark than ponderosa pine and western larch) yet benefit habitat by removing subalpine fir that encroaches into and shades whitebark pine habitat. Many whitebark pine were observed to have subalpine fir growing next to them, providing ladder fuel that would burn the whitebark pine individual and kill it. Implementation of the prescribed burn would take into consideration the nature of these two species when burning the proposed unit to minimize the effects of fire to cone-bearing trees. Some individuals would likely be lost. Since there are other viable individuals and populations scattered across the district and the forest, as well as restoration efforts underway, this project *may affect individuals, but is not likely to result in a trend toward federal listing or loss of viability*.

#### COMMON CAMAS (CAMASSIA QUAMASH)

Common camas is not a listed RFSS plant, but it is considered culturally important in this area. Its general habitat coincides with wetlands that are protected from harmful management activities. The Flathead National Forest tries to maintain as many healthy populations as possible of this species. Camas populations are scattered across the project area, with potentially more populations that were not located during surveys. Proposed harvest activities and temporary road construction may disturb populations, remove plants, as well as increase the risk for invasive species infestation. Since camas usually exists in wetlands, it would normally be excluded from activities by a 50-foot buffer if the wetland is less than an acre and a 100-foot buffer if greater than an acre. In areas where camas is not in a wetland, it would be excluded from ground disturbing activities.

The other rare plant populations in the project area that are near proposed units would not be affected by harvest activities or road/access activities. Ground disturbance over the populations would not be a concern since these species are wetland plants occupying either open water or very wet meadow/fen conditions – areas that are not conducive to harvesting or road building and are buffered from such activities. If necessary, project design features would be used to protect the habitat of these populations from project activities. The only other rare plant populations within an activity area are in maximum management area (MMA) of the wilderness burn units. These populations occupy extremely wet habitats on lakeshore and would likely not carry a burn. There would be no ignition in these areas; any burning would be a carryover from ignition south of the lakes.

If any more rare plant populations are identified during project implementation, they will be protected as specified in the contract clause and in the project design features.

### SUITABLE HABITAT FOR SENSITIVE SPECIES

The project area contains habitat guilds for many sensitive plant species. Undocumented occurrences of RFSS plants may be affected by soil disturbance and compaction, competition from invasive species, roadside dusting, increased light availability from opening up the canopy, and hydrology alteration due to project activities.

## TIMBER HARVESTING

Timber harvesting may alter the hydrologic processes for sensitive plants of wetland-associated habitat groups such as the riparian, wet meadow, and moist coniferous forest groups. Changes to the hydrologic processes of wetlands may result in either a decrease or increase of wetland water levels and alter species diversity (Chadde et al. 1998). Timber harvesting often decreases canopy cover and consequently may decrease evapotranspiration rates of surrounding upland trees. This could result in increased inundation of wetlands from runoff. Alternatively, increased canopy openings near wetlands could increase evaporation of the wetlands, effectively reducing water levels earlier in the growing season.

Harvesting in upland forested areas can alter suitable habitat. The removal of canopy cover allows more light to the ground as well as more air movement which can decrease humidity and increase temperatures. These changes to microclimate can affect any existing RFSS individuals. Impacts include wilting from increased temperature and decreased humidity, as well as sunburn from increased light levels. These changes to the habitat can also make these areas more suitable for weed invasion.

Table 13 has the harvest types in each action alternative broken down by prescription. Both Alternative 2 and 3 propose approximately 1500 to 1300 acres of intermediate treatment through improvement cuts and commercial thinning. These intermediate treatments would remove about half of the trees within each unit, retaining a more forested appearance. Alternative 2 proposes more regeneration harvest than Alternative 3, which includes clearcut, seed tree, and group selection harvests. Regeneration treatments would remove most trees from the harvested area. Clearcutting leaves up to 10 trees per acre at less than 5 percent canopy cover. A seed tree prescription leaves 5 to 10 percent canopy cover, while a group selection leaves 0 to 70 percent canopy cover (average 30 percent) (Project Exhibit J-7). These harvest prescriptions (clearcut, seed tree, and group selection) would have the most impact on suitable habitat, since they would change the site conditions considerably. It could take up to 50 years for the canopy to recover enough to improve understory conditions. Habitat guilds that would be affected by these treatments include subalpine, mid-elevation moist coniferous forests, and riparian areas.

Included in the previous figures are units in Alternative 2 that propose vegetation management in the RHCAs to reduce the risk of stand-replacing fire that would potentially kill legacy trees. The prescriptions proposed in RHCAs for Alternative 2 are commercial thinning, pre-commercial thinning, improvement cuts, and daylighting. Management in the RHCAs increases the potential for altering suitable habitat to unsuitable, especially when using ground-based equipment for improvement cuts or commercial thinning prescriptions in the RHCA. The primary concern with harvest is the potential spread of invasive plan species into the habitat. Camas populations are known to occupy some of the areas proposed for harvest in the RHCA, and these populations would be excluded from the activity areas. All areas proposed for treatment have been surveyed for sensitive and rare plants. Alternative 3 does not propose harvest activities in the RHCAs, except for Units 460 and 491, where a road is already located in the RHCA and harvest activities were determined not to contribute additional effects.

Methods of tree removal would be ground-based mechanical, skyline, or hand (Tables 2, 3, 7, and 8). Ground-based harvesting includes mechanized equipment such as tractors, clippers, skidders, forwarders, etc., and would cause soil disturbance that could alter suitable habitat, prepare the soil for invasive species, and possibly remove undocumented rare plant populations. Skyline methods utilize cables to yard woody material up to a landing at the top or bottom of the unit. Skyline harvesting is lighter on the land, but still disturbs the soil when trees are dragged across the units and when landings are created.

Reforestation would occur in regeneration harvest units either by planting or natural regeneration. These are units where inadequate natural regeneration of tree species is predicted. The remaining acres not proposed for planting would naturally regenerate with on-site seed and adjacent leave trees, usually lodgepole pine, larch, ponderosa pine, or Douglas-fir. In addition to reforestation in regeneration harvests, there are also 329 acres of fill planting proposed in both action alternatives. Planting trees benefits native plant habitat by starting the recovery process immediately, instead of waiting the few years for seedlings to germinate and survive.

Alternative 3 would have the least amount of timber harvesting and soil disturbance, affecting the least amount of RFSS plant habitat. Alternative 2 has the most amount of timber harvesting and would affect the most amount of rare plant habitat.

### THINNING TREATMENTS

Pre-commercial thinning is proposed in both Alternative 2 and 3 (Table 4and Table 9) Thinning treatments reduce tree densities within stands with the objective of promoting healthier and more resilient forest conditions now and into the future, as well as improving timber productivity. Thinning also removes ladder fuels and reduces fire hazard. Desired species, such as ponderosa pine, Douglas fir, and western larch, would be favored as leave trees, while removing adjacent competing trees (primarily lodgepole pine). Increased light and moisture would be available to the leave trees and to the understory vegetation, improving growth and vigor of these components.

Pre-commercial mechanical thinning treatments would have similar effects to suitable habitat as intermediate treatments; much of the canopy would be left behind, but there would still be soil disturbance and removal of native vegetation. Hand treatments are preferable since there would be less soil disturbance and virtually no removal of native vegetation; however, the action alternatives propose primarily mechanical thinning. Alternative 3 proposes less pre-commercial thinning, therefore would have the least effect to suitable habitat.

Daylighting and group selection cuts would focus on whitebark pine restoration and legacy tree preservation. These methods would be used for discouraging bark beetle attacks on whitebark pine, white pine, ponderosa pine, western larch, and Douglas fir. These treatments also address ladder fuels beneath target trees. While these individual trees are important to protect, the removal of the understory trees will alter the habitat and result in higher temperatures, increased light availability, and lower humidity. Although it would affect suitable habitat for some rare plant species, considering the abundance of Howell’s gumweed in that part of the district, these treatments may also provide habitat for that species. These treatments may also provide suitable conditions for invasive species.

### FUEL TREATMENT ACTIVITIES

The objective of fuels treatment is to restore the role that fire has historically played in these stands – reducing tree density; reducing surface and ladder fuels; and stimulating grass, forb and shrub growth. Suitable habitat in the proposed burn areas may be directly affected for a brief period due to burn over of the area. Burning activities that occur after germination and prior to seed set for annual plants could possibly reduce population viability for plant populations. Perennial plants would also be burned over; however, depending on fire severity, rootstock would remain intact and experience temporary temperature increases in the soil. Although low intensity fire generally benefits native vegetation, it carries the risk of changing suitable habitat to unsuitable habitat if the burn severity is moderate to high. These effects would be of short duration and could benefit these plants by stimulating growth and removing debris from their stem bases. Understory prescribed fire and thinning of the canopy may stimulate the expansion of undetected rare plant populations by reducing competition and increasing light penetration for those species that thrive in open conditions. Alternatively, fire activities can increase exposed mineral soil and increase the risk of these areas to invasive species establishment, which may affect the integrity of suitable habitat. Other effects of burning include siltation and changes in water chemistry due to the removal vegetation upslope of wetlands and open water. These effects could alter wetland species diversity of downstream areas.

Fuel treatment is proposed for each unit in the action alternatives. Slash treatment would be a combination of mechanical and hand methods such as lop and scatter, mechanical piling and burning, and whole tree yarding. As with mechanical methods for timber harvesting, there would be ground disturbance that would provide suitable substrate for invasive species as well as remove native vegetation and alter suitable habitat. The other type of fuel treatment is prescribed burning, of which there are a few units proposed (Table 4 and Table 9).

Other burning activities that would occur in all action alternatives across the timber harvest units include excavator or hand piling, and pile burning. Past observations have seen these piles present a high risk for invasive species infestations. The high intensity burning of the confined area 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 these sterile conditions, and once they are introduced, there is no natural competition to prevent establishment and persistence of invasive species. These areas are priority for post-treatment monitoring and treatment. Hand piling is preferred due to the little to no soil disturbance for moving the slash into piles. Excavator piling uses heavy equipment and creates more soil disturbance in the unit other than the piles themselves.

While both alternatives propose mechanical piling and burning, Alternative 3 has the least amount of mechanical piling and burning and would have the least amount of disturbance to native plant communities and the least amount of risk of weed infestation.

## ROADS

There are approximately 68 miles of existing NFS roads within the project area. Both action alternatives propose temporary road construction on historic templates, as well as new construction (Table 13). Using an existing template has an advantage over new constructions because soil compaction and vegetation removal has already occurred in those corridors. Based on personal observations, temporary roads stay on the landscape and are not easily accessible for weed treatment or RFSS plant monitoring like permanent roads. Decommissioning and moving roads into storage are also proposed. A short segment (0.15 miles) of road realignment would occur to allow for decommissioning of 0.38 miles of road.

Effects to suitable habitat from temporary road construction and road realignment include the removal of vegetation and soil compaction, edge effects, altered hydrology, and siltation. The construction of new road template removes vegetation, often putting it to the side of the corridor where it is left to decompose. Equipment could compact the soil creating a drivable surface and, depending on the project need, gravel would be laid down to improve the driving surface. This construction removes the area from the productive landbase for the life of the road, preventing native vegetation from growing back. Generally, temporary roads are on the landscape for the duration of the project and then blocked, reclaimed or recontoured after it is no longer needed. If the road is reclaimed via ripping and putting back the native surface and/or recontouring, eventually native vegetation would grow back if it is not outcompeted by weeds. If the road is left as is on the landscape without rehabilitation, vegetation would still grow back, but plant growth would be hindered due to soil compaction and lack of nutrition, and weeds would have a competitive advantage in the harsher growing environment. If not rehabilitated properly, roads have a lasting effect on the land. They can become corridors for invasive species to enter areas that would not normally be at risk of invasion. By allowing invasive species into natural areas, suitable habitat for RFSS plants decreases. Recontouring these roads and seeding them with an approved seed mix has inhibited weed spread in the past and is included in the project design features in this project.

Edge effects are described as an increase in light, temperature, and wind, as well as a decrease in humidity, and in the case of roads, an increase in dusting (Trombulak andFriessell 2000). The extent of edge effects is difficult to determine, since it depends on the size of the adjacent opening/road corridor and the affected forest type but it can extend from 15 feet to 50 feet (Watkins et al. 2003). The effect to native vegetation would be a change in habitat that affects the diversity of the stand edge.

Roads can alter hydrologic regimes by increasing or decreasing the water levels of the affected wetlands, as well as increasing silt to downstream wetlands (Chadde et al. 1998). These changes can impact native vegetation and sensitive plant suitable habitat. Roads are well known as corridors for invasive species, which can also indirectly impact wetlands and other natural areas (Trombulak andFrissell 2000; Tyser et al. 1992; Von der Lippe et al. 2007) . There would not be any new road construction in the Beaver Creek Project Area that would further impact hydrology-dependent plant habitats.

Alternative 2 has the most temporary roads proposed for construction or reconstruction. It would have the most effect to native vegetation and suitable habitat, in regards to direct effects and indirect effects.

Alternative 2 and 3 propose 4.5 miles of decommissioning of forest system roads. Road decommissioning options range from no ground disturbing activities (passive restoration) to full recontouring of the old road bed, culvert removal and waterbar construction (active/passive restoration). Decommissioning, although in the long term is beneficial to the landscape, disturbs the road template and negates any vegetation growth to date. Passive restoration does not use equipment and has no soil disturbance, yet the road bed may be infested. Culvert removal and waterbar construction keeps the template undisturbed for the most part but there would still be disturbance and movement of weeds through the corridor, affecting native vegetation. The most useful decommissioning in regard to native vegetation and habitat restoration is treating weeds ahead of implementation and then fully rehabilitating the road template, which includes recontouring, with extensive revegetation (generally with grass seed). As long as native vegetation can dominate the weeds, treatment is not necessary.

Intermittent Stored Service (ISS) has similar effects to rare and sensitive plants as road decommissioning. These roads stay on the system but have culverts removed and drainage features installed to protect the road surface from water damage. Without access, these roads would not be treated for weeds until the next time they would be opened for forest management, which would allow these infestations to passively spread on the landscape, affecting native vegetation and suitable habitat. There is the same amount of roads proposed for ISS in both alternatives.

## AQUATIC RESTORATION PROJECTS

In Alternative 2, one concrete fish barrier and a culvert replacement are proposed along the same stretch of a perennial tributary to Beaver Creek. Both of these activities would require travel through infestations and moving soil. In the case of the concrete fish barrier, an access route would be built for installation and then rehabilitated. Although there would be seeding, mulching, decompaction and woody debris over the rehabilitated access route, the parent road (NFS road 91201) is heavily infested. Native vegetation would be removed permanently, altering the habitat to be more conducive to invasive species. The second site (culvert replacement) is not currently infested, although there are infestations along the road to the site. Revegetation would be necessary on the disturbed areas to promote native vegetation and reduce the risk of infestation. Alternative 3 does not propose a concrete fish barrier and instead proposes culvert replacement higher upstream to serve as a fish barrier.

Both action alternatives propose a culvert on NFS road 11636 to act as a fish barrier. The entire length of NFS road 11636 is heavily infested. Existing infestations would be disturbed and moved around, possibly making the infestation denser and reducing native vegetation. However, providing a culvert and consequently a road crossing over the tributary could allow access for weed treatment and revegetation efforts if the road remains accessible.

Another culvert replacement is proposed in both action alternatives on NFS road 906 to relieve the constant clogging and the subsequent ponding, which is affecting the road's stability. Riparian vegetation has grown around this pond and would be impacted by a drop in water level, which affects temperature and humidity. However, vegetation would be allowed to return to historic conditions and provide suitable habitat for riparian plant species.

### NON-NATIVE INVASIVE SPECIES CONTROL

Sensitive and rare plants adjacent to areas of chemical invasive species control may be at risk of exposure to herbicide. On the Flathead National Forest, TES plant surveys are conducted for each site before any chemical control treatments are implemented, as required by the Flathead National Forest's Noxious and Invasive Weed Control DN (USDA 2001b); pp. DN-6 – DN-7). With the exception of some RFSS plants that occur in "disturbed" or early successional habitats (i.e., Howell's gumweed, pale corydalis, Austin's knotweed, and western moonwort), most invasive species generally do not persist in intact rare plant habitat due to different habitat requirements. There are many infestations in the project area, and accessible roads are sprayed as part of the Forest's weed program, as well as would be sprayed in preparation for the Beaver Creek Project activities.

Although much of Montana Highway 83 is bordered by NFS lands, it is maintained by the state Department of Transportation and by the local counties. The Forest Service does not have control over what these agencies do for maintenance along their right-of-way corridor, which includes weed control.

# REGIONAL FORESTER'S SENSITIVE SPECIES

## ALTERNATIVES 2 AND 3 – ACTION ALTERNATIVES
## CUMULATIVE EFFECTS

Past, present, and reasonably foreseeable actions within the project area include timber harvesting, wildland fires and fire suppression, road activities, recreation, forest products gathering, invasive species control, land development, special use permits, range/agriculture and other activities. The earliest activities considered in this analysis occurred in the 1920s. These actions may have historically affected RFSS plants and may continue to have effects.

### TIMBER HARVESTING AND PRE-COMMERCIAL THINNING

Timber harvesting decreases canopy cover and increases light level to the forest floor. This may be beneficial for some sensitive species, but may have adverse effects for other species requiring greater canopy cover (e.g., clustered lady's-slipper, crested woodfern). Over time, changes in forest structure alter native vegetation types and sensitive species habitat. In many cases, timber harvesting creates stand changes similar to wildland fire; however, the pattern and distribution of forest size classes has drastically shifted from historical patterns that were created under natural disturbance regimes. Today forested stands are far more fragmented in forest structure and size class across the landscape than in the past.

Additionally, harvesting activities disturb soil which increases the amount of exposed mineral soil. Soil disturbance carries a high risk of invasive species establishment, and if equipment is contaminated, also has a high risk of introduction of invasive species. Soil disturbance also exposes the dormant seed bank in the soil. The introduction and establishment of invasive species would affect the integrity of native and sensitive species habitats by outcompeting native vegetation and using up resources like space, water and light. There have been 10,385 acres of past timber harvest in the project area, mostly from commercial harvests, on current NFS lands. Although there are no records of timber harvest on private lands, those lands have also been harvested (ground observations and aerial photos). Many of these acres overlap and have been harvested many times over the same area. There are currently no other foreseeable timber projects in the project area.

The Forest Service acquired former PCTC lands through a land transfer agreement with TNC. The Nature Conservancy operated timber sales on those lands in 2011 and 2012 (Beaver Highway and Two Bears). No RFSS plants are documented in those sections.

## ROAD ACTIVITIES

Past, present, and future maintenance of roads can have both adverse and beneficial cumulative effects on RFSS plant populations. Disturbance of roadsides may benefit those species that have a competitive edge in disturbed environments (i.e., Howell's gumweed, pale corydalis, Austin's knotweed, and western moonwort); yet disturbance would temporarily adversely affect these populations until new seedlings establish in the openings. Maintenance may increase traffic along these roads and thus increase the risk of the introduction of invasive species which could affect RFSS plant populations or habitat. Maintenance such as blading activities may also disturb plant populations adjacent to roads. Road construction and maintenance may also affect wetland habitats by disrupting the hydrology (Trombulak andFrissell 2000).

The Howell's gumweed population along Montana Highway 83 has most likely been affected by dusting by traffic. Since it is along the right-of-way and off of the main road, dust from traffic settles on the plants and does not wash off due to the glandular resin that makes the plants very tacky. Dust can impede photosynthesis and respiration, as well as contribute to molding by holding moisture on the leaves.

There are many rare plant populations in the project area that are in wetlands or ponds. It is possible that past (and future) road construction may have affected groundwater and sediment flow in some wetlands. Increased siltation may result in shifts in the wetland vegetation composition, supporting emergent vegetation in place of submergent vegetation types (USDI 1996). Past road closures have positively affected suitable habitat and native vegetation by reducing the above effects and decreasing the potential for invasive species invasion.

The 68 miles of road in the project area include system roads that are open year-round, seasonally, or closed year-round. Most of them (60 miles) are closed to the public and are not maintained. This figure does not reflect the amount of temporary roads or decommissioned roads that have been on the landscape in the past. Many of those corridors still exist, whether they are grown over with tree saplings or native vegetation or are infested with weeds. The action alternatives would add temporary roads to the landscape for a short period of time and then would be rehabilitated once project activities are complete.

## FIRE

In general, NFS lands contain high fuel loads in the understory due to fire suppression over the last century. Fire suppression has created a denser understory condition in many untreated stands where, historically, low-intensity understory fires occurred regularly. The fires that have been eliminated from the understory played a role in reducing fuels as well as encroaching vegetation. Fire suppression, resulting in closed-canopy forests, has reduced light levels and affected understory vegetation. Additionally, fire suppression activities, such as dozer lines and hand-dug fire lines, increase exposed mineral soil which can be vulnerable to invasive species establishment, which would affect the integrity of suitable habitat. When wildland fires occur, they can burn hot in areas, affecting the soil and reducing its nutrient content. Native plants eventually grow back over time, but compete with invasive species for the remaining nutrients.

Fuels reduction, whether by the Forest Service or by other landowners, reduces the risk of catastrophic wildland fires and the need for extensive fire suppression activities. Since vegetation removal is part of fuels reduction activities, there is a risk of disturbing undocumented RFSS plant populations; however, an intense burn would also disturb existing populations. The largest known burn occurred in 1919 over 8,000 acres in the project area. Over the past 45 years, most of the fires in the project area were quickly suppressed and kept at less than an acre in size. More specific information about past fires in the project area can be found in the Fire/Fuels Section and in the Beaver Creek Project Area Fire History Map (Map 3-2). Fire suppression would continue in the future, mostly due to the presence of private land in the area.

## RECREATION

Campgrounds, hiking, biking and horse trails, motorized trails, lake and river access points, and other areas frequented by recreationists all require construction and maintenance. These activities cumulatively affect sensitive plants by removing suitable habitat, especially in areas along streams, lakes, and associated wetlands. Dispersed and developed camping increases the risk of introducing invasive species to RFSS plant habitat, as well as trampling of native vegetation surrounding these sites.

Trail construction and maintenance near wetlands may affect wetland species by increasing siltation into wetlands or increasing the risk of introducing invasive species by recreationists. These linear, non-vegetated features create edge effects into the adjacent understory and affect suitable habitat by increasing light and temperature, and decreasing humidity. These features also provide corridors for invasive species, allowing them to move into the understory. There are some trails in the project area that run adjacent to a couple wetland areas. Their vegetative condition is unknown at this time.

Other recreation activities such as off-trail hiking, hunting, trapping, outfitters and guides, berry picking, and horse riding can also impact sensitive plant habitat. Native vegetation and RFSS plants may experience cumulative effects of trampling and collecting from dispersed recreation.

## FOREST PRODUCTS

Public use of forest products (firewood, boughs, berries, etc.) may contribute to the cumulative effects to sensitive species populations and habitat. While obtaining forest products, trampling and collecting of RFSS species may occur. Popular collection sites would have the most impact with possible habitat degradation. The project area is adjacent to other ownerships and access to NFS lands is easy and frequent. Temporary roads would be rehabilitated and public motorized access would be restricted on these roads during project activities. Collection of forest products occurs often and would continue to occur in the project area. Common camas has been traditionally harvested for its edible bulbs and would continue to be harvested on a limited basis.

## INVASIVE SPECIES CONTROL

Past vegetation management, wildland fire suppression, recreation, land development, and road related activities have all contributed to the spread of invasive species in the project area. The proposed activities also carry the risk of introduction and further spread of invasives. The Flathead National Forest has an integrated weed management program that identifies and controls infestations across the Forest. Herbicide is the most commonly used treatment method to control invasive species, which can affect native plant species. The Flathead National Forest also uses biological control on tansy ragwort, spotted knapweed, and Canada thistle. These species-specific organisms have spread on their own, as well as with human help, into the project area (except for tansy ragwort biocontrol). Since areas to be treated with herbicide are surveyed prior to spraying, there would not be an effect to documented populations of sensitive plants. Currently, the Flathead National Forest treats many of the roads in the project area.

Since 2009, the Swan Lake Ranger District has been able to benefit from a Congressional Act called Collaborative Forest Landscape Restoration Program (CFLRP). This act has supplemented the District’s regular programs with funding for restoration projects. Weed spraying through contracts has been a large part of the program. With CFLRP, the Swan Lake Ranger District has been able to control many more infestations in a short amount of time than the normal forest program would be able to sustain. Many of the roads in the Beaver Creek Project Area have been and will continue to be treated as part of this program.

Without prevention measures, inventories, and treatment, the risk of spread would increase in this project area and would further affect suitable habitat. The project design features in this proposed project would contribute to preventing further invasive species establishment as a result of project activities; however, due to the amount of existing infestations, there would still be a moderate-high risk of spread, which could continue to impact suitable RFSS habitat.

Howell's gumweed has likely been impacted in the past by herbicide spraying along the Montana Highway 83 corridor by the Montana Department of Transportation. This action has been occurring for many years and has most likely extirpated most of the population along that stretch of the highway; however, losing a portion of this population would not lead to a loss of viability to the species or lead to federal listing since there are many other populations nearby on the Swan Lake Ranger District.

Reed canarygrass has invaded many wetlands in the Swan Valley to the point of complete extirpation of native grasses and forbs. Due to state pesticide regulations, the Forest has not been able to combat this threat effectively. This invasive plant is especially dangerous to RFSS plants that grow in wetland habitats. Many wet meadows that may have been occupied by common camas have been affected by this weed and other invasive species.

### Land Development and Exchanges

Effects to sensitive plant species as a result of past development and land clearing on private lands could have been detrimental to population viability; however, since there is no historical data on sensitive species, it is difficult to analyze the effects of those actions. Much of the suitable habitat for plants associated with wetlands has been lost or degraded on private lands. These areas have been used for agriculture or development and were often cleared of trees or drained. Continued development of lands could reduce potential habitat, alter hydrologic regimes, and increase the likelihood for new invasive species establishment. There are several parcels in the project area that belong to private individuals.

Plum Creek Timber Company land that has been acquired by the Forest Service (Legacy lands) has been surveyed for RFSS plants and weeds and would be managed for protection and restoration of wildlife and fish habitat and wetlands into the future.

### Grazing and Agriculture

There is one range allotment in the project area, the Holland Cattle and Horse Allotment. It allows 50 cow/calf pairs from June through September. This time period is the prime growing season for native and invasive plants. Livestock grazing has been known to cause soil compaction and vegetation trampling (Belsky et al. 1997). With such low livestock numbers allowed in the allotment, the impacts to forested land are low; however, livestock tend to gather in riparian areas and along roadsides, concentrating impacts to those areas. When livestock enter the understory, their grazing can affect the vegetation by removing forbs, tree and shrub seedlings, and provide suitable conditions for weed seed. This allotment would continue to be used.

A small amount of private land in the project area has been converted to agricultural practices, removing native vegetation and altering the ecology of that plot indefinitely.

### Other Actions in the Project Area

There are several special use permits in the project area. There are several road easements, many utility permits for fiber optics, phone and power lines, and various other special use permits. These permitted actions have removed suitable habitat from the landscape indefinitely. Since there are no historical plant surveys from many of these sites, it is unknown if currently listed rare species might have existed prior to activities.

### SUMMARY OF EFFECTS

The proposed Beaver Creek Landscape Restoration Project may have effects on RFSS, specifically Howell's gumweed. Although not an RFSS plant, common camas may also be affected by activities through placement of temporary roads and harvest equipment in units. There are project Design Criteria (Table 16) to avoid known populations of all protected species; however, these two species are in areas where specific activities would occur. Documented sites would be flagged prior to implementation to protect the majority of the populations, yet individuals may be disturbed if they are not found during the flagging process.

Effects to Howell's gumweed and common camas include increased light to the understory and localized ground disturbance that could be easily infested by invasive species. In the case of gumweed, ground disturbance may be beneficial since the species occupies disturbed habitats, as long as it is not outcompeted by weeds. Common camas, on the other hand, does not do well in disturbed habitats and is not able to compete with weeds.

Cumulative effects to RFSS plants are difficult to determine since there are no historical plant surveys in the area. Currently, populations are stable. The amount of land development, roads, vegetation management and wildland fires within the project area has had an impact on the landscape and presumably any rare plant populations that may have existed at the time. The Beaver Creek Project would add to these activities and change the landscape further.

## EFFECTS OF A FOREST PLAN AMENDMENT TO ASSIGN MANAGEMENT AREAS TO ACQUIRED LANDS

The Beaver Creek Project includes a Forest Plan Amendment to assign interim management areas (MA) to approximately 5,457 acres of former PCTC lands acquired by the USDA Forest Service to be managed as part of the Flathead National Forest. These interim management areas will be in effect on acquired lands until the ongoing Forest Plan Revision effort is completed, anticipated in 2 years.

The effects of the Forest Plan Amendment to threatened, endangered, sensitive, and rare plant species are minor because the Forest Plan standards and guidelines apply to all lands managed by the Flathead National Forest even if management areas are not assigned. Plant surveys would continue to occur prior to any management activities being conducted to conserve threatened, endangered, sensitive, and rare plant resources.  The recommended buffers for habitat suitable for water howellia will continue to apply across all lands managed by the Flathead National Forest, forest wide monitoring efforts, as described earlier in this report, have documented that the regulatory mechanisms and monitoring efforts appear to be benefiting the species. These MA assignments are consistent with the existing condition of these lands and the management direction assigned to adjacent lands and will not preclude future MA assignment under the Flathead Forest Plan Revision effort.

The cumulative effects of this forest plan amendment are very limited due to the geographic scope and expected duration of the amendment. At the Flathead National Forest scale, this amendment is only addressing management area direction on less than 1 percent of the NFS acreage on the Flathead National Forest. Additionally, the duration of this amendment is expected to be short-term since forest plan revision is ongoing with a decision expected in 2017. When the revision effort is completed, new management areas will be assigned across the entire Flathead National Forest, including the Beaver Creek project area, and will supersede any of the interim management areas proposed in this amendment.  Reasonably foreseeable activities identified on the lands associated with the amendment is very limited as identified in Table 17 in Chapter 3 of this EA. If future land management activities occur on these lands they will be subject to forest-wide direction found in the Flathead National Forest Land and Resource Management Plan, federal and state laws, and other Forest Service regulations, as they are now, and will be guided by the proposed management area direction. Future land management activities such as timber harvest, road work, changes to public access etc. would be subject to site-specific NEPA analysis in the future.

# DETERMINATION

## WATER HOWELLIA (HOWELLIA AQUATILIS)

Water howellia is listed as a "Threatened" species under the ESA. A BA was prepared and submitted to the USFWS for consultation.

## SPALDING'S CATCHFLY (*SILENE SPALDINGII*)

It is my determination that the proposed Beaver Creek Project would have *no effect* on Spalding's catchfly, its habitat, or potential habitat for these species. This determination is based on the lack of known occurrences and suitable habitat within the project area.

## REGIONAL FORESTER'S SENSITIVE PLANTS

It is my determination that the proposed Beaver Creek Project *may affect individuals and habitat, but would not result in a trend toward federal listing or cause a loss of viability* for RFSS plants. This determination is due to the presence of known RFSS and other rare plant species, as well as suitable habitat within the project area and within the proposed treatment units, and the implementation of project design features to protect those populations.

# REGULATORY FRAMEWORK AND CONSISTENCY

In accordance with Section 7(c) of the Act, the USFWS has determined that the following threatened or endangered listed species are or may be present on the Flathead National Forest: water howellia (*Howellia aquatilis*) and Spalding's catchfly (*Silene spaldingii*) (USDI 2015).

The Beaver Creek Project would meet the direction outlined by the Flathead National Forest in the Forest Plan and Amendments, as well as direction found in FSM 2670. It is also in compliance with the ESA and NFMA. The BE and BA (Project File Exhibits J-3 and J-4) analyze the potential effects of the project.

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# FIRE/FUELS RESOURCE

## INTRODUCTION

Fire has been the major disturbance on vegetative patterns, composition, structure, age, and development of both individual stands and the larger landscape (Arno 1976, 1980; Fischer et al. 1987; Habeck et al. 1973) in the Upper Swan Valley. The mixture of forest types found in this analysis area developed under mixed-severity fire regimes, varying with moisture, temperature, and vegetative composition. Fire history surveys and subsequent fire regimes classifications provide an important basis for understanding the role of fire in western ecosystems (Agee 1993; Brown 2000; Quigley et al. 1996).

Suppression efforts, since settlement, have altered pre-settlement fire regimes and reduced the number of forested acres burned each year (Barrett 2002). The combination of fire suppression and other natural disturbance processes have allowed fuels to accumulate in fire-excluded forests at both a landscape and stand level. As a result of higher fuel loading, unusually severe fires in historically mixed-severity and nonlethal fire regimes have been linked to effects of fire exclusion (Agee 1993; Barbouletos et al. 1998; Barrett 1998; Steele et al. 1986). The North Fork Flathead Valley in Glacier National Park, an area characterized by a mixed-severity fire regime, experienced the unusually large and severe Red Bench Fire in 1988, after the fire-free interval had more than doubled due to successful fire exclusion (Barrett et al. 1991). In the past decade, large, high-severity, hard to contain fires have occurred on the Swan Lake Ranger District in areas around the analysis area partly due to high fuel loading (Table 54). The suppression efforts that have occurred in the last century, have allowed fuels within the analysis area to accumulate in some stands to unnatural levels based upon the associated fire severity/frequency regimes.

The Beaver Creek Analysis Area can be characterized as having several different forest types within the analysis area resulting in different fire severity regimes ranging from non-lethal to stand-replacing. Information on historical fire regimes can be used to develop ecosystem process models and subsequent management plans at various scales (Brown 2000; Cissel et al. 1999; Hardy et al. 1998). Fuels treatment planning and implementation may return some stands to more natural fuel loading levels and aid in the suppression of future fire starts, cost containment of fire suppression, protection of values at risk and assist with overall forest health.

> “Living with fire embodies an array of competing social values, multiple interests, and uncertain outcomes of how we manage land and fire. Coexisting with fire is contentious and complex because there are many diverse people, or stakeholders, involved with and affected by fire. We all have a stake in this problem. How we understand our differing situations and varying contexts determines the choices we make with respect to living with fire. Different people see issues of living with and managing fire through different lenses. For example, a forest ecologist studying a fire dependent ecosystem may see the use of fire as a management tool quite differently than the people who live or work in or near the forest.” (Kaufmann et al. 2009)

## ANALYSIS AREA

The scale of the analysis area was chosen to allow sufficient size and time to characterize the potential effects of the alternatives without those effects diminishing to unnoticeable levels. The following descriptions identify the analysis area for this project.

### SPATIAL BOUNDS

The spatial boundary for this analysis is the Beaver Creek Project Area, which is largely coincident with the Beaver Creek Grizzly Bear Subunit, henceforth referred to as the analysis area. This approximately 34,962-acre area is large enough to capture tends and patterns of forest vegetation. About 5,453 acres of the Beaver Creek Analysis Area is located inside of the 2013 Seeley Swan Community Wildfire Protection Plan (CWPP) Wildland Urban Interface boundary.

### TEMPORAL BOUNDS

The temporal bounds of this analysis are designed to capture the direct, indirect, and cumulative effects of the alternatives to forest vegetation within the analysis area. The effects of the proposed activities would likely last between 15 and 100+ years. Where intermediate silvicultural treatments are proposed, an effects time frame of 15 to 20 years is estimated. This length of time seems reasonable given site index curves and forest succession data for Western Montana (Arno et al. 1985; Milner 1992). Beyond this time period, and in the absence of additional disturbance or treatments, normal forest succession would substantially alter residual stand conditions from those resulting from initial treatment. Long-term stand trajectories would be different from pre-treatment conditions, but accumulation of surface fuels, height growth of advanced regeneration, ingrowth of shade-tolerant species, expansion of residual tree crowns, and individual tree mortality would all have cumulative effects on the character of the stand to such an extent that they would mask the effects of initial treatments. Where regeneration treatments are applied, effects would be expected to last longer, possibly a time period required for the stands to progress through successional stages from stand initiation to a mature stand condition (estimated 100 years) (Arno et al. 1985). Some effects, such as changes in species composition, and the quantity of large down woody material, could last even longer. For past activities considered in the cumulative effects analysis temporal bounds are limited by the availability of accurate data relating to forest vegetation condition. Data is generally available dating back only to the 1950s.

## DATA SOURCES, METHODS, AND ASSUMPTIONS

This section discusses the methodologies, data sources, and assumptions used to compile this analysis.

### DATA SOURCES

#### FUELS DATA

The existing fuels data set was compiled using a combination of common stand exams, field visits, fire regimes data from Steve Barrett, and the Landscape Fire and Resource Management Planning Tools Project (LANDFIRE Project). The LANDFIRE Project was initiated by a request from Federal land agencies asking the principal investigators to develop maps needed to prioritize areas for hazardous fuel reduction.

The LANDFIRE Project is a joint multi-agency project between the USDA Forest Service, the USDI Geological Survey, the Bureau of Land Management, the National Park Service, the Bureau of Indian Affairs, the USFWS, and TNC; with the principal investigators located at the USDA Forest Service Rocky Mountain Research Station Fire Sciences Laboratory in Missoula, Montana, and the USGS National Center for Earth Resources Observation and Science in Sioux Falls, South Dakota. The objective of the LANDFIRE Project is to provide the spatial data needed by land and wildland fire managers to accurately identify the amount and locations of lands or communities with hazardous fuel build-up or extreme departure from historical conditions. These data also facilitate the prioritization of ecosystem restoration and hazardous fuel reduction treatments to protect ecosystems, property, and people. Moreover, these data may be used during specific wildland fire incidents to maximize firefighter safety, pre-position resources, and evaluate fire behavior under a variety of fire weather conditions. These spatial data and predictive models would be hierarchically designed so that they can be used at the national, regional and local levels. Additional information on LANDFIRE can be obtained at www.landfire.gov.

### CLIMATOLOGY AND FIRE BEHAVIOR THRESHOLDS

Local weather information was obtained from a remote automated weather station (RAWS) in Condon, Montana. This weather information was obtained from the FAMWEB Website under Fire and Weather Data for the Condon Remote Automated Weather Station for a 15-year time period from 2000 through 2014. The computer program, Fire Family Plus Version 4.1, was used to analyze fire weather parameters associated with fire occurrence data in determining fire behavior thresholds. These thresholds can be used as general guidelines to help warn fire managers and firefighters of potential fire danger. Fire Family Plus 4.1 was used to analyze this information and produce the 97$^{th}$ percentile Energy Release Component (ERC) conditions from June 1 to October 16.

### FIRE HISTORY

The fire history analysis in the Upper Swan was based on the data collected between 1997 and 2002 for the Swan Lake Ranger District's TSMRS, Steve Barrett (Fire History Researcher), and Swan Lake Ranger District personnel. Data was also collected from the FAMWEB website under Fire and Weather Data from 1970 to 2014 and local fire records. ARCGIS 10.0 was used to create fire history maps.

## METHODOLOGIES

### FUEL TREATMENT PRINCIPLES AND CONSIDERATIONS

Fuels, weather, and topography influence fire behavior. Fuels are the only factor that management can modify. Fuels are made up of the various components of vegetation, live and dead, occurring on a site. These components include litter and duff layers, the dead-downed woody material, grasses and forbs, shrubs, regeneration, and timber. Various combinations of these components define the major fuels groups of grass, shrub, timber, and slash. The differences in fire behavior among these groups are fundamentally related to the fuel load and its distribution among the particle size classes. Fuel load and depth are critical fuel properties for predicting whether a fire will ignite, its rate of spread, flame length and its intensity.

Fuel treatments reduce the crown and surface fuels by thinning trees and burning, removing, or chipping fuel on the ground. Table 50 describes the effects of some fuel treatment principles.

**TABLE 50. FUEL TREATMENT PRINCIPLES.**

| PRINCIPLE[6] | EFFECT | ADVANTAGE |
|---|---|---|
| Reduce surface fuels | Reduces potential flame length | Improves control and reduces torching |
| Increase canopy base height | Requires longer flame to start torching | Reduces torching |
| Decrease crown density | Makes tree-to-tree crown fire less likely | Reduces potential for crown fire |
| Retain larger trees survival | Increases proportion of trees with thicker bark, taller crowns | Increases tree survival |

[6] Adapted from Agee, J. K. 2000. 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 Resource Institute. 199.126.

Fuel component characteristics contribute to fire behavior properties. Fuel loading, size class distribution of the load, and its arrangement (compactness or bulk density) govern whether an ignition would result in sustaining fire. Horizontal continuity influences whether a fire would spread or not and how steady the rate of spread would be. The loading and vertical arrangements, of fuels, influence flame size, and ability for fire to burn in or into the overstory. With the proper horizontal continuity in the overstory, fire can develop into a crown fire. Fuel moisture content has a substantial impact upon fire behavior affecting ignition, spread, and intensity.

Crown fuels are described by canopy bulk density (the foliage contained per unit crown volume), canopy base height (the average height from the ground to the lowest living foliage), and canopy fuel load (the volume of canopy fuel load) (Scott et al. 2005). Crown fuels are important for determining crown fire characteristics, such as whether a fire can transition from the ground to the tree crowns.

## STANDARD FIRE BEHAVIOR FUEL MODELS

Fuel models are a tool to help fire/fuels managers realistically estimate fire behavior in ground fuels. Simulating surface fire behavior with the 40 fuel models was developed by Scott and Burgan (Scott et al. 2005). Each fuel model is described by:

- The fuel load and the ratio of surface area to volume for each size class.
- The depth of the fuel bed involved in the fire front.
- Fuel moisture, including that at which the fire will not spread (called the moisture of extinction).

These are based on Albini's (Albini 1976) paper "Estimating Wildfire Behavior and Effects" and Rothermel's spread equation for surface fire developed in 1972. The criteria for choosing a fuel model includes the fact that the fire burns in the fuel stratum's best condition to support fire. The 40 fuel models for fire behavior estimation are for the severe period of the fire season when wildland fires pose greater control problems and impacts on land resources (Scott et al. 2005). The difference between fuel models is a factor of fuel loading and fuel distribution.

A combination of models and site visits was used to determine a specific fuel-value estimate. The LANDFIRE Project was used primarily for the fuel characteristics; however, site visits to verify or adjust values were performed by the district fuels personnel.

## FIRE BEHAVIOR MODELING

Fire behavior modeling is performed to estimate a number of fire behavior characteristics. There are three main categories of inputs to fire behavior modeling:

1. Fuels.
2. Weather.
3. Topography.

FLAMMAP is a two-dimensional, non-temporal fire behavior modeling system. It is a spatial fire behavior model that creates calculations (for an instant in time) for all points in the analysis area, using one set of wind and fuel moisture conditions. FLAMMAP exists as a stand-alone computer program and is a well-known and recognized fire behavior model. A version is used in Wildland Fire Decision Support System (WFDSS).

FARSITE is a geo-spatial modeling system that incorporates topography, fuels, and weather to model surface fire, crown fire, and two-dimensional fire growth. In this assessment, FARSITE was used as a landscape editor for post treatment fuel model modification of the LANDFIRE data. The topography input related to fire behavior is percent slope.

There are several outputs available with fire behavior modeling. The outputs of most concern for fire managers in this ecosystem are flame length, type of fire and spotting distance; all of which are used to estimate resistance to control.

## FIRE DANGER AND FIRE BEHAVIOR THRESHOLDS

The Energy Release Component (ERC), a number related to the available energy per unit area within the flaming front at the head of a fire, was used to categorize weather. The ERC is often used for planning and estimating the relative fire danger on any given day. The 97$^{th}$ percentile ERC would only be expected to occur on approximately 3 percent of the fire season days and is based off of real weather days as gathered by the Condon RAWS. The 97$^{th}$ percentile ERC weather conditions were calculated to be used as inputs when modeling fire behavior (Table 51).

**TABLE 51. PERCENTILE WEATHER BY ENERGY RELEASE COMPONENT (ERC).**

| FUEL CHARACTERISTICS (%) | 97% BY ERC |
|---|---|
| 1 Hour Fuel Moisture | 3 |
| 10 Hour Fuel Moisture | 4 |
| 100 Hour Fuel Moisture | 9 |
| 1000 Hour Fuel Moisture | 11 |
| Herbaceous Fuel Moisture | 52 |
| Woody Fuel Moisture | 80 |
| 20-ft Wind Speed | 4 |
| Temperature | 97 |
| Relative Humidity | 11 |

Fuel moisture is the amount of moisture in a piece of fuel relative to its oven-dried weight. Fuel moistures are displayed in six categories based on type of fuel (live or dead) and size class. The size classes for dead fuels are as follows:

- 1 hour fuels are 0 to 0.25 inch in diameter,
- 10 hour fuels are 0.25 to 1 inch in diameter,
- 100 hour fuels are 1 to 3 inches in diameter, and
- 1000 hour fuels are 3+ inches in diameter.

Dead fuels are classified in this manner because different sizes of fuels take different amounts of time to gain or lose moisture, thus the number of hours associated with each (Anderson 1982). Live fuels are classified as either herbaceous or woody, depending on the type of plant.

Twenty-foot wind speed is the speed of the wind measured 20 feet above the vegetation. It is important to note that 20-foot winds are often three times the strength of the wind we feel on the ground in a forested area. For example, in a moderately dense conifer stand, it would take a 20 mph 20-foot wind to produce a 6 mph eye level wind (National Wildfire Coordinating Group 2014). Eye-level winds are often referred to as mid-flame winds because these are the winds that most directly affect surface fires. Mid-flame wind speeds are calculated from 20-foot winds by using a wind adjustment factor (National Wildfire Coordinating Group 2014).

## SPATIAL ANALYSIS

Spatial analysis of the forest vegetation resource for this project was completed using the ArcMap 10.0 software. Data from the Flathead National Forest GIS library was used as the basis for the analysis. A number of project-specific GIS layers were created by Ranger District Resource Specialists.

## ASSUMPTIONS

When completing an analysis of a dynamic environment, at this scale, some assumptions are necessary from an efficiency stand point. The following are some assumptions used in this analysis:

- Fuels data used in this analysis are assumed to represent current on-the-ground conditions. Efforts were made to ensure that this assumption is true including; field verification, and photo series interpretation, and incorporation of remote sensing technology. At the time this report was written, no large-scale or catastrophic events were known to have occurred since the data for this project was compiled.
- GIS data used in this analysis is assumed to be accurate to within acceptable standards. This includes ownership boundaries, stand delineations, project and analysis area boundaries.
- Modeling of fire behavior dynamics using the methods described above gives a reasonable estimate of how fire behavior would respond to fuels treatments as to be able to compare alternative treatment options.

## MEASUREMENT INDICATORS

Fuels are classified as surface fuels and crown fuels. Surface fuels are described with a fire behavior fuel model number (Scott et al. 2005). The fuels are classified based on several factors including type of fuel and amount of surface fuel present.

To focus the fire/fuels analysis and describe relevant effects, the following effects indicators have been used:

### FIRE BEHAVIOR INDICATORS

Fire scientists and managers recognize three general types of wildland fire depending on the fuel stratum in which the fire is burning.

1. **Ground Fire** - A ground fire burns in duff, organic soils, roots, rotten buried logs, etc. Ground fires are generally ignited by surface fires. Ground fires have very low spread rates. For these reasons, ground fires are not predicted or further discussed in this analysis, because they would be secondary to and in association with a surface fire.
2. **Surface Fire** - A surface fire burns in the surface fuel layer, which lies immediately above the ground fuels, but below the canopy, or aerial fuels. Surface fuels consist of needles, leaves, grass, dead and down branch wood, logs, shrubs, low brush, and short trees(<3 feet). Surface fire behavior varies widely depending on the nature of the surface fuel complex (vertical and horizontal arrangement). Surface fires are generally easier to contain than any type of crown fire.
3. **Crown Fire** - A crown fire burns in the elevated canopy fuels. Canopy fuels normally consumed in crown fires consist of the live and dead foliage, lichen, and very fine live and dead branch wood found in the forest canopy. Reducing the potential for crown fire is very important in reducing the risk of lofted fire brands that may threaten structures.

Table 52 below shows the relationship between surface fire flame length and fireline intensity in terms of suppression strategy (Andrews et al. 2011).

**TABLE 52. RELATIONSHIP OF SURFACE FIRE LENGTH AND FIRELINE INTENSITY TO SUPPRESSION INTERPRETATIONS.**

| FLAME LENGTH (FEET) | FIRELINE INTENSITY BTU/FT/S | FIRELINE INTENSITY KJ/M/S | INTERPRETATION | |
|---|---|---|---|---|
| < 4 | < 100 | < 350 |  | Fires can generally be attacked at the head or flanks by persons using hand tools. Hand line should hold the fire. |
| 4 – 8 | 100 - 500 | 350-1700 |  | Fires are too intense for direct attack on the head by persons using hand tools. Hand line cannot be relied on to hold the fire. Equipment such as dozers, pumpers, and retardant aircraft can be effective. |
| 8 – 11 | 500-1000 | 1700-3500 |  | Fires may present serious control problems – torching out, crowning, and spotting. Control efforts at the fire head will probably be ineffective |
| > 11 | > 1000 | > 3500 |  | Crowning, spotting, and major fire runs are probable. Control efforts at head of fire are ineffective. |

### PREDICTED FLAME LENGTH (FEET)

Flame lengths are important to determine fire suppression techniques. If flames are over 4 feet, suppression with hand crews is generally unsuccessful and could require mechanized equipment. If flame lengths are over 8 feet, mechanized equipment is not considered an effective suppression tool; this is known as the Hauling Chart and is used in standard practice by fire managers (National Wildfire Coordinating Group 2014).

### SPOTTING POTENTIAL (FEET)

Spotting potential is an important fire behavior indicator. It is a factor in determining suppression strategy, and greatly influences suppression success. In addition, spotting potential quantifies the likelihood of firebrands being lofted to resources at risk and increases the risk of both firefighting personnel and the public.

# AFFECTED ENVIRONMENT

This section explores and discusses the historic, existing, and desired conditions of hazardous fuels within the analysis area. This information is useful in placing the actions proposed into context.

## HISTORICAL CONDITION

Much work has been completed related to the historical fuels conditions of the Swan Valley and western Montana. While this work covered broad areas, they often included portions of, and can be applied to, the analysis area. The Upper Swan Valley Landscape Assessment (Swan Ecosystem Center 2004) includes a detailed historical analysis that is also applicable to the analysis area. Historical forest vegetation conditions provide us with an idea of what the area looked like at various points in time. However, it is important to remember they are limited by the availability and accuracy of historical information and do not necessarily identify desired current/future conditions.

### FIRE REGIMES

A fire regime describes the frequency, predictability, and severity of fire in an ecosystem. Fire regimes can range in severity and occurrence, from non-lethal to stand-replacing levels. Natural historic fire regimes best illustrate fire disturbance patterns. An analysis of fire history in the Upper Swan Landscape Assessment was used to determine:

- Spatial and temporal distribution of fire disturbances.
- Mean fire intervals in areas with similar bio-physical and climatic characteristics.
- Whether fire suppression has affected pre-settlement fire regimes.

Areas of similar fire severity, frequency, size, and pattern have a similar fire regime (Brown 2000; Long 1998). The Upper Swan Landscape Assessment defines three identified regimes in the area:

- Frequent, low intensity non-lethal severity fire regime with 1 to 25 year intervals.
- Less frequent and more severe mixed-severity (MS) fire regime with 25 to 75 year intervals resulting in scattered mortality.
- Infrequent stand-replacing lethal severity fire regime with intervals greater than 75 years (Project File Exhibit U-1).

Historically, most fires burned with low to moderate severity with the occasional severe fire creating a diverse mosaic across the landscape of mature stands that burned repeatedly interspersed with younger fire regenerated age classes. During the pre-settlement era in the Upper Swan Valley, valley bottom forests were dominated by mixed-severity fire regimes; low-severity fires were restricted to the driest terrain, and high-severity fires were largely found on steep slopes at higher elevations and moist canyon bottoms (Barrett 2002).

Mixed-severity fire regime areas can experience the full range of severities during either a single event or consecutive events. Mixed-severity fire regime areas could experience fires of intermediate effects, often consisting of fine-grained spatial patterns resulting from a mosaic of varying severity. The mixed-severity fire regime in the analysis area ranges from fairly frequent, non-lethal fires (lower elevations around Lindbergh Lake) to moderately low frequency with moderate to high-severity results (high elevations in the Mission Mountains Wilderness).

The non-lethal and mixed-severity fire regimes are generally three to six fire intervals from the historical range based upon successful suppression of fires. At the Lindbergh Lake sites, Barrett (Barrett 2002) noted fire return intervals to be four times longer than the historical mean. A potential increase in fire intensity and shifted fire regimes have occurred within the analysis area. Long-term fire exclusion and other factors have promoted a shift toward a stand-replacement fire regime across a broad area in the Upper Swan Valley (Arno et al. 1995; Barrett 1998; Hart et al. 1994).

> "From at least 1600 to 1900, nonlethal and mixed-severity fires were very frequent in relatively dry stands occupying the upper Swan Valley, including riparian zones. Fires were frequently caused by lightning and Indians. However, long-term fire exclusion during the past 100 years has substantially disrupted area fire cycles, producing fundamental changes in the valley's lower elevation forests. Whereas the pre-1900 stands were dominated by early seral species, shade tolerant species now dominate the understories of many fire-excluded sites. Stand structures have also often changed since 1900. Tree densities in the ponderosa pine-larch dominated stands have shifted from relatively light- to moderately heavy stocking, greatly increasing the level of tree competition and ladder fuels." (Barrett 1998)

Barrett (Barrett 1998) also looked closely at the areas unique riparian "pothole" stands from a fire history stand point. He found that even in these areas, frequent non-lethal and mixed-severity fires burned within a few feet of the shoreline at intervals similar to adjacent drier sites.

Drought cycles and fuel availability have a considerable influence on fire regimes. Wildland fires often occur during the driest months of the year, typically July, August, and early September, and can have considerable effects to an area during drought periods. The quantity and type of fuels also affect fire behavior. Fire fuels are made up of dead woody debris and living vegetation. Fuel quantities can vary considerably, depending on the vegetation composition and recent fire history.

A study conducted from 1982 through 2006 involving 76 RAWS stations in Montana and Idaho shows a 57 percent decrease in precipitation during the core fire season (July, August, and September). Additionally, the season ending event has increased by more than 15 days over the same time period (Hadlow 2009). This research shows that over this 25-year time period, fire seasons have become longer and drier suggesting there is an increased risk of uncharacteristic high severity wildfire to occur on the landscape.

The scale of wildfires also appears to have increased. Ayres (Ayres 1899) reported a "big burn" having an area of about 5 square miles" in 1898. In 2003, the 11,281-acre Crazy Horse Fire grew to almost four times that size despite intensive suppression efforts. The threat of abnormally high-severity fires is one of the primary risks to ecological integrity of much of the western forest types like those found in the analysis area. Other large fires in the last decade show that fire regimes have changed in many areas.

The increased risk of high severity fires also has a social impact on the communities of the Upper Swan Valley. Area fire hazard has been increasing across the valley landscape, posing a threat to forest health and threatening the nearby wildland/rural interface (Barrett 1998, 2002)

## FIRE HISTORY

Disturbance relative to forest vegetation can be defined as a relatively discrete event in time that disrupts ecosystem, community, or population structure and changes resource availability or the physical environment (Helms 1998). Observations and recent studies (Arno et al. 1995; Ayres 1899; Barrett 1998, 2002; Freedman et al. 1985) indicate that fire has been the most influential natural disturbance factor following the retreat of the most recent glacial events in the Upper Swan Valley. Fire also provides us a record of its effects to forest vegetation, through fire scars and forest conditions, making it one of the most easily analyzed historical disturbances. Many other natural and human-induced disturbance factors have influenced the forest vegetation in and around the analysis area including: insects, disease, wind, floods, invasive species, residential and commercial development, transportation systems, and timber harvest.

Studies have looked closely at the fire history and fire regimes in and around the analysis area. These studies combined with fire history data from historical accounts provide a picture of how fire has been a dynamic agent of change in the region's forest vegetation. Fires were the result of natural causes, such as lightning, and traditional burning by Indians (Arno et al. 1997; Ayres 1899; Barrett 1998, 2002). Most Indian fires occurred in the valley grasslands and lower-elevation forests dominated by ponderosa pine, Douglas-fir, and western larch. These fires were likely ignited to improve big game browse, berry production, food gathering and hunting, improved travel, communication and horse grazing (Barrett et al. 1982).

Naturally occurring fires were frequent in the Upper Swan Valley until the early 1900s, with the earliest fire evidence dating from about 1241 A.D. Barrett (Barrett 1998) reported that 1768, 1814, 1850, 1889, 1919, 1929 were important fire years in the area. In this area, fire occurred about every 23 years (range of 6 to 50 years) between 1687 and 1919, with the last major fire occurring in 1919. The 1919 fire(s) burned approximately 8,000 acres of the analysis area as part of a 13,000 acre fire. This was largely a severe fire that occurred during a significant regional drought (Barrett 2002). No other large fires have occurred in the project area since 1885. Recent wildfires have been managed for full suppression and have been kept to less than 100 acres, with the majority being less than 10 acres (See Map 3-2 Beaver Creek Fire History Map).

## FOREST CONDITIONS

The forest vegetation conditions within the Swan Valley have been documented at various times throughout history starting at about the turn of the 20th Century. These accounts have been at varying intensities and for diverse purposes. Most accounts were to inventory the area's timber resources. More recent efforts were conducted to explore the ecology and reconstruct the historical conditions associated with the area's forests.

As is described in the Forest Vegetation Report of this document, H. B. Ayers recorded observations of the Swan Valley in 1899 during his mission to survey the timber of the then Lewis and Clark Forest Reserve (Ayres 1900). His journals describe large expanses of the Swan Valley dominated by large trees of ponderosa pine, Douglas-fir, and western larch grown in an open canopy on the valley, benches and foothills, and denser stands of shade tolerant species on the stream bottoms and high elevations. He determined that these forest conditions were the result of frequent fires (Ayres 1900).

# EXISTING CONDITION

## CURRENT CONDITION CLASS DEPARTURES

Fire Regime Conditions Classes (FRCC) are a function of the degree of departure from historical fire regimes resulting in alterations of key ecosystem components, such as species composition, structural stage, stand age, and canopy closure. Current Condition Class Departures are defined in terms of the relative risk of losing one or more key components that define an ecological system based on five ecosystem attributes (Laverty et al. 2000):

- Disturbance regimes (patterns and frequency of fire, insect, disease, etc.),
- Disturbance agents,
- Smoke production,
- Hydrologic function,
- Vegetative attributes (composition, structure, and resilience to disturbance agents).

The higher the condition class departure, the more the risk of losing key components of an ecological system if a wildland fire occurs. This is developed from the changes in fire regime based upon accumulation of fuels and increased intervals between fire events. Condition class departures are categorized by the National Fire Plan as displayed in Table 53.

**TABLE 53. FIRE REGIME CONDITION CLASSES (SCHMIDT ET AL 2002).**

| CONDITION CLASS | ATTRIBUTES | EXAMPLE MANAGEMENT OPTIONS |
|---|---|---|
| 1 | Fire regimes are within or near an historical range. The risk of losing key ecosystem components is low. Fire frequencies have departed from historical frequencies by no more than one return interval. Vegetation attributes (species composition and structure) are intact and functioning within an historical range. | Where appropriate, these areas can be maintained within the historical fire regime by treatments such as fire use. |
| 2 | Fire regimes have been moderately altered from their historical range. The risk of losing key ecosystem components has increased to moderate. Fire frequencies have departed (either increased or decreased) from historical frequencies by more than one return interval. This results in moderate changes to one or more of the following: fire size, frequency, intensity, severity or landscape patterns. Vegetation attributes have been moderately altered from their historical range. | Where appropriate, these areas may need moderate levels of restoration treatments, such as fire use and hand or mechanical treatments, to be restored to the historical fire regime. |

**TABLE 53. FIRE REGIME CONDITION CLASSES (SCHMIDT ET AL 2002).**

| CONDITION CLASS | ATTRIBUTES | EXAMPLE MANAGEMENT OPTIONS |
|---|---|---|
| 3 | Fire regimes have been significantly altered from their historical range.<br>The risk of losing key ecosystem components is high.<br>Fire frequencies have departed from historical frequencies by multiple return intervals. This results in dramatic changes to one or more of the following: fire size, frequency, intensity, severity or landscape patterns.<br>Vegetation attributes have been significantly altered from their historical range (Laverty and Williams 2000). | Where appropriate, these areas may need high levels of conversion restoration treatments, such as hand or mechanical treatments. These treatments may be necessary before fire is used to restore the historical fire regime. |

In the absence of fire for the past 90+ years, tree species, such as the more shade-tolerant Douglas-fir, alpine fir, and spruce have become well established as understory and have resulted in thick tree stocking in the timber stands being considered for treatment under the action alternatives.

The vast majority of the project area, 96 percent, falls within Condition Class 2, meaning the fire regime has been moderately altered from its historical range. A small percentage of the landscape, less than 1 percent, falls within Condition Class 1. Approximately 3 percent of the project area falls within and Condition Class 3, where fire regimes have been significantly altered from their historic range and the risk of losing key ecosystem components is high.

## RECENT FIRE HISTORY AND FIRE SUPPRESSION

Fire ignitions in the analysis area have occurred frequently since 1970. Records from FAMWEB (Fire and Weather Data) website and Swan Lake Ranger District fire records show that 51 fire ignitions have occurred from 1970 to 2014 in the Beaver Creek Analysis Area. Of those 51 ignitions, all have been actively suppressed. Suppression success has been very successful, only 3 fires have grown to over 10 acres and none over 100 acres (See Map 3-2 Beaver Creek Fire History Map).

Notable fires within the project area include:

- Lindbergh Lake Fire (2008) 64 acres.
- Sunset Peak Fire (2001) 30 acres.
- Bunyan Fire (1998) <100 acres.

Ignitions in other areas of the Upper Swan Valley occur at relatively the same frequency as in the analysis area. In the last decade, fire behavior and location of ignitions have promoted large fire growth in the surrounding area in spite of intensive suppression action.

The fires listed below, and in Table 54, were located within or adjacent to the analysis area and have burned in the recent past. A GIS dataset from the Flathead National Forest GIS library spatially displays the approximate locations of some of the major fires in those years within and adjacent to the analysis area (See Map 3-2 - Fire History Map).

Notable fires adjacent to the project area include:

- Herrick Run Fire (1953) 780 acres on the western shore of Lindbergh Lake. This fire started near the shore and burned upslope and was primarily a high-severity fire.
- Crazy Horse Fire (2003) 11,281 acres north of the analysis area.
- Holland Peak Fire (2006) 1,646 acres on the east side of the Swan Valley.

- Jocko Lakes Fire (2007) 36,000 acres on the Lolo National Forest south of the analysis area. South Fork of Lost Creek Fire (2011) 1,200 acres northeast of the analysis area.
- Condon Mountain Fire (2012) 5,500 acres northeast of the analysis area.
- West Marshall Creek Fire (2012) 30 acres on the Lolo National Forest south of the analysis area.
- Goat Creek Fire (2014) 215 acres northeast of the analysis area.
- Table 54 below shows the large fires that occurred in the Swan Valley between 2003 to 2014 and the approximate suppression costs for each fire.

**TABLE 54. LARGE FIRES IN THE SWAN VALLEY (SWAN LAKE RANGER DISTRICT) (2003-2014).**

| FIRE NAME | YEAR | SIZE (ACRES) | COST ($) |
|---|---|---|---|
| Crazy Horse Fire | 2003 | 11,281 | $13 Million |
| Holland Peak Fire | 2006 | 1,840 | $1.3 Million |
| Lindbergh Lake Fire | 2008 | 64 | $0.8 Million |
| South Fork Lost Creek Fire | 2011 | 1,890 | $2.2 Million |
| Condon Mountain Fire | 2012 | 5,500 | $6.8 Million |
| Goat Creek Fire** | 2014 | 215 | $0.1 Million |

Data in Table 54 was obtained from Swan Lake Ranger District Fire Records and USDA Forest Service National FIRESTAT Database. In addition, the Goat Creek Fire was managed for multiple resource objectives.

There are three Fire Management Units (FMU) found within the analysis area, as described by the Flathead National Forest Fire Management Plan (2014). These FMU's include:

## FULL (FEDERAL AND STATE PROTECTION)

This FMU includes natural resources as well as political, social, and economic interests as values to be protected. These values are generally higher in this FMU than any other place on the Forest, leading to a strong protection emphasis within the unit. The highest fire management priority here is the safety of fire management personnel and the public, including owners and users of adjacent lands. The strategic objectives for wildland fire management in the unit are:

- The safe suppression of all fires utilizing aggressive initial attack action with an objective of containing each fire at the smallest possible size, but in a cost-effective manner.
- Aggressive hazardous fuel reduction and community protection emphasis.

## MODIFIED

This FMU provides a wide range of important natural resource values. The Flathead National Forest's commercial timber base, timber management, and timber stand improvement investments are concentrated in this unit. The FMU supports many important watersheds, and wildlife and botanical habitats. The relatively good access in this FMU provides most of the developed and dispersed motor-based recreation opportunities on the Flathead National Forest.

The highest fire management priority in this FMU is the safety of fire management personnel and the public. The protection emphasis for the unit calls for suppression of all wildland fires using a cost-effective strategy. The strategic objectives for wildland fire management in the unit are:

- Suppression of all fires in a safe and cost-effective manner is the appropriate management response.
- Preventing fire spread to adjacent interface lands and private or other agency-owned property would be priorities.
- Protection of significant natural resources, recreation sites, cultural and historic resources.
- Consideration of the full range of suppression strategies from perimeter control to area control.
- Use of prescribed fire and mechanical fuel treatment methods to reduce hazardous fuels, improve resource conditions, and enhance ecosystem health.

### LIMITED

The strategic fire management objective for a majority of this FMU is to manage naturally-ignited wildland fires to accomplish specific pre-stated management objectives, primarily associated with wilderness resource protection and perpetuation. In those lands outside wilderness, protection is the appropriate objective. However, "unplanned ignition prescribed fire procedures may be implemented on completion of site specific plans to enhance designated resource values," as specified by the Forest Plan."

Fuel accumulations within the Mission Mountains Wilderness are in a state that naturally ignited wildfires cannot be allowed to play their role on the landscape. By applying prescribed fire within the wilderness boundaries, there would be greater opportunities in the future to allow natural fires to burn and not escape the wilderness boundaries.

## WILDLAND URBAN INTERFACE (WUI)

In 2013, Missoula County completed the "Seeley Swan Community Wildfire Protection Plan" (Project File Exhibit K-13). This plan described areas considered WUI in the project area. The majority of the project area proposed for treatment is in designated WUI.

The January 4, 2001 Federal Register (Project File Exhibit K-3) supplied the three categories of WUI considered in the National Fire Plan. The WUI is defined as the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels. The Upper Swan Analysis Area only includes the type of WUI called Category 2 - Intermix Community, defined as follows:

> "The Intermix Community exists where structures are scattered throughout a wildland area. There is no clear line of demarcation. Wildland fuels are continuous outside of and within the developed area. The development density in the Intermix ranges from structures very close together, to 1 structure per 40 acres. Fire protection districts funded by various taxing authorities normally provide life and property fire protection and may also have wildland fire protection responsibilities."

Areas within the Upper Swan categorized as Category 2 include small cluster developments, such as ranches, summer residences, hay meadows, timber production areas, ranch outbuildings, and other structures. Approximately 5,453 acres of the Beaver Creek Project Area is located within the WUI.

These areas encompass not only the home sites themselves, but also the continuous slopes and fuels that lead directly to them. When wildland fire enters these areas, the suppression efforts require a large commitment of firefighting resources. During the fires of 2000, large portions of otherwise high-priority fires remained unstaffed, because resources were committed to structure protection. Experienced fire managers know that the Intermix area is one of the most dangerous environments in which to conduct fire suppression operations. Poor ingress and egress compromise firefighters' escape routes. Hazardous materials and other man-made materials produce toxic gases when burned and pose major threats to firefighters and the public. The high values at risk (homes, vehicles, domestic animals, etc.) can lead even the most seasoned wildland firefighters to take risks that he or she would not consider in the wildland environment.

There has been significant development along the east shore of Lindbergh Lake and around Cygnet Lake. These residences consist of year-round residences, as well as summer recreation cabins. Several residences are found along the MT Highway 83 corridor, as well as a few scattered private inholdings within the analysis area.

This project has designed units that would give firefighters a higher probability of containing and controlling wildfires before they enter private lands by reducing crown fire potential, flame lengths and spotting from firebrands. If fire were to enter the wildland urban interface within the project area, it would prove to be extremely hazardous to the public and first responders due to the amount of residences and lack of access for fire personnel.

### EXISTING FOREST AND FUELS CONDITION

Although timber harvest and associated fuel treatments have not replicated wildland fire, they have replaced wildland fire as the dominant process that changes the patterns of vegetation and woody debris accumulations in the forest. Since the 1950s, approximately one third of the Upper Swan Area has been regeneration timber harvested and fuels have been treated (prescribed burning and machine piling of slash with pile burning). These previously managed areas are considered to be in a Condition Class 1.

The greatest effect of fire suppression and exclusion in unison with other natural disturbance processes has allowed biomass to accumulate in most unmanaged timber stands. The bulk of the biomass currently occupying the analysis area is in the form of dead standing and downed trees and shrubs, as well as live shade-tolerant true firs, spruce, lodgepole pine, and Douglas-fir. The combination of dead fuel and continuous live vegetation from the forest floor to the upper forest canopy creates a complex of fuel that, when ignited under severe fire conditions, would leave little or no surviving above-ground vegetation. Large legacy trees that are found within the analysis area, that have survived several fires in the past, would be at high risk during a wildfire burning under severe conditions.

The existing forest conditions are described in the Forest Vegetation Section of this EA. The existing fuel conditions are variable across the landscape. Surface fuels are described with a fire behavior fuel model in order to classify fuel conditions for estimated potential fire behavior (Scott et al. 2005). The fuel models defined by Scott and Burgan (Scott et al. 2005) were used in this analysis. The majority of the forested/timbered areas are classified as:

- TU5 (closed timber with a high/load of understory vegetation and timber liter),
- TL5 (closed canopy with little vegetation and high load timber litter), and
- TL3 (closed timber with moderate load timber litter).

Other fuels models are represented, but at low densities, and are generally not targeted for fuels treatment.

## ENVIRONMENTAL CONSEQUENCES

The proposed fuel reduction techniques focus on reducing the potential for crown fires, high intensity surface fires, and spotting potential in treatment units, and thus reducing the resistance to control and maintaining forest health. Thinning of trees would reduce the crown density. Removing understory trees would also increase the canopy base height, making it more difficult for a crown fire to be initiated. Thinning would primarily focus on removing smaller trees and species that are less resistant to fire, leaving larger, fire resistant species where possible. To focus the fire/fuels analysis and describe relevant effects, the following fire behavior indicators are used.

- Type of predicted fire (crown fire potential).
- Predicted flame length (feet).
- Spotting Potential (feet).

The post treatment fuel model in each unit was compared to the existing condition (displayed in Alternative 1) fuel model (LANDFIRE) by flame length, crown fire potential and spotting potential in the following tables. FLAMMAP is used to run a simulation of fire behavior on the 97$^{th}$ percentile weather day. The simulation produces 97$^{th}$ percentile fire behavior indicators by treatment type. The results are derived from an overall average of the median values for all individual treatment types that are proposed within the Beaver Creek Project Area. Project File Exhibit K-4 displays the table used to calculate the appropriate fuel model by unit.

Table 55 displays the difference between flame length and spotting potential when comparing the existing condition (Alternative 1) to post-treatment results for activities proposed in Alternative 2.

**TABLE 55. FIRE BEHAVIOR INDICATORS BY FUEL TREATMENT FOR EXISTING CONDITION AND ALTERNATIVE 2.**

| TREATMENT TYPE | EXISTING CONDITION FLAME LENGTH MAXIMUM (FEET) | ALTERNATIVE 2 POST-TREATMENT FLAME LENGTH MAXIMUM (FEET) | EXISTING CONDITION SPOTTING POTENTIAL MEDIAN (FEET) | ALTERNATIVE 2 POST-TREATMENT SPOTTING POTENTIAL MEDIAN (FEET) |
|---|---|---|---|---|
| Commercial Thin | 9.9 | 3.7 | 221 | 62 |
| Improvement Cut | 11.2 | 5.7 | 245 | 127 |
| Seed Tree with Leave Clearcut with Reserves | 8.0 | 2.5 | 323 | 284 |
| Pre-Commercial Thinning | 4.5 | 2.3 | 107 | 31 |
| Broadcast Burning (Wilderness) | 35 | 16 | 736 | 359 |

Figure 30 displays the difference between the types of fires that would occur under existing conditions (Alternative 1) and under post-treatment conditions for activities proposed in Alternative 2.

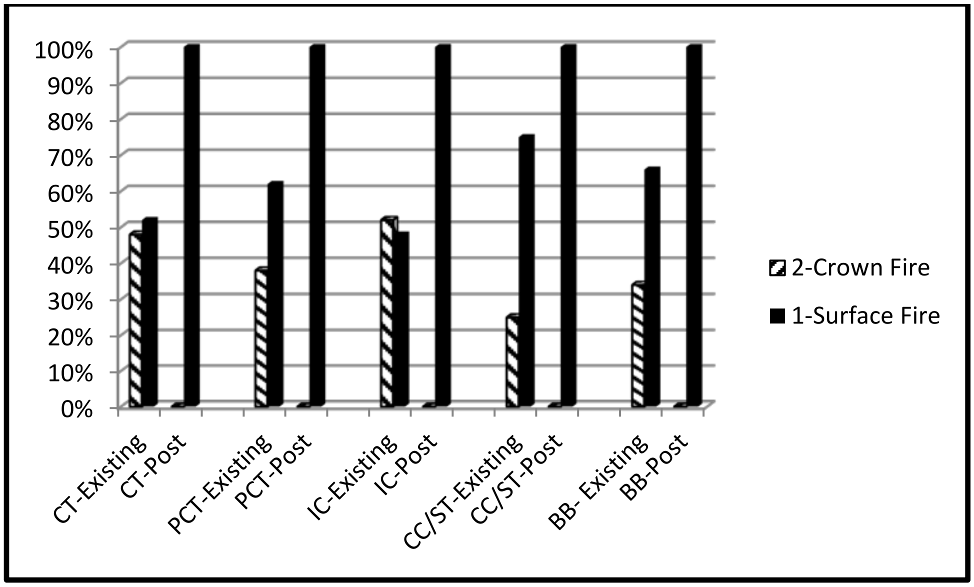


**FIGURE 30. CROWN FIRE POTENTIAL BY FUEL TREATMENT FOR EXISTING CONDITION AND ALTERNATIVE 2.**

Table 56 displays the difference between flame length and spotting potential when comparing the existing condition (Alternative 1) to post-treatment results for activities proposed in Alternative 3.

**TABLE 56. FIRE BEHAVIOR INDICATORS BY FUEL TREATMENT FOR EXISTING CONDITION AND ALTERNATIVE 3.**

| TREATMENT TYPE | EXISTING CONDITION FLAME LENGTH MAXIMUM (FEET) | ALTERNATIVE 3 POST-TREATMENT FLAME LENGTH MAXIMUM (FEET) | EXISTING CONDITION SPOTTING POTENTIAL MEDIAN (FEET) | ALTERNATIVE 3 POST-TREATMENT SPOTTING POTENTIAL MEDIAN (FEET) |
|---|---|---|---|---|
| Commercial Thin | 9.5 | 3.8 | 277 | 68 |
| Improvement Cut | 9.3 | 7.5 | 302 | 150 |
| Seed Tree with Leave Clearcut with Reserves | 7.7 | 2.7 | 380 | 337 |
| Pre-Commercial Thinning | 3.8 | 1.9 | 100 | 29 |
| Broadcast Burning (Wilderness) | 35 | 16 | 736 | 359 |

Figure 31 displays the difference between the types of fires that would occur under pre-treatment conditions (existing conditions) and under post-treatment conditions for activities proposed in Alternative 3.

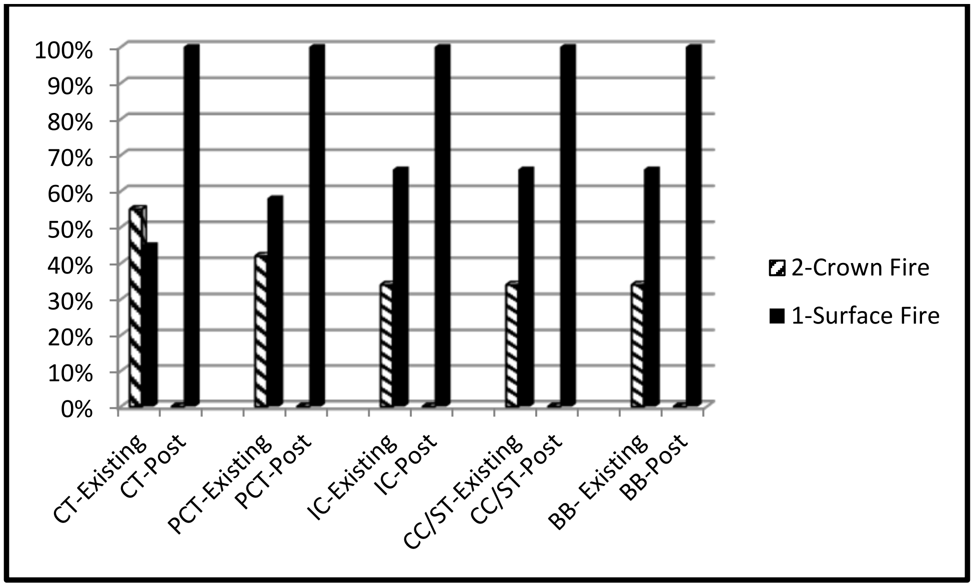


**FIGURE 31. CROWN POTENTIAL BY FUEL TREATMENT FOR EXISTING CONDITION AND ALTERNATIVE 3.**

The model outputs are showing the predicted changes for a single point on the landscape and not a combined spatial fire behavior scenario. As a result, as fire intensity increases the models tend to underestimate actual fire behavior because it doesn't factor in combined/cumulative radiant heating into the prediction as addressed in Scott and Reinhardt (Scott et al. 2001).

## ALTERNATIVE 1 - NO ACTION DIRECT, INDIRECT, AND CUMULATIVE EFFECTS

Under Alternative 1, no fuel treatments would occur. In the absence of disturbance, fuel conditions would generally persist or fuel loadings would increase throughout the project area. The overall result would be a continuation of current fuel loadings with an increased fire hazard over time.

Large-diameter western larch, Douglas-fir, and ponderosa pine in most of the forest stands would continue to lose vigor due to competition from dense understories of shade-tolerant tree species. This understory also would serve as a ladder fuel that would permit a surface fire to expand into the canopy, thereby killing many of the existing large-diameter trees that would have otherwise survived a non-lethal surface fire (Agee et al. 2005; Graham et al. 1999; Skinner et al. 2002; USDA 2003). Insects and disease have existed in the past and would continue in the foreseeable future within the project area. It can be anticipated that fuel build-up would continue due to tree mortality from these sources.

The Alternative 1 would likely cause a fire to burn more intensely in the analysis area than the action alternatives. Depending on such factors as wind speed and direction, fuel moistures, and other factors, it is possible that the lack of treatment could place residents, adjacent landowners and Flathead National Forest visitors at risk, should a wildfire occur. Table 55 displays the No Action Alternative fire behavior indicators as existing condition flame length, crown fire potential, and spotting distance. The largest threat of stand-replacing fires in the lower elevations is to private property, homes, public safety, and firefighter safety throughout the landscape. In addition, the likelihood of a high-intensity wildfire starting in the affected areas on NFS lands and then spreading into non-NFS lands would be highest under this alternative.

Historically, stand-replacing fires were less common in the larch/ponderosa pine/Douglas-fir forest types, where frequent moderate intensity fires maintained a mosaic pattern of vegetation with an overstory component of large diameter trees. If a stand-replacing fire were to occur in the

Beaver Creek Analysis Area today, the overstory trees would likely not survive, and the burned areas would regenerate to lodgepole pine. This is represented well by the Crazy Horse Fire of 2003. Also, the large tree component that is found within the Beaver Creek Analysis Area would likely not survive a large stand-replacing fire event.

Any fire that occurred adjacent to or in the WUI could be extremely hard to suppress on a 97$^{th}$ percentile day. The combination of high flame lengths, crown fire and mid- to long-range spotting potential, would make most suppression techniques unsuccessful. The potential for firebrands to land on non-NFS lands or structures would be highest under this alternative.

## ALTERNATIVES 2 AND 3 – ACTION ALTERNATIVES DIRECT AND INDIRECT EFFECTS

Nearly all treatment areas proposed by both action alternatives are linked to previously treated stands or natural fuel breaks and in areas that would strategically give fire managers an advantage during a large fire event. This helps to create larger, more effective treatment areas. These treated areas are important to either slow the spread or reduce the intensity of wildland fire, thus increasing the effectiveness of suppression efforts to protect values at risk, and maintain forest health.

### FUEL REDUCTION TREATMENTS

Fuel reduction treatments are designed to remove existing hazardous fuels that have accumulated either on the forest floor, ladder fuels, or in the crowns. The treatments proposed are designed to reduce the potential for crown fires, flame length, and spotting distance, which have several effects:

- The reduction in the potential for crown fire reduces the likelihood of reduced forest health. The risk of losing forest structure and continuity is high in large severe burning fires that produce crown fire. Forest diversity is also lost in large landscape fires that burn at high intensity (Keeley 2009).
- The reduction in crown fire potential provides for the increased success of fire suppression. This reduces the risk to firefighters and the public in a suppression action. The decrease in crown fire potential also allows fire managers to use more tools in suppression efforts (Andrews et al. 2011; Werth et al. 2011).
- Lowering flame lengths decreases the likelihood that there would be crown fire initiation. Lowering flame lengths increases the ability to actively suppress fires effectively during a severe fire season. Using hand crews is the most effective way to attack wildfires; hand crews are generally not effective with flame lengths over 4 feet in height. The activities proposed in both alternatives effectively reduce the flame lengths in treatment units, so hand crews can be utilized (Andrews et al. 2011; Andrews et al. 1982).
- To reduce the threat of spotting distance from firebrands (spotting potential), fuels would need to be reduced both near and at some distance from the WUI. Implementation of vegetation treatments would result in decreasing the behavior of a wildland fire and would increase the likelihood that fire suppression efforts would be successful in containing fires at a small size (Werth et al. 2011).
- By strategically locating fuels treatments, the likelihood that future fire starts would be successfully attacked is increased and the potential for wildfire damage to values at risk is reduced (Agee et al. 2005).
- In addition to reducing the spotting potential, the proposed treatments also increase the likelihood that future fire starts would be successfully attacked at other features, i.e., roads, which fuel treatments are often adjacent too, in the event that a fire burns into a treated area from a non-treated area.

- As shown in Table 55 and Table 56, prescribed fire within the Mission Mountains Wilderness would reduce crown fire potential, decrease flame lengths and decrease spotting distances and, therefore, would increase the probability that a natural ignition would stay within the wilderness boundary and fire could play its natural role on the landscape.
    - Associated with the project is an area designated as the Maximum Management Area (MMA). The MMA is not targeted for treatment; it may contain resource values that we would not intend to burn. However, suppression actions would normally not be taken to keep prescribed fire from spreading into the MMA from the primary ignition units. The MMA is designated as an area bounded by topographic or fuel conditions that make fire leaving the MMA unlikely. The purpose of this is to allow for incidental fire spread outside the target burn unit without being required to take suppression action (generally ground-disturbing actions, such as fire line, etc.). Burn plans and associated prescriptions, as well as ignition techniques would be developed to keep the burn within the primary ignition unit boundaries, recognizing that resource values could be at risk outside of the units. The MMA allows for flexibility to continue meeting the objectives of the prescribed burn in the project boundary area without placing firefighters at risk or causing impacts from suppression actions. If the prescribed fire is not meeting objectives within the primary ignition area or within the MMA, a wildfire declaration may take place and suppression action would take place commensurate with values at risk.

Figure 32 below shows the prescribed burn units proposed in the Mission Mountains Wilderness and the Maximum Management Area (MMA) that has been identified for implementation of these prescribed burns.

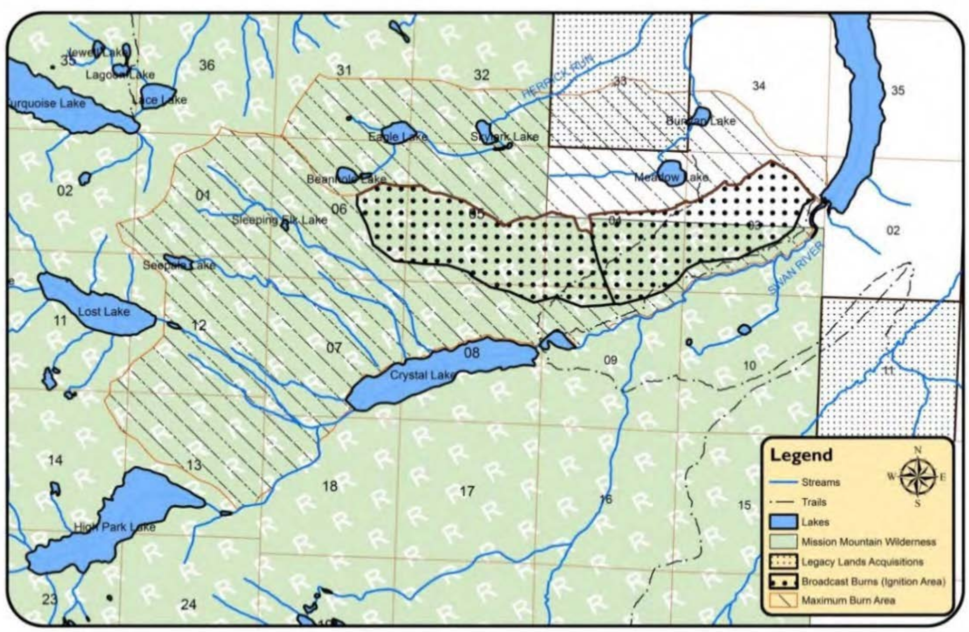


**FIGURE 32. MISSION MOUNTAINS WILDERNESS PRESCRIBED BURN AREA AND MMA.**

## COMPARISON OF ALTERNATIVES AND THEIR POTENTIAL EFFECTS ON FIRE BEHAVIOR

Both of the action alternatives support the purpose and need. As discussed above, harvest treatments would reduce flame lengths and the potential of crown fires, thus reducing the resistance to control. This is indicated by reductions in flame length, crown fire potential, and spotting potential after treatment (Table 55 and Table 56 and Figure 30 and Figure 31). Because of these reductions in fire intensity, the ability for firefighters to conduct initial attack and control fires would be improved. This should allow firefighters to better protect human and natural resource values due to reduced fire behavior intensity and resistance to control. Throughout all treatment areas, fire-tolerant species would be favored and, in many areas, these species would be planted.

The differences in effectiveness of each alternative are related to the number of acres treated in each alternative and the location of the treatment areas. In general, the more acres of effective fuel reduction treatments, the lower the fuel hazard and subsequent fire behavior characteristics. The specifics of each action alternative are displayed in the following table.

**TABLE 57. PROPOSED PRESCRIBED BURNING ACTIVITIES**

| PRESCRIBED BURNING AND FUELS TREATMENT | ALT. 2 (ACRES) | ALT. 3 (ACRES) |
|---|---|---|
| Prescribed Burning Acres following harvest | 166 | 130 |
| Prescribed Burning Acres without other treatments in the WUI | 538 | 538 |
| Prescribed Burns Acres within Mission Mountains Wilderness | 1,104 | 1,104 |
| Total Acres of Prescribed Burning | 1,808 | 1,772 |
| Total Acres of Prescribed Burning without Other Treatments | 1,642 | 1,642 |

To reduce hazardous fuel conditions that are created by harvest activity, slash reduction treatments would be implemented. Some tree boles, limbs, and foliage would have been deposited in the forest floor adding to both fine and coarse down wood material fuel loadings. In some areas, this material would be scattered, and in other areas, it would be concentrated in large amounts. As suggested by Brown et al. (Brown et al. 2003), this fine and coarse down wood contribute to fire hazard and severity. Fire intensity in thinned stands is greatly reduced if thinning is accompanied by reducing the surface fuels created by the cuttings (Graham et al. 1999).

Table 58 summarizes the number of acres of hazardous fuels reduction treatments by alternative. The effects in the Fuel Reduction Treatment Section (above) are also applicable to Slash Reduction Treatments.

**TABLE 58. ACRES OF SLASH TREATMENTS BY ACTION ALTERNATIVE.**

| SLASH TREATMENT | ALTERNATIVE 2 | ALTERNATIVE 3 |
|---|---|---|
| Lop and Scatter | 376 | 145 |
| Mechanical | 593 | 495 |
| Mechanical/Pile | 271 | 222 |
| Whole Tree Yarding | 497 | 390 |
| Whole Tree Yarding/Lop and Scatter | 0 | 54 |
| Whole Tree Yarding/Mechanical | 198 | 101 |
| Whole Tree Yarding/Pile | 801 | 450 |
| Whole Tree Yarding/Pile/Mechanical | 579 | 354 |
| Total Slash Treatment Acres | 3,315 | 2,211 |

Many of the stands targeted for treatment in Alternatives 2 and 3 are currently in a state that if a wildfire were to occur they would likely exhibit fire behavior that is difficult to control during times of high fire danger.

Under these alternatives, the proposed harvest and associated activity slash treatments would reduce the fire hazard and fire severity risk through reduction of fuel loading. This is indicated by reductions in flame length, crown fire potential, and spotting potential after treatment (Agee et al. 2005; Graham et al. 1999). Due to these reductions flame length and fire line intensity, our ability to initial attack and control fires would be improved (Andrews et al. 2011). This should allow firefighters to better protect human and natural resource values due to reduced fire behavior intensity and resistance to control. Throughout all treatment areas, fire-tolerant species would be favored and, in many areas, these species would be planted.

The differences in effectiveness between alternatives are related to the number of acres treated in each alternative and the location of the treatment areas. In general, the more acres of effective vegetation treatments, the lower the fuel hazard and subsequent fire behavior characteristics.

In Alternative 2, prescribed burning ignition will not occur in Riparian Habitat Conservation Areas (RHCAs) but fire will not be actively excluded from RHCAs during prescribed burning activities. In Alternative 3, fire will be actively excluded from RHCAs through the construction of fireline prior to prescribed burning activities. This could leave areas of high fuel loading that would serve as a fire wick into untreated stands, which would present a challenge to fire managers during a severe wildfire event. Prescribed fire implementation costs would also be higher in Alternative 3 due to additional fire lines being constructed along RHCA boundaries, as well as needing additional fire personnel to hold fire out of these areas.

Additional differences in Alternative 2 and Alternative 3 consist of 372 acres of vegetation treatment in Units 57, 62, 89, 99, 100, 114, 252, 259 and 260. These units are mostly comprised of seed tree regeneration treatments in Alternative 2. In Alternative 3, these units are comprised of commercial thin and improvement cuts. Seed tree treatments in Alternative 2 reduce flame lengths down to around 2.5 feet, compared to 3.8 feet (commercial thin) and 7.5 feet (improvement cut) in Alternative 3.

Alternative 2 includes Unit 83, which has drawn interest due to its location and proximity to Lindbergh Lake. Unit 83 was designed to address the high amount of crown fire potential along the east shore of the lake. Models show that if fire was to establish along the lakeshore, it's likely to quickly transition into a crown fire and affect private lands to the north. Reducing the amount of surface and crown loading within the unit will effectively force a fire to transition back to a surface fire, giving firefighters a better chance of containment. Consideration was given to visual effects during the unit design, to try and keep it out of the viewshed of the private homes on the north end of the lake. Alternative 3 does not propose treatment in Unit 83 in response to the public comments received expressing concern about the potential visual effects of the treatment, the potential visual effects are discussed further in the Scenery Resource section of Chapter 3.

As displayed in Table 58, Alternative 2 is the most effective in meeting the goals of the purpose and need due to the highest number of acres treated. Alternative 3 would be less effective due to fewer acres treated

## ACCESS MANAGEMENT

All action alternatives propose changes to access management within the project area. In general, these include adding temporary roads (See Chapter 2 for a detailed listing of proposed access management changes). Much of the project area is readily accessible for fire management activities with existing roads or templates.

Decommissioning is proposed in all action alternatives totaling an estimated 4.5 miles. Re-contouring and removing of culverts on roads could limit fire management vehicle access to portions of the project area. This is often most critical during initial attack (the first response to a fire). During extended attack fires, or fires that take several days of fire management, it is not uncommon to utilize equipment to re-open roads for vehicle travel. Early detection would continue to play a key role in preventing small fires from growing into large fires. Fire detection efforts would not change and would continue to rely mostly on lookouts, aerial patrols, and public reports.

The precise location of a fire start cannot be predicted. Fire behavior of a start also cannot always be accurately predicted for an extended period, because weather and fuels vary over time. If extreme fire conditions are predicted or exist, restrictions and/or closures could be put into effect to limit public access to the forest.

## ALTERNATIVES 2 AND 3 – ACTION ALTERNATIVES CUMULATIVE EFFECTS

The Cumulative Effects Worksheet (Project File Exhibit K-2) considers and describes proposed activities in addition to the past, current, and reasonably foreseeable activities listed at the beginning of this chapter in Table 17 and Table 18. Those activities that cumulatively contribute indiscernible effects on fuel conditions are not included in this section. Those activities that cumulatively affect the fuels conditions are discussed below.

Harvest, whole tree yarding, and yarding of un-merchantable material, combined with slashing ladder fuels/excavator piling/burning, group selection, daylighting and pre-commercial thin treatments, would continue to reduce fuels and the associated risk of wildland fire (Graham et al. 1999). Pre-commercial thinning would help to create healthy, vigorous stands of trees composed of a desirable mixture of tree species. These stands would be more resistant to insects and disease, be able to better withstand low- to moderate-intensity wildland fires over time, and could be machine, hand piled, or masticated as needed. The overall cumulative trend would be a continued improvement in forest health conditions as management moves stands towards desired future conditions.

### PAST ACTIVITIES

Portions of the NFS lands within the Beaver Creek Project Area have been harvested in some manner (see Chapter 3 - Past, Present and Foreseeable Action Section and the Forest Vegetation Section). Timber harvest has occurred on private and industrial lands in the project area.

Firewood cutting has an annual effect on forests 200 feet adjacent to roads open year round and seasonally. Larch and Douglas-fir are the preferred species; however, due to the high demand and scarcity of available area, lodgepole pine and any other dead species are removed. This activity has the potential to reduce coarse down woody material, snags, and fuel up to 200 feet from roads. It is difficult to know how many acres have been affected by this activity. Removing the dead fuel component creates a corridor of defensible area necessary for successful suppression activities. In areas of heavy firewood collection, the removal of dead wood breaks up horizontal and vertical fuel continuity; this action combined with the fuel-free road surface would assist in successful suppression operations.

Private land development has been occurring for the last century in the analysis area; however, it has been most intense in the past several decades. There has been a recent response to fire prevention education involving effective fuel reduction within some of these private in-holdings. Although in most cases, the desire of the landowners has been to maintain a forested setting, on one or more aspects, in the immediate vicinity of dwellings and structures that is contiguous with forested public lands. In many cases, small private forested areas have not been managed and forests have become densely-stocked stands with large quantities of dead trees. These sites are highly vulnerable to insect and disease outbreaks and wildland fire.

Approximately 3,010 acres of past fuels treatments have occurred on NFS lands since 1983 (including former PCTC lands acquired by Forest Service from 1998 to 2012) within the analysis area. These harvests have likely decreased stand densities, modified average stand diameters, modified vertical structure from a two-storied structure to primarily a single-storied structure, and altered fuel arrangements. These changes in the fuel and fire behavior characteristics would be similar to the post treatment scenarios described in this analysis.

The Beaver Creek Project Area includes approximately 5,487 acres of former PCTC land acquired through the Land and Water Conservation Fund (LWCF) and Montana Legacy Project between 1998 and 2012. Acquiring these lands has increased the amount of fire protection and fire starts the Swan Lake Ranger District is responsible for on a yearly basis.

## REASONABLY FORESEEABLE ACTIVITIES

Firewood cutting is expected to continue along seasonal and yearlong open roads. This activity could have the potential to reduce coarse down wood material, snags, and fuel up to 200 feet from roads. This removal of dead standing and downed wood would reduce the amount of fuel left on NFS lands. Firewood gathering would contribute to the overall effort to reduce fuels in the WUI.

The construction of driveways, buildings, and other improvements on private land within the project area has been occurring for decades and may continue. The Forest Service is not aware of any applications for further development.

Other foreseeable actions include noxious weed control, road maintenance, administrative road use, public recreational use, timber stand improvement and small forest products gathering for personal use. These activities would not be expected to contribute to, or inhibit, efforts to achieve desired stand conditions.

## CONCLUSION

Alternative 1 (No Action Alternative) does not address the project's purpose and need. Alternative 1 would leave the forest stands in the project area in a state that a wildfire occurring would likely exhibit fire behavior that is difficult to control during times of high fire danger.

Both Alternative 2 and 3 support the purpose and need of this project. Fire behavior modeling indicates that in both action alternatives, fuels reduction treatments reduce flame length, spotting potential, and crown fire potential. The firefighting environment would be improved due to reductions in resistance to control. This is indicated by reductions in flame length, spotting potential, and crown fire potential post treatment. Due to these reductions in fire intensity, our ability to initial attack and control fires would be improved. This should allow firefighters to better protect human and natural resource values due to reduced fire behavior intensity and resistance to control. Throughout all treatment areas, fire-tolerant species would be favored and in many areas these species would be planted.

The differences in effectiveness are related to the number of acres treated in each alternative and the location of the treatment areas. The importance or priority for treatment of any individual unit is based not only on predicted changes in fire behavior by treatments as displayed previously, but also a number of other factors. One of these factors would be insect and disease, which is discussed in the Vegetation Section of the EA. Higher risk stands may be more in need of treatment than relatively healthy stands. The location of a unit is also a factor to consider. As previously stated, the location of a fire start on any given day within the project area cannot be predicted. However, units that are generally closer to private land or values at risk are often more important for treatment than those farther away. There are some exceptions to this, such as a unit adjacent to other treated areas that could be used as a firebreak, thus hopefully stopping a fire before it gets closer to private land. Alternative 2 is the most effective in meeting the goals of the purpose and need due to the highest number of acres treated. Alternative 1 - No Action Alternative would be least effective since no acres would be treated. Table 57 lists the amount of acres treated in the WUI by alternative.

# EFFECTS OF A FOREST PLAN AMENDMENT TO ASSIGN MANAGEMENT AREAS TO ACQUIRED LANDS

The Beaver Creek Project includes a Forest Plan Amendment to assign interim management areas (MAs) to approximately 5,457 acres of former Plum Creek Timber Company (PCTC) lands acquired by the U.S. Forest Service to be managed as part of the Flathead National Forest. These interim management areas will be in effect on acquired lands until the ongoing Forest Plan Revision effort is completed, anticipated in 2 years.

Alternative 1- No Action Alternative proposes not to assign management areas to acquired lands although forest-wide standards and guidelines will continue to apply to all NFS lands on the Flathead National Forest.

Alternative 2 proposes to assign 55 acres of acquired lands to MA 2, 8 acres of acquired lands to MA 5, 2,312 acres to MA 11C, 320 acres to MA12, 2,033 acres to MA15, 712 acres to MA 15C, and 17 acres to MA 17. These proposed MA assignments were made in consideration of the characteristics of the acquired parcel and the management direction on surrounding lands. Table11 describes the management emphasis for each of these MAs, but lands assigned to MA5, MA11C, MA15, MA15C, and MA17 are considered suitable for timber production, while MA 2 and MA 12 are considered unsuitable for timber production although management activities may occur to benefit other resources.

Alternative 3 proposes different management area assignments to reflect public concern about the scenic integrity of lands on the east side of Lindbergh Lake. To accomplish this, Alternative 3 assigns MA5 instead of MA15 on approximately 502 acres of acquired land on the east side of Lindbergh Lake to maintain or enhance the scenic quality of these lands when viewed from Lindbergh Lake. Although MA5 will allow for timber harvest to occur on these lands, it will emphasize the maintenance of a natural appearing landscape where management activities are not evident.

The effects of the Forest Plan Amendment to fire within analysis area are minor because the Forest Plan fire suppression FMUs apply to all lands managed by the Flathead National Forest even if management areas are not assigned. The affects to fuels under Alternative 1 – No Action Alternative could cause effects over the long term because it could limit the ability for management activities to occur that will modify fire behavior and reduce fuels within the WUI to protect private property and residences. The effects of the Forest Plan Amendment under Alternative 2 and 3 are beneficial to the fuels resource because they allow for timber management to occur on the acquired lands which will contribute to fuels reduction. The difference between Alternative 2 and 3 on fuels is that Alternative 3 could result in a potential increase in fire behavior adjacent to private lands due to limitations in vegetation management activities on MA5 lands that could proactively modify fire behavior. The management area assignments in Alternative 2 are more beneficial to the fire fuels resources.

These MA assignments are consistent with the existing condition of these lands and the management direction assigned to adjacent lands and will not preclude future MA assignment under the Flathead Forest Plan Revision effort.

The cumulative effects of this forest plan amendment are very limited due to the geographic scope and expected duration of the amendment. At the Flathead National Forest scale, this amendment is only addressing management area direction on less than 1 percent of the NFS acreage on the Flathead National Forest. Additionally, the duration of this amendment is expected to be short-term since forest plan revision is ongoing with a decision expected in 2017. When the revision effort is completed, new management areas will be assigned across the entire Flathead National Forest, including the Beaver Creek project area, and will supersede any of the interim management areas proposed in this amendment. Reasonably foreseeable activities identified on the lands associated with the amendment is very limited as identified in Table 17 in

Chapter 3 of this EA. If future land management activities occur on these lands they will be subject to forest-wide direction found in the Flathead National Forest Land and Resource Management Plan, federal and state laws, and other Forest Service regulations, as they are now, and will be guided by the proposed management area direction. Future land management activities such as timber harvest, road work, changes to public access etc. would be subject to site-specific NEPA analysis in the future.

## REGULATORY FRAMEWORK AND CONSISTENCY

The Beaver Creek Project is consistent with the following Forest Plan Fire Management Direction (USDA 2001a) and Fire and Fuels direction for all affected management areas:

- Implement prescribed fire to maintain healthy, dynamic ecosystems that meet land management objectives.
- Integrate an understanding of the role fire plays in regulating stand structure into the development of silvicultural prescriptions.
- Planned ignition prescribed fire may be utilized to reduce hazards from activity-caused fuel concentration and to maintain or enhance vegetative components or wildlife habitat (Forest Plan, pp. III-74).

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# AIR QUALITY

## INTRODUCTION

The basic framework for controlling air pollutants in the United States is mandated by the 1970 Clean Air Act, as amended in 1990 and 1999. The Clean Air Act was designed to "protect and enhance" air quality. The primary means by which this is to be accomplished is through implementation of National Ambient Air Quality Standards (NAAQS).

Section 160 of the Clean Air Act requires measures:

> "to preserve, protect, and enhance the air quality in national parks, national wilderness areas, national monuments, national seashores, and other areas of special national or regional natural, recreational, scenic, or historic value."

Stringent requirements are established for areas designated as "Class 1" attainment areas. Class 1 Areas include Forest Service and USFWS wilderness areas over 5,000 acres that were in existence before August 1977, and National Parks in excess of 6,000 acres as of August 1977. Designation as a Class 1 Area allows only very small increments of new pollution above existing air pollution levels. The Bob Marshall Wildernesses and Glacier National Park were considered in the development of this project.

Air quality regulations and standards are set by the EPA by the authority of the Clean Air Act. National Ambient Air Quality Standards set limits on air pollution and are monitored and regulated by the State of Montana's Department of Environmental Quality (DEQ). In addition to Montana DEQ, counties also have regulations that may be more restrictive to air quality pollutants. Information on National Standards and State and County Regulation can be found at: EPA www3.epa.gov/ and DEQ www.deq.mt.gov/default.mcpx websites.

The EPA has established NAAQS for six criteria pollutants that have been determined harmful to the public and environment, including:

1. Carbon monoxide,
2. Lead,
3. Nitrogen dioxide,
4. Sulfur dioxide,
5. Ozone,
6. PM2.5, and PM10.

The major pollutant of concern in smoke from wildland fire is fine particulate matter (PM), both PM10 and PM2.5. Smoke from prescribed fire must meet the ambient air quality standards for PM10 and PM2.5. In Montana, the state standard for PM10 is the same as the federal NAAQS: 50 mg/m³ (micrograms per cubic meter, which is 1/1,000,000 of a gram per cubic meter) for the annual arithmetic mean, and 150 mg/m³ for the 24-hour average. For PM2.5, no state standard has been established; the Federal NAAQS is 12 mg/m³ for the annual arithmetic mean and 35 mg/m³ for the 24-hour average. Fine particulate matter, generally less than 2.5 microns in diameter (PM2.5), is the primary cause of visibility impairment although gases also contribute. Emissions from wildland burning include both gases and particulate matter ranging in size from 0.1 to 2.5 microns which greatly impacts visibility. For more information or a listing of the NAAQS, please see the Environmental Protection Agency's website at EPA Air Quality Criteria www3.epa.gov/air/criteria.html

If a community does not meet or attain the NAAQS, it is designated as a non-attainment area and must demonstrate to the public and the EPA how it will meet standards in the future. This demonstration is done through the State Implementation Plan. Kalispell, Whitefish, and Columbia Falls are non-attainment areas addressed in this report.

Under the current State and Federal rules, wildland fires are considered natural events, so the smoke they produce is not considered as a cause of violations of air quality standards or visibility protection goals. Conversely, prescribed fires are considered active management, so the smoke produced is considered as an impact on air quality and visibility standards.

This analysis discloses the potential effects to air quality from implementing the action alternatives and a No Action Alternative, to provide the decision maker with a means of comparing these alternatives. The analysis of both the action and no action alternatives include the effects of wildland fire smoke and prescribed fire smoke.

This analysis includes the direct effects (effects resulting from the implementation of an alternative that occurs at the same place and time), indirect effects (effects resulting from the implementation of an alternative that occurs later in time or are further removed in distance but are reasonably foreseeable), and cumulative effects (effects resulting from the incremental impacts of past, present and reasonably foreseeable future actions regardless of who is responsible).

# ANALYSIS AREA

## SPATIAL BOUNDS

The Montana Air Quality Bureau divides the State of Montana into ten Airsheds. Airshed 2 (as defined by the Montana/Idaho Airshed Group) is the primary analysis area for assessing the influence of the Beaver Creek Project's activities on air quality, because it encompasses the effects of any activities undertaken in the project area. Airshed 2 comprises Flathead, Lake, Sanders, and the northern portions of Missoula and Powell Counties. Impacts from any burning within the project area would usually occur downwind in an easterly-northeasterly direction, as prevailing winds are from the west to southwest. Sensitive areas potentially affected include the WUI within and adjacent to the project area and possibly the Mission Mountains Wilderness, the Bob Marshall Wilderness, and Glacier National Park.

## TEMPORAL BOUNDS

Impacts from any burning within the project area would usually occur within 5 years of the initiation of the project. This is the time frame used for the air quality effects of the action alternatives. The No Action Alternative does have an undetermined potential for increased smoke related effects to air quality due to a possible large fire. This potential increases over time due to ground fuel accumulations increasing as dead trees fall in the forest. Concurrently, over time, the area is exposed to more potential ignition sources. At some point, the stands would begin to regenerate and a reduction in fuel loading would begin as the rate of falling trees is exceeded by natural amelioration of the surface fuels.

# DATA SOURCES, METHODS, AND ASSUMPTIONS USED

## DATA SOURCES

The evaluation of direct, indirect, and cumulative effects on air quality used the most recent and representative site-specific information and data related to past, present, and reasonably foreseeable events that have occurred or may occur in the air quality analysis area.

## METHODS

BlueSky Playground was used to estimate PM2.5 and PM10 emissions and airborne concentrations for all project alternatives. BlueSky Playground uses widely known fire modeling programs, such as CONSUME for pile burning emissions, Fire Emission Production Estimator (FEPS) to estimate emissions from broadcast and natural fuels, Hybrid Single Particle Lagrangian Integrated Trajectory Mode (HYSPLIT) to model smoke dispersion, and Fuels Characteristic Classification System (FCCS) and Landscape Fire and Resource Management Planning Tools (LANDFIRE) for fuels information datasets.

## ASSUMPTIONS

For the purposes of this analysis the maximum expected fuel loadings were used based upon standard forest cover types. The actual loadings could vary depending on site-specific conditions.

Smoke production comparisons are based on the difference between a stand-replacement wildfire (No Action) and prescribed fire activity (Action Alternatives) on an acre-to-acre basis. This does not take into account future fire activity that may or may not occur, regardless of the selected alternative.

## MEASUREMENT INDICATORS

The combustion products of smoke from wildland fires and prescribed burning include carbon dioxide, water vapor, carbon monoxide, particulate matter, hydrocarbons, nitrogen oxides, and trace minerals. Federal and State ambient air quality standards have been established for particulate matter, which is the pollutant of most concern from smoke. Specifically, particulate matter less than or equal to 10 micrometers in aerodynamic diameter (PM10) is the size that can penetrate the inner recesses of the lungs, causing health problems. It is also the size that most severely impacts local and regional visibility.

If a community does not meet or "attain" the NAAQS, it is designated as a non-attainment area and must demonstrate to the public and the EPA how it will meet standards in the future. This demonstration is done through the State Implementation Plan.

The current Federal and State standards are:

- **PM10:** The concentration of PM10 must not exceed 150 micrograms per cubic meter over a 24-hour period; or the annual arithmetic average must not exceed 50 micrograms per cubic meter.
- **PM2.5:** The concentration of PM2.5 must not exceed 35 micrograms per cubic meter over a 24-hour period; or the annual arithmetic average must not exceed 12 micrograms per cubic meter.

Monitors for PM10 and PM2.5 are located in Libby, Kalispell, Whitefish, Missoula, Helena, and several other sites in Montana.

For this purpose of this analysis, there are two activities that may impact air quality with the emissions of PM10 and PM2.5:

1. **Wildland Fire Smoke** - Wildland fires are a natural combustion process that consumes both living and dead vegetative material and produces smoke that can have adverse impacts on air quality. The size, intensity, and occurrence of wildland fires depends directly on variables, such as meteorological conditions, the type of vegetation present, the moisture content of both live and dead fuel, topography and the total weight of consumable material available. Small fuel, such as dead grass and conifer needles, supports fire spread. Larger dead fuels are consumed to a variable extent depending on their moisture content. Under environmental conditions that reduce the moisture content of live fuels, such as drought and extreme heat, these fuels may also be consumed. Slope effects fire in much the same way wind does, the steeper the slope the greater the effect. The aspect of a slope influences the moisture content of fuels with north aspects being relatively damp and south slopes being relatively dry. Under the extreme condition of heavy fuel, drought, and hot, dry weather nearly all forest fuels are available for consumption. The impacts to air quality vary by the amount of smoke produced, which varies with burning conditions. Large amounts of smoke are produced under extreme burning conditions.

2. **Prescribed Fire Smoke -** The amount of smoke emissions, resulting from prescribed burning of both natural fuels and logging slash, would be mitigated by four general methods: fuel loading reduction, fuel consumption reduction, flaming combustion, and impact avoidance.

Smoke produced from the prescribed burning of timber harvest residue and natural fuels could have an adverse effect on air quality. The amount of smoke produced is influenced by the same factors that influence the amount of smoke produced by wildland fires. Increasing the utilization of sub-merchantable material could reduce the amount of fuel remaining after timber harvest and so reduce the amount of smoke produced. The type and timing of burning, as well as weather conditions, influences the amount of smoke produced.

# AFFECTED ENVIRONMENT

## HISTORICAL CONDITION

Quantitative air quality data is not available for the period prior to settlement of the analysis area late in the 19th century. However, it is known that fire played a major role in the development of vegetative patterns throughout western Montana.

Prior to the advent of effective fire suppression (about 1930), fires that started in the area burned unchecked from the time of ignition until weather changes stopped their spread. Smoke production varied as environmental factors changed. Smoke could have been produced for just a few hours or for as long as several months. During severe fire seasons, especially when stagnant high pressure systems persisted, regional air quality was no doubt poor. The number of acres burned by wildland fires decreased as effective fire suppression became common; and as a result, air quality improved. During the last two decades of the 20th century, natural fuels resulting from decades of fire suppression have reached a level where larger; more intense fires are becoming common.

## EXISTING CONDITION

## AIRSHED

Montana is divided into ten airsheds by the Montana State Air Quality Bureau. The project area lies entirely within Airshed 2. Airshed 2 is the primary analysis area for assessing the influence of the Beaver Creek Project activities on air quality, because it encompasses the effects of any activities undertaken in the project area (as defined by the Montana/Idaho Airshed Group).

Smoke produced within the analysis area would most likely be carried in an easterly-northeasterly direction by the predominantly westerly, synoptic scale, wind flow pattern that influences western Montana. Airshed 2 comprises Flathead, Lake, Sanders, and the northern portions of Missoula and Powell Counties.

Airshed 2 air quality is influenced predominantly by smoke and dust originating from areas located to the west, since the general wind flow direction for the area is from this direction. This includes grass burning in Idaho and Washington, as well as other agricultural areas in northern Oregon. Industrial emissions, as well as those from internal combustion engines, add to the level of regional haze and air pollution load. Prescribed burning of logging residue by private and other government entities adds wood smoke to the air mass. Wildland fires, burning as far west as the coastal range of Oregon and Washington, also contribute to air quality degradation. Dust, originating from tilled farm land, during dry windy weather, can add to local haze and reduce air quality.

## SENSITIVE AREAS

The EPA designates communities that do not meet NAAQs over a period of time as "non-attainment areas." States are then required to develop a plan to control source emissions and ensure future attainment of the standards. The emissions from prescribed fire may be considered as contributing emissions. Three cities in the Flathead Valley (Kalispell, Columbia Falls, and Whitefish) are considered sensitive areas because they are non-attainment areas for PM10. Kalispell is considered an area of concern, though not formally designated a non-attainment area for carbon monoxide.

The Clean Air Act provides for additional measures "to preserve, protect, and enhance the air quality" in larger National Parks, Wilderness Areas and other areas of special national significance. These areas are designated Class I Airsheds. Of particular concern under this requirement is visibility or haze. The Prevention of Significant Deterioration (PSD) provisions of the Clean Air Act require measures

> "to preserve, protect, and enhance the air quality in national parks, national wilderness areas, national monuments, national seashores, and other areas of special national or regional natural, recreation, scenic, or historic value."

Stringent requirements are, therefore, established for areas designated as Class I Areas [42 U.S.C. 7475 (d)(2)(B)]. Designation as a Class I Area permits only very small increments of new pollution above existing air pollution levels. The Bob Marshall and Mission Mountains Wilderness areas, as well as Glacier National Park, are designated as Class I airsheds. All other lands immediately east of the project area are designated as Class II.

A requirement of PSD is that new major stationary sources, or major modifications of existing stationary sources, must first receive a PSD permit from the appropriate air regulatory agency before implementing construction or modification. A stationary source is one that is well defined, such as the smokestack of a coal-fired power plant or smelter. Prescribed burning from this project is not considered a major stationary source and, therefore, is not subject to the PSD permitting process.

## SMOKE DISPERSION

Smoke dispersion is primarily determined by transport winds and mixing height. Transport winds determine the direction of a smoke plume and the speed at which it travels, while mixing height controls the ability of smoke to mix into an air mass. In the spring and summer, solar heating of the earth surface is much more intense, increasing the amount of warm air contributing to an unstable atmospheric condition. The more unstable the atmosphere, the higher the likely mixing height would be, and the greater the dispersion. During the fall and winter, stable atmospheric conditions prevail as cooler air pools in the valley bottoms. Solar heating is not enough to heat this pooled air, so the stable conditions remain, reducing dispersion until a frontal passage "scours" out the valley air.

Forest Service management-ignited prescribed fire contributes smoke that may cause short-term deterioration of air quality in the area. Management-ignited prescribed fires contribute smoke to the airshed, though prescribed fires tend to produce less smoke than wildfires of equal size, since fuel consumption is typically lower in prescribed burns. On the Flathead National Forest, prescribed burning is generally accomplished when dilution, dispersal, and mixing conditions are considered fair to excellent. Prescribed burning requires approval from the Montana/Idaho Airshed Group, and the burn must be implemented within the regulatory framework. This includes daily approval from the Lake and Missoula County Air Quality hotline and the Montana/Idaho Airshed Group. More information on the Montana/Idaho Airshed Group can be found online at Smoke MU (http://www.smokeemu.org).

# ENVIRONMENTAL CONSEQUENCES

The Cumulative Effects Worksheet (Project File Exhibit K-2) considers and describes proposed activities in addition to the past, present, and reasonably foreseeable activities listed in the beginning of this chapter in Table 17 and Table 18. Those activities that cumulatively affect air quality are discussed below.

There were no issues raised concerning air quality. The indicator used to evaluate the prescribed fire effects of each alternative on smoke production was particulate matter less than 2.5 microns in diameter. These small particles are respirable suspended particulate matter that, because of its small size, has an especially long residence time in the atmosphere and penetrates deeply into the lungs. Small smoke particles also scatter visible light and, thus, reduce visibility (Hardy et al. 2001).

## ALTERNATIVE 1 – NO ACTION
## DIRECT, INDIRECT, AND CUMULATIVE EFFECTS

### WILDLAND FIRE SMOKE

No management activity would occur if Alternative 1 is selected. The direct effect of wildland fire smoke on air quality from implementing Alternative 1 is that fire occurrence, intensity, and size would be similar to fires in the recent past. The Crazy Horse Fire occurred in 2003 and burned 11,000 acres. See Fire and Fuels Section of this EA for fire history within and adjacent to the project area.

Fires are generally small, burning less than 1 acre each. However, there is an increasing probability that one of these fires would escape initial attack and grow to several hundred to thousands of acres, burning for several days, weeks, or months. Fires of this scale and duration would impact air quality to varying degrees during the time the fire would be active.

An indirect effect of wildland fire smoke, from selecting Alternative 1 would be the gradual change in the existing fuel complexes as dead woody fuels accumulate secondary to insect, disease, and weather disturbance. Live fuels, especially ladder fuels, would also increase over time as stand density declines and understory shade-tolerant species increase in response to increased sunlight. As the fuel loading increases, the incidence and intensity of wildland fires, and the smoke they produce, would increase. The current non-lethal to mixed-lethal fire regime would change, over time, to a mixed-lethal to lethal regime.

Due to the increases in fuels over time with the No Action Alternative, it can be anticipated that the intensity and extent of wildfires would increase in the project area as compared with historic more frequent interval fires as discussed in the Fire and Fuels Section of this EA. Associated smoke from such wildfires could increase as a consequence of taking no action as contrasted with Alternatives 2 and 3.

The cumulative effects of wildland fire smoke on air quality for Alternative 1 - No Action would include all pollution sources contributing particulates to the air mass in addition to the smoke produced by wildland fires within the analysis area. The greatest cumulative effect would occur when wildland fires are burning outside and upwind of the analysis area and wildland fires within the analysis area burn at the same time. The cumulative effect of these sources could result in extended periods of poor air quality.

### PRESCRIBED FIRE SMOKE

There would be no direct, indirect, or cumulative effects to the air quality of human health from Alternative 1. Alternative 1 would not implement any prescribed smoke producing activities, such as pile burning, and would not directly contribute to air quality impacts.

## ALTERNATIVES 2 AND 3 – ACTION ALTERNATIVES DIRECT AND INDIRECT EFFECTS

### WILDLAND FIRE SMOKE

For the purpose of analysis, it was assumed that all of the acres proposed are burned by mixed-severity wildland fire. In doing this, a basis for comparing the potential air quality impacts of wildland fire to the potential impacts of management activities is derived. The following table displays these estimates. However, these are only estimates of a potential wildland fire scenario.

**TABLE 59. PARTICULATE AMOUNTS (TONS/ACRE) PRODUCED BY ALTERNATIVE IN THE PROJECT AREA.**

| ALTERNATIVES | PM10 TONS/ACRE PRODUCED | TOTAL PM10 EMISSIONS (TONS) | PM2.5 TONS/ACRE PRODUCED | TOTAL PM2.5 EMISSIONS (TONS) |
|---|---|---|---|---|
| 1 | 0.42 | 995 | 0.35 | 843 |
| 2 | 0.34 | 803 | 0.29 | 682 |
| 3 | 0.33 | 789 | 0.28 | 670 |

### PRESCRIBED FIRE SMOKE

It is assumed that there would be piles resulting from harvest within the proposed units. It is anticipated that all harvest units would have unit and/or landing piles to be burned; however, the number of piles varies by alternative. It was assumed that there was 1 landing pile for every 20 acres harvested and 2 piles per acre when unit piles are prescribed. The BlueSky Playground model assumes that all burning would be ignited over a single day following harvest treatments. It is much more likely that this would occur over a period of several years. The amount of smoke emissions, resulting from prescribed burning would be mitigated by 4 general methods.

1. **Fuel Loading Reduction:** The Flathead National Forest has encouraged, through sale contract provisions, the increased removal of material that is smaller than the established utilization standard for a given timber sale. First, purchasers are required to pay for and, therefore, encouraged to utilize, top wood smaller than the utilization standard. Second, the standard contract allows the purchaser to remove sub-merchantable material from regeneration harvests without prior consent of the Forest Service [Standard Contract Provision B(T)3.41]. Third, sub-merchantable material may also be removed from commercial thinning units with prior Forest Service agreement. All these measures help decrease the amount of woody fuel that must be burned.
2. **Fuel Consumption:** The reduction of the amount of fuel consumed by prescribed burning would be accomplished through the use of spring or fall burning. Harvested

areas located on east, southeast, south, southwest, and west aspects would be burned, to the extent possible, during the spring burn season, typically from late March through June. During this time frame larger diameter fuels and the duff layer usually have relatively high moisture contents that reduce the amount of these fuels consumed by prescribed burning.

3. **Flaming Combustion Optimization:** When prescribed burning is determined to be the most appropriate fuel treatment, methods that increase the flaming combustion phase would be used. Concentration of logging slash by whole tree yarding or excavator piling increases the amount of material consumed during flaming combustion and also allows material to be burned in the late fall during cloudy weather when smoke is less obvious and the risk of escape is low. Purchasers are required to construct piles so they are compact and free of excess soil.

4. **Impact Avoidance**: Smoke impact avoidance would be accomplished through daily monitoring of airshed conditions. In Montana, the open burning season runs from March 1 through November 30. All open burning in the state is regulated by the State of Montana DEQ. Major prescribed burners, including the Forest Service, have formed the Montana State Airshed Group. Through an MOU with the DEQ, this group has established a smoke monitoring system that provides daily air quality predictions and restrictions to its members. To accomplish this, the Airshed Group has a monitoring unit consisting of meteorologists and technicians that use weather forecasts, balloon soundings, burn plans, and air quality conditions to determine, on a daily basis, the need for restrictions on prescribed burning. The Forest Service is issued an annual permit to burn by the Montana Air Quality Bureau. Issuance of this permit is based on participation and compliance with burning restrictions issued by the Montana Airshed Group. Prescribed burning is reported to the Airshed Coordinator on a daily basis. If ventilation problems are forecasted by the monitoring unit, prescribed burning is either restricted by elevation or curtailed until good ventilation conditions return. The Forest Service cooperates with the State in meeting the requirements of the State Implementation Plan and the Smoke Management Plan.

The direct effects of prescribed burning smoke, for the action alternatives, are directly related to the total acres treated by prescribed fire. Alternative 1 – No Action would not produce prescribed burning smoke since no prescribed fire activities would be implemented. The direct effects of prescribed burning smoke are reduced visibility and increased level of small diameter particulates, specifically PM2.5. Although, over time, wildfires would be expected to occur and produce smoke within the project area, the amount of smoke produced and the timing is not predictable, so for the purposes of this comparison, Alternative 1 is showing no PM2.5.

The following table displays, by alternative, the total number of acres for the pile burn treatment category, the estimated total fuel loading (after removal of merchantable timber), in tons, for that acreage and the estimated percent fuel reduction.

**TABLE 60. ESTIMATED FUEL LOADINGS (PILES) FOR THE BEAVER CREEK PROJECT.**

| ACTIVITY | ALTERNATIVE 1 | ALTERNATIVE 2 | ALTERNATIVE 3 |
|---|---|---|---|
| Potential Pile Burn Acres | 0 | 608 | 472 |
| Total Pre-burn Fuel Load (tons) | 0 | 8,944 | 6,880 |
| Total Consumed Fuel Load | 0 | 8,047 | 6,190 |
| Percent fuels reduced | 0 | 90 | 90 |

The estimated amount of smoke emissions, produced by prescribed burning associated with the action alternatives, is portrayed in the following table. The project file contains the calculations used to develop these estimates (Project File Exhibit K-5).

The indirect effects of prescribed burning smoke produced as a result of the implementation of the action alternative would be directly related to the amount of timber volume to be removed.

Indirect effects are limited to the air quality degradation, as a result of PM2.5 particulates, and increased haze. Particulate Matter 2.5 levels would rapidly disperse as they are carried by local and general winds.

The following tables show the PM2.5 emissions for the prescribed burning activities for each action alternative. The total amount of PM2.5 and the estimated 24-hour concentrations of PM2.5 were modeled for all alternatives. While more than 90 percent of the mass of particulate matter produced by wildland fires is less than 10 microns in diameter, PM2.5 was chosen because 80 percent of the emissions is less than 2.5 microns in diameter. Total PM 2.5 emissions are given to show the total output for each alternative for a means of comparing the relative total outputs.

**TABLE 61. AIR QUALITY EMISSIONS BY ALTERNATIVE.**

| TREATMENT CATEGORY | NUMBER OF ACRES | NUMBER OF PILES | PM2.5 (TONS) | PM2.5 24 HR AT 1 MILE (μG/M3) |
|---|---|---|---|---|
| **ALTERNATIVE 1 AIR QUALITY EMISSIONS.** | | | | |
| Wildfire | 2,390 | 0 | 843 | >10 |
| **ALTERNATIVE 2 AIR QUALITY EMISSIONS** | | | | |
| Piles | 608 | 1,300 | 54 | < 10 |
| Broadcast Burning | 1,782 | 0 | 628 | < 10 |
| Total of harvest related PM2.5 emissions | 2,390 | 1,300 | 682 | < 10 |
| **ALTERNATIVE 3 AIR QUALITY EMISSIONS.** | | | | |
| Piles | 472 | 1000 | 42 | < 10 |
| Broadcast Burning | 1,778 | 0 | 628 | < 10 |
| Total of harvest related PM2.5 emissions | 2,250 | 1000 | 670 | < 10 |

## ALTERNATIVES 2 AND 3 – ACTION ALTERNATIVES CUMULATIVE EFFECTS

This section discloses past, present, and reasonably foreseeable effects from Federal, State, Tribal, and private land fire use activities. The cumulative air resource analysis is unique in that past impacts to air quality are not usually evident. However, present and foreseeable effects could include impacts from other prescribed forestry burning, agricultural burning, residential wood combustion, traffic exhaust, fugitive road dust or point sources of pollution. Individual sources of smoke from other agencies are too numerous and variable to list. Because of the complexity and uncertainty of timing associated with other agencies burning, coordination with the Montana/Idaho State Airshed group is critical to minimize cumulative air quality impacts within Idaho and Montana.

The cumulative effects area is Airshed 2. Smoke emissions produced by the implementation of the project, road dust, and vehicle emissions could combine with air pollutants from other projects in the area, such as other prescribed burning and particulates produced west of the project area. Implementation effects could contribute to the cumulative impact of air pollutants within the Flathead Valley. Prescribed burning would be implemented during good smoke transport and dispersion conditions and would be accomplished over time; minimizing any adverse effects from prescribed burning smoke emissions. The cumulative impacts of all private and agency burning are assessed daily during the burning season, through the coordination of the Montana/Idaho State Airshed Group. This group also considers other sources of smoke, such as wildfires and industrial sources. Any prescribed burning in the project area, including prescribed burning associated with other projects, would be approved or denied on a daily basis through the Montana/Idaho State Airshed group. Based on current and forecasted weather, burns are approved or disapproved according to their cumulative impact on the airshed. This regulatory mechanism ensures that the cumulative effects of prescribed burning do not lead to a violation of air quality standards. The Forest Service is an active participant in the Montana/Idaho State Airshed Group.

Road dust due to log hauling and normal public traffic would be common in the project area. Dust abatement may be used, if needed, on haul roads to minimize the effects of road dust including safety concerns.

Wildland fires locally, or anywhere in the northwest and Canada, can affect regional haze in the Flathead Valley and Swan Valley. Wildland fires are anticipated to continue to produce smoke, primarily during the summer months. However, fires occurring in areas that are treated as described in the action alternatives would be more easily suppressed post treatment, potentially reducing emissions from future wildfires.

### Wildland Fire Smoke

The cumulative effects of wildland fire smoke on air quality for the action alternatives would include all pollution sources contributing particulates to the air mass, in addition to the smoke produced by wildland fires within the analysis area. The greatest cumulative effect would occur when wildland fires are burning outside and upwind of the analysis area and wildland fires within the analysis area burn at the same time. The cumulative effect of these sources could result in extended periods of poor air quality. The potential amount of smoke produced would vary by alternative and would be proportionate to the amount of fuel hazard reduction resulting from each alternative; and for this analysis, the alternative with the greatest impacts would be Alternative 1 – No Action. It should be noted that the airshed impacts between the action alternatives is minimal.

### Prescribed Fire Smoke

The cumulative effects on air quality of prescribed burning smoke, produced as a result of the implementation of the action alternative, would result in an incremental decrease in air quality as PM2.5 and PM10 particles from this source combine with other particles produced both by the implementation of other aspects of this project, specifically fugitive road dust, as well as 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. Particulates from industrial and automotive sources also contribute to regional particulate loading. Other vehicle traffic, agricultural, and industrial sources within the analysis area would also contribute to the cumulative particulate loading. It is not possible to predict the amount of particulates contributed by these other sources.

The cumulative effects on Class 1 Airsheds from the implementation of the action alternatives and other present and reasonably foreseeable future actions are not known at this time. The production of air pollutants associated with the implementation of this project would vary over time and would not be continuous. Therefore, impacts would be episodic in nature and the potential of occurrence would end when the implementation of this project is completed.

## Effects of a Forest Plan Amendment to Assign Management Areas to Acquired Lands

The Beaver Creek Project includes a Forest Plan Amendment to assign interim management areas (MAs) to approximately 5,457 acres of former PCTC lands acquired by the USDA Forest Service to be managed as part of the Flathead National Forest. These interim management areas would be in effect on acquired lands until the ongoing Forest Plan Revision effort is completed, anticipated in 2 years.

The effects of the Forest Plan Amendment to air quality within analysis area under Alternative 1, 2, and 3 are minor because the Forest Plan air quality standards apply to all lands managed by the Flathead National Forest even if management areas are not assigned. The effects of the Forest Plan Amendment under Alternative 2 and 3 are also minor in scale because although they allow for timber management to occur on some lands they will maintain consistency with the forest-wide standards and guidelines that are in place to conserve air quality over time. These MA assignments are consistent with the existing condition of these lands and the management direction assigned to adjacent lands and will not preclude future MA assignment under the Flathead Forest Plan Revision effort.

The cumulative effects of this forest plan amendment are very limited due to the geographic scope and expected duration of the amendment. At the Flathead National Forest scale, this amendment is only addressing management area direction on less than 1 percent of the NFS acreage on the Flathead National Forest. Additionally, the duration of this amendment is expected to be short-term since forest plan revision is ongoing with a decision expected in 2017. When the revision effort is completed, new management areas will be assigned across the entire Flathead National Forest, including the Beaver Creek project area, and will supersede any of the interim management areas proposed in this amendment. Reasonably foreseeable activities identified on the lands associated with the amendment is very limited as identified in Table 17 in Chapter 3 of this EA. If future land management activities occur on these lands they will be subject to forest-wide direction found in the Flathead National Forest Land and Resource Management Plan, federal and state laws, and other Forest Service regulations, as they are now, and will be guided by the proposed management area direction. Future land management activities such as timber harvest, road work, changes to public access etc. would be subject to site-specific NEPA analysis in the future.

# REGULATORY FRAMEWORK AND CONSISTENCY

As designated by law, State air quality rules, and the Flathead Forest Plan, the Flathead National Forest cooperates with the State Air Quality Bureau and Missoula County Environmental Health Division, Air Quality Program. The Forest Service is a member of the Montana/Idaho State Airshed Group. This coordination ensures that during project implementation burning only occurs under conditions that would protect air quality and meet State and National standards.

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# AQUATICS

## SUMMARY

The project area has about 266 wetlands of varying ecological types and importance. Some wetlands have been degraded by non-native fish and both action alternatives would install barriers to protect several wetlands from additional invasions. Both action alternatives reduce the likelihood of a severe wildfire, and this may reduce stress to wetlands from potential climate change. Alternative 2 conducts vegetation management near 11 wetlands to provide a more natural mosaic of disturbance, and these management activities would not have adverse impact to these wetlands, Alternative 3 does not propose these management activities. A prescribed burn proposed in Alternative 2 may leave one particular wetland vulnerable to adverse impacts from an existing cattle grazing allotment. In Alternative 3 fire would be excluded from this wetland.

Beaver Creek contains primarily non-native brook trout and is not a bull trout stream. Past land management may have caused excessive sedimentation, but the stream currently has good fish habitat conditions. Recent road projects have helped reduce the impact from roads and the action alternatives continue this trend. Minor, short-term sedimentation is expected from road decommissioning and intermittent stored service; but, in the long term, these activities would be beneficial to water quality. The proposed vegetation restoration activities will not impact water quality, with the exception of Units 4108 and 4110, which could result in a minor impact on water temperature. Alternative 2 includes a concrete fish barrier on the Sunset Creek tributary in order to conserve the last remnant cutthroat trout population from non-native invasion. Alternative 3 includes a culvert barrier that has less short-term effect to soils and water resources affected by the barrier construction, but the culvert replacement proposed in Alternative 3 will also be less beneficial to the cutthroat population in Beaver Creek. The restoration work proposed in both alternatives, would allow the Beaver Creek watershed to be considered “functioning appropriately” with the Watershed Condition Framework.

Lindbergh Lake contains excellent water quality. Bull trout spawn upstream of the lake, and both the lake and the inlet river are identified as Bull Trout critical habitat. The greatest threat to bull trout in the watershed is due to the establishment of non-native fish and this project has not proposed actions to address this issue. The proposed vegetation treatments in both Alternative 2 and 3 will not affect the watershed. The prescribed burn in the wilderness is also unlikely to have effects to the watershed; but in a worst-case scenario, it could result in a small and unmeasurable amount of sediment. This potential effect would be too small to affect bull trout or reduce water quality.

The entire Swan River Valley has been considered for downstream, cumulative effects, and to analyze potential effects a few acres of vegetation management downstream of Lindbergh Lake that do not fit into the other analysis areas. The Swan River Valley has good habitat conditions and recent vegetation management and NFS road management have preserved water quality. Implementing either Alternative 2 or 3 would likewise preserve water quality and fish habitat. This project, along with another reasonably foreseeable project elsewhere, would mean that all watersheds in the Swan River Valley would be “functioning appropriately” according to the Watershed Condition Framework. This project would also conserve 1 of the 22 remaining cutthroat trout populations with conservation value in the Swan Valley Watershed.

# INTRODUCTION

Clean, fresh water is an important resource in the landscape. Humans and countless wildlife species rely on streams, wetlands and lakes for habitat, food and water. The fisheries resources are also especially valued by many people. This section describes the condition of Aquatic Resources in the project area, and the potential effects of the alternatives.

# ANALYSIS AREAS

There are four analysis areas for this project. Three of them are “nested” inside the larger, fourth analysis area that is the Swan River Valley. Descriptions of these four analysis areas follow and Map 3-3 displays these analysis areas.

## SPATIAL BOUNDS

### WETLANDS

Wetlands vary considerably in size, appearance and productivity. The definition of a wetland is “an ecosystem that arises when inundation by water produces soils dominated by anaerobic processes, which, in turn, forces the biota, particularly rooted plants, to adapt to flooding” (Keddy 2010). This may include marshes, vernal ponds, lakes, fens, streams and riverine floodplains. All wetlands have ecological value. This analysis does not distinguish between wetlands with “jurisdictional” regulation by the Army Corps of Engineers (which is largely utilized for dredging and mining permits), and those not regulated. This section focuses on depressional wetlands and defers streams and floodplains to other analysis area discussions.

The Swan River Valley has an unusually rich abundance and diversity of wetlands. A landscape assessment prepared by the Swan Ecosystem Center (2004) notes that while most places in Montana have about 2 percent of the landscape in wetland habitat, the southern half of the Swan Valley floor has 16 percent occupied by wetlands (the northern half was not assessed). In 2010, the MNHP and Swan Ecosystem Center jointly delineated as many wetlands as they could from USGS topographical maps, aerial photography and some field validation. This information is stored in GIS and from this; it appears that approximately 266 unique wetlands lie within the Beaver Creek and Lindbergh Lake watersheds. There may be additional small wetlands not yet detected. Even if the 2010 inventory is accurate, there is uncertainty if complex wetlands act as multiple distinct units rather than one whole. About two-thirds of the wetlands are on the valley floor (generally below 4,400-foot elevation) and one-third lie within the Mission Mountains Wilderness (above 6,000 feet) with almost no wetlands in the foothills region between them. The wetlands range in size from a fraction of an acre up to the largest one at 828 acres, which is Lindbergh Lake. Figure 33 displays most wetlands outside of the wilderness, but a larger scale map that illustrates all known wetlands, including those in wilderness, is found in Project File Exhibit M-4. Note that while Lindbergh Lake is technically a wetland, this lake will be analyzed separately in the Lindbergh Analysis Area and not reviewed in this section.

Not all wetlands are illustrated in the following figure because of the map scale. Six Groundwater Dependent Ecosystem (GDE) wetlands are shown in yellow. Two wetlands that have been drained are in red hatch.

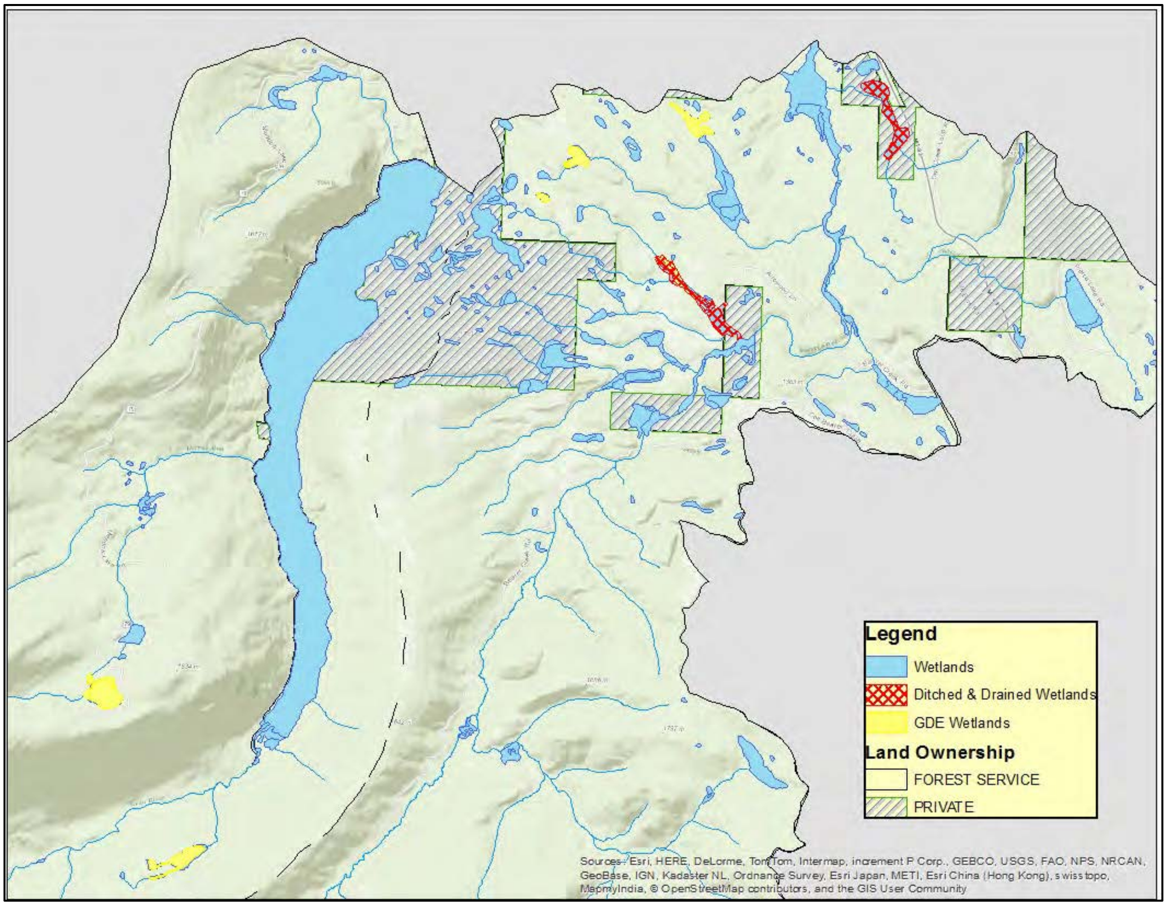


**FIGURE 33. LOCATION OF WETLANDS IN LOWER ELEVATIONS OF THE BEAVER CREEK PROJECT AREA.**

While all wetlands have value, GDE are wetlands of considerable value because they often contain uncommon plants or unusual plant diversity. Groundwater Dependent Ecosystems have substantial groundwater input and typically have at least 30 cm (11.8 inches) of peat accumulation. The MNHP has compiled (Greenlee 1998) and (Chadde et al. 1998) identified GDE and has also recently found additional GDE in the Swan River Valley. To date, a total of 6 wetlands in this project area are ecologically valuable GDE, illustrated on Figure 33.

## BEAVER CREEK

Beaver Creek is a 15,825-acre watershed located on the southern edge of the Swan River Valley (Figure 33). The stream originates from several small wetlands at 6,000-foot elevation inside the Mission Mountains Wilderness and travels roughly 11.5 miles before merging with the Swan River on the valley floor. Approximately 13 percent of the watershed is within the Mission Mountains Wilderness. Although Plum Creek Timber Company (PCTC) previously owned several square miles of the watershed, all of their holdings within this watershed were transferred to public lands between 1998 and 2014. The watershed is currently 90.8 percent on NFS lands and 9.2 percent private lands. Private lands are primarily rural residual tracts that are largely forested with sparse agricultural development (hay fields). Two large conservation easements on private land restrict subdivision development on nearly half of the private land total acreage.

One outstanding feature of the Beaver Creek watershed is the mosaic of beaver (*Castor canadensis*) dams that occupy the lower third of the drainage. The watershed also has many wetlands with intermittent outlet streams that discharge into Beaver Creek. The stream is too warm for bull trout (*Salvelinus confluentus*), and it is not designated critical habitat.

Beaver Creek has no water quality limitation and the Montana Department of Environmental Quality (DEQ) considers the beneficial uses are “fully supported.” A 2011 national evaluation of watershed health classified the Beaver Creek drainage as Class 2 “functioning at risk.” This evaluation, called the Watershed Condition Framework, ranked Beaver Creek as Class 2 due to the following characteristics (not listed in a particular order): degraded riparian vegetation in wetlands; invasive terrestrial weeds; high road density; forest health threatened by insect and disease; and non-native fish. Details of this evaluation and the Beaver Creek Watershed Condition Framework draft recovery plan are available in the Project File (Exhibit M-12).

### LINDBERGH LAKE

Lindbergh Lake watershed is a 26,396-acre watershed located just north of Beaver Creek (Figure 33). Approximately 76 percent of the watershed is within the Mission Mountains Wilderness. The watershed has 14 mountain lakes that discharge into the lowest elevation lake, Lindbergh Lake that is situated at 4,300-feet elevation. The Lindbergh Lake watershed consists of 95 percent NFS lands, 2 percent private lands, and 3 percent undesignated (lake bottom). The privately-owned lands are all adjacent to Lindbergh Lake and consist of small tracts with residential development.

Lindbergh Lake is highly prized for its mountainous setting and is an oligotrophic lake, which means it has comparatively low nutrients and productivity. The lake was previously called Elbow Lake, but was renamed in honor of the famous aviator Charles Lindbergh who visited in the area in the early 1900s. Lindbergh Lake has no water quality limitation and the DEQ considers the beneficial uses are fully supported. The 2011 national evaluation of watershed health considers this watershed as Class 1 “fully functional”. Lindbergh Lake and its primary inlet river (Swan River) are designated critical habitat for bull trout.

### SWAN RIVER VALLEY

The Swan River Valley extends from the headwaters of the Swan/Clearwater Divide downstream to Swan Lake. The outlet of Swan Lake is not included because this is a different fishery community, and no potential impacts would be felt below the lake. The watershed is approximately 428,000 acres. National forest system lands comprise 74 percent of the watershed. The Swan River State Forest makes up about 18 percent of the land ownership, roughly 9 percent is privately owned, and less than 1 percent is a USFWS wildlife refuge. The Swan River Valley is a U-shaped trough carved by glaciers that is roughly 51 miles long and has steep valley walls on both sides. One outstanding feature of this watershed is that development has been generally limited to the valley floor, and the mountain ranges on both sides are unroaded in high elevations.

## TEMPORAL BOUNDS

The timeframe for this analysis is 20 years from project completion. All short-term impacts, such as sedimentation, would cease within a year of project completion. However, the longest impact would be from implementation of a fish barrier to conserve cutthroat trout. This barrier would isolate the cutthroat trout for many decades, but population response can only be predicted for about 20 years (roughly 5 generations). Therefore, a 20-year temporal bound reflects the longest measurable response for aquatic communities.

# INFORMATION SOURCES

Information for this analysis has been gathered from a variety of sources. Geographic information system (GIS) was used to define the spatial location of management activities to streams and wetlands. Spatial data on roads and forest vegetation was used to analyze the effects of alternatives on hydrologic processes, erosion, and sediment delivery. Aerial imagery provided by

Farm Service Agency's 2011 National Agriculture Imagery Program was utilized to assess current vegetation and land use on private and public land.

Fish habitat evaluations within the analysis areas have been conducted by the Forest Service since 1968. Fish population inventories have been gathered by the Forest Service and MFWP since 1972. All raw data is stored at the Swan Lake Ranger District office and is incorporated by reference. In addition to this, peer-reviewed scientific literature has been used as the primary source of information regarding the life histories and habitat requirements of the aquatic organisms and the effect of natural and human-caused disturbances upon those organisms.

Some habitat surveys are designed as inventories. Inventories sequentially measure every foot of the stream and then compile the results within a given stream reach. The oldest surveys relied on technicians to visually examine the entire stream and then ascribe a single numeric value for pools, percent gravels, etc. for each reach based on opinion. Inventories completed since 1992 followed protocols defined by Overton et al. (Overton et al. 1997), and this standardization has reduced observer bias. Inventories have an advantage in that they quantify an entire stream and do not risk mischaracterizing a stream. However, because inventories do not have a fixed sampling location, they are less valuable for monitoring trends.

Other habitat surveys are specifically designed to monitor conditions. Within a Designated Monitoring Reach (DMR), efforts focus on quantifying microhabitat features in smaller representative areas with carefully defined habitat measurements to avoid observer bias (Roper et al. 2003). Changes over time are analyzed with various statistical tools to determine when the change is significant. A statistically significant change provides confidence that the habitat has actually changed rather than random results or observer errors. The oldest DMR locations in this project area were established in 2000. Protocol evolved gradually until it was finally written down in 2006 (USDA 2006a). This analysis assumes the gradual change in protocol is acceptable, and the original surveys are compatible to more recent surveys. The advantage of DMR is the ability to quantify change over time. The disadvantage is the short representative area may not fully typify the stream and a single survey without repeat cannot provide information about trends or conditions.

The majority of fish population data in the analysis areas has been collected by electrofishing. Electrofishing offers superior ability for crews to identify and accurately measure each fish. Techniques are virtually unchanged since the earliest available data (1972), thus allowing repeat monitoring. The weakness of electrofishing is that it does not effectively capture all fish, since some individuals drift out of sight or escape the area prior to sampling. Cryptic, bottom-dwelling species, such as bull trout and sculpins, especially tend to be underrepresented. Electrofishing is only done in summertime low-flow conditions in a small, representative area (often 100 meters [328 feet] in length). This analysis assumes that available electrofishing data does an adequate job in characterizing species relative abundance distribution during low flows on gravel bed streams.

A limited amount of snorkeling has been conducted in the analysis areas. This analysis assumes that snorkeling surveys do an adequate job of identifying species distribution, but also recognizes that they do not prove species absence and may not fully characterize the population. Redd counts (counting the number of spawning nests) are also used to gage population trends for bull trout. Bull trout make fairly distinctive redds and their annual count is a valuable monitoring tool. However, redd counts are inaccurate for estimating population size due to error from poor weather conditions during survey or hybridized fish making redds or spawning pairs creating more than one redd. The MFWP has also conducted nearly annual inventories of Lindbergh Lake with sinking and floating gill nets. These data provide relative abundance of species in the lake but it is not designed as population estimates.

## MEASUREMENT INDICATORS

The Aquatics analysis has three measurement indicators:

1. Hydrologic Processes.
2. Water Quality.
3. Aquatic Species.

These were selected based on public comment on potential issues and also because they represent a wide spectrum of potential aquatic impacts. The specifics of measurement indicators vary slightly from one analysis area to another. For example, water quality in Lindbergh Lake analysis area has a focus on sediment and nutrient input; while in the Beaver Creek analysis area, it is focused on sediment, temperature and habitat complexity.

# WETLANDS

## EXISTING CONDITION

### HYDROLOGIC PROCESSES

The hydrologic processes of wetlands are dominated by the frequency and duration of water saturation. Wetlands function very differently if they are permanently flooded (such as a lake) or seasonally flooded for short periods (such as a vernal pond). A wetland that experiences a change in the hydrologic process is still a wetland, but changes its function. An example of this is when a seasonally-flooded marsh with the forb *Veronica spp.* becomes impounded by beavers and converted into an open-water type of wetland dominated by bulrush *Schnoenoplectus spp*.

The primary natural drivers of wetland hydrologic processes are:

- Precipitation.
- Groundwater input and output (if any).
- Surface water inlet or outlet (if any).
- Evaporation.
- Evapotranspiration of trees near the wetland.

The importance of any of these drivers varies by location, and all can change over time. Reeves et al. (2004) studied the water budget of three small pothole wetlands in the Swan River Valley and found that precipitation, especially snowmelt, was the most important regulator. Precipitation and evaporation varies due to climate and weather. Surface input and output can vary from beaver activity, climate, or vegetation changes in the watershed. Groundwater input is generally stable, but the relative importance can vary, such as if the wetland receives surface water flows during wet years, but not in dry years. Evapotranspiration of trees near the wetland can change when many trees die, such as from a wildfire. There have been three potential anthropogenic impacts to wetland hydrology in this analysis area.

First, two particular wetlands have been artificially modified. Both of these wetlands were drained many decades ago to shorten the inundation period and convert them into seasonal hayfields. Thus, the role of surface water outlet rate has been accelerated. One of these degraded wetlands is entirely on private land. The other is an ecologically valuable GDE that is mostly on public land, but the ditched portion is on private land. At this point in time, no restoration proposals are being brought forward since the private landowners have declined to participate. It should be noted that during the scoping of this project, two other wetlands were suspected to have been modified based on aerial photography, but field examination in 2014 determined that no work was needed

Second, there is a possibility that climate change may impact wetland hydrology. Higher temperatures during the past few decades has decreased snow cover depth, duration, and extent, a trend that will likely continue with further warming (Vose et al. 2012). Overall warming in the mountainous areas of western Montana correlate with observed earlier peak stream flow (Stewart et al. 2005), and a 30 percent reduction in April 1 snow water equivalent across the Pacific Northwest since 1950 (Kendall 2011; Mote et al. 2005). Reduced precipitation input by snowfall may result in wetlands warming up quicker and also drying out quicker, especially in higher elevations. Wetlands dependent on surface water input may be more sensitive than those with groundwater input. There is much uncertainty if climate is a substantial concern or inconsequential considering the natural variability in wetland hydrology (Pilliod et al. 2008).

Third, past timber harvest near wetlands may have impacted wetland hydrology if the number of trees near the perimeter removed was great enough to reduce the evapotranspiration rate. This would, in turn, raise the water level in the wetland for a period of time until young, vigorous saplings increase evapotranspiration rate and the water level returns to previous levels. This impact is temporary and has the same effect as a wildfire. A review of aerial imagery in the project area found 8 wetlands appear to have a majority (greater than 70 percent) of their perimeter currently in a non-forested state (Project File Exhibit M-18). Five of these wetlands are on private land. Three of these wetlands are on lands previously owned by PCTC, but are now NFS lands. None of these 8 wetlands are GDE wetlands nor do they support *Howellia aquatilis* (a threatened plant species) or its habitat. It is unknown if these 8 wetlands actually have altered hydrologic processes but, this analysis considers that there likely has been some effect. All other wetlands have 40 to 100 percent of their perimeter surrounded by mature timber and thereby considered to retain natural hydrologic processes.

Other than these concerns, there have been no impacts to wetland hydrology in the analysis area. The District Wildlife Biologist notes that beavers are still present and, thus, creating and abandoning dams at normal rates. There is no mining in the project area. The role of wildfire suppression does not seem to have been a factor to date. As described in the Fire and Fuels analysis in this EA, the last major wildfire event that occurred in the project area was in 1919, so evapotranspiration by trees may be on the high end. Because the project area has only moderately departed from its historic fire regime of mixed severity, it is assumed this cycle is still within normal variability for wetland hydrology.

## WATER QUALITY

The water quality of a wetland is centered on the issue of fertility. Fertility controls the biomass and species richness of a wetland. Keddy (2010) describes fertility as the secondary constraint to a wetland, following the importance of water inundation. The limiting factor for wetland fertility is usually nitrogen or phosphorus or both (Keddy 2010). A wetland with increased fertility tends to have more biomass, but less species diversity. If nutrient loading is too extreme (i.e., “eutrophication of a wetland”), it can result in increased algal and phytoplankton growth, reduced water clarity, and anoxic conditions.

Nitrogen and phosphorus, hereafter simply called nutrients, can be added to a wetland from industrial pollution, atmospheric deposition, animal waste, sewage effluence, or sedimentation. Most of these are not a factor in the analysis area. There are no industrial developments in the project area and, thus, industrial pollution and atmospheric deposition are not factors. While there are multiple septic systems on private lands in the project area, there is no information on the status or efficacy of these systems. No assumption is made regarding the water quality of wetlands on private lands. The only known potential increase of animal waste contribution is the 50 cow/calf pairs that are grazed on NFS lands for 4 months of the year within the Holland Allotment. The cattle primarily forage along roads and openings, and no grazing beside wetlands has been observed. The 2004 South Swan Range Allotment EA authorized this grazing and did not identify any water quality impacts to wetlands and, therefore, animal waste is assumed to not be a factor.

Sedimentation into wetlands is assumed to be the primary source of nutrients in this analysis area. Nutrients bind to sediments; and as sediments are delivered to the wetland, the nutrients are captured and used by plants. All wetlands receive sediments from the surrounding landscape and inlet streams and would inevitably (over thousands of years) fill in completely. Therefore, it is not that sedimentation itself is harmful or unnatural, but rather the issue is the rate of sediment delivery. Historically, the greatest source of sediment would have come from erosion that follows periodic wildfires or extreme flood events. Fire suppression may have delayed sediment delivery but the wetlands are not considered "sediment starved" yet. Wildfires occur at unpredictable intervals and the delayed sediment delivery to wetlands is not extraordinary.

Roads and forest clearings near wetlands may have altered sediment delivery to some wetlands. A road located too close to a wetland could have eroded sediment when it was first constructed and sometimes it can remain a chronic source of sediment after each precipitation event. Given the gentle topography near wetlands in the valley floor, plus the natural roughness and debris on the ground that captures erosion, it is assumed that sediment from roads could not have traveled further than 50 feet across the forest. This assumption is further verified by modeling completed by the Soils Scientist (Project File Exhibit M-6). Therefore, GIS analysis of potential sediment sources only queried for roads that are within 50 feet of wetlands. This modeling found 18 wetlands with roads within 50 feet of the wetland perimeter, 9 on private land and 9 either wholly or partially on NFS lands (Project File Exhibit M-18). Most roads in the analysis area were constructed between 1950 and the mid-1980s, so any pulse of sediment has long settled. A 2012 inventory of road erosion on NFS lands did not find any of these road segments to have chronic erosion (Project File Exhibit M-5). Forest clearing next to wetlands can also accelerate erosion into the wetlands. As described earlier, 8 wetlands have had timber removal on more than 70 percent of their perimeter. These are different wetlands than those with adjacent roads, so that totals to 26 wetlands that may have been impacted either by previous road construction or forest clearing. Thus, 26 out of 266 wetlands (10 percent) may have accelerated sedimentation due to past land management. None of these potentially impacted wetlands are GDE.

## AQUATIC SPECIES

The wetlands in the analysis area contain many endemic plants, amphibians, invertebrates, zooplankton, reptiles, and other species. Plants are not reviewed further here, but discussed in the Threatened and Sensitive Plant Species and the Invasive Plant Species Sections of this EA.

To date, 26 wetlands in the project area have been inventoried for amphibian and reptile distribution and several have been repeatedly monitored. These surveys indicate all native species are still present in the analysis area. However, the amphibian surveys have discovered 5 non-native fish species in multiple wetlands. Figure 34 illustrates where non-native fish are confirmed or suspected in wetlands. The wetlands in high elevations have not been invaded and are not shown in the following figure. Each species is briefly described below.

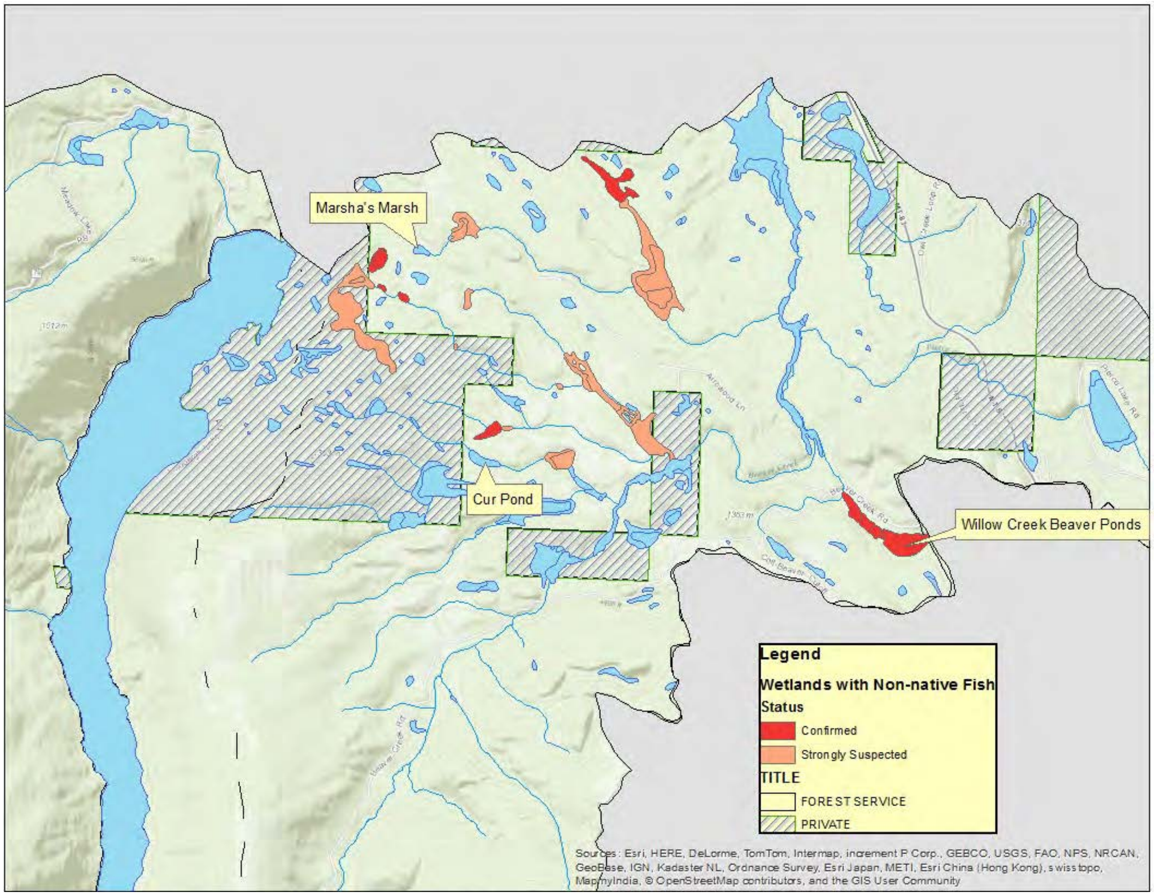


**FIGURE 34. WETLANDS WITH KNOWN OR SUSPECTED COLONIZATION OF NON-NATIVE FISH.**

- Brook stickleback (*Culaea inconstans*) is a fish species that is native to the Missouri River drainage in eastern Montana. This species was first observed in a 1997 amphibian survey in the Beaver Creek area and has since been documented in other wetlands in the Swan Valley, plus the Swan River, Swan Lake, and recently reported in Flathead Lake. Sticklebacks have also been recently observed in the upper Clearwater River Basin (Hendrickson 2014). Brook sticklebacks have been confirmed in five wetlands in the analysis area and suspected in eight additional ones. They are omnivorous and consume invertebrates, algae, and fish eggs. Sticklebacks appear to thrive in wetlands and can tolerate shallow, warm water with low dissolved oxygen. They have been observed along the edges of the Swan River, but appear to merely use this for migration to other wetlands. Given that many wetlands in the analysis area are seasonally connected with intermittent streams, sticklebacks have spread opportunistically. This species was likely introduced illegally for mosquito control.
- Central mudminnow (*Umbra limi*) is a freshwater fish species that is native to the Appalachian Mountains and the Great Lakes. This species was first observed in a 1995 electrofishing inventory of Beaver Creek and, subsequently, found in four wetlands and suspected in eight additional ones. To the best available knowledge, it has not yet been found downstream of the Beaver Creek watershed. Mudminnows can tolerate very low oxygen conditions and borrow into mud during drawdowns. They are primarily insectivores. This species was likely introduced illegally for mosquito control and/or bait fish.
- Fathead minnow (*Pimephales promelas*) is a native minnow to eastern Montana. This species was first observed in 2013 and so far has only been documented in one wetland

in the Beaver Creek area. Fathead minnows are omnivorous and consume vegetation or invertebrates. This species was likely introduced illegally for bait fish.

- Bullheads (*Ameiurus* spp.) are native fish to the Great Lake Region. A single, partially decomposed individual was observed in a Beaver Creek wetland in 2013 (species not identified). No other bullheads have been captured, and it is unknown if a population has been established. Bullheads are omnivorous and consume insects, crustaceans, fish, and vegetation. This species was likely introduced illegally for bait fish.
- Brook Trout (*Salvelinus fontinalis*) are native to the Appalachian Mountains and the Great Lakes. They were initially stocked in the Swan River and tributaries in the 1920s by various government agencies to enhance recreational fishing. The species is now invasive and has colonized and dominated many tributaries. Brook trout have colonized a chain of beaver pond wetlands in the “Willow Creek” drainage, which have sufficient deep, oxygenated water to support them. Brook trout are primarily insectivores.

All wetlands invaded by non-native fish are similar in that they have at least some open water and have inlet or outlet streams (perennial or intermittent). The initial, illegal fish stocking could have taken place on privately-owned wetlands that were connected to other wetlands. It is not always easy to confirm if non-native fish have invaded a wetland. Sometimes the fish are numerous but other wetlands will have sparse density. One wetland required multiple surveys before invasive fish were documented.

Inventories have shown that there are 17 wetlands in the project area that are currently occupied or suspected to be occupied by non-native fish. The non-native fish may continue to spread to other wetlands that have inlet or outlet streams (perennial or intermittent) and at least some open water. A review of aerial photographs suggests there are two wetlands at risk. One wetland (“Cur Pond”) is highly vulnerable, but field surveys have found it is not yet invaded. The other wetland (“Marsha’s Marsh”) also has outlet connectivity; but in most years, it does not have open water. Therefore, it is assumed that Cur Pond is vulnerable in the analysis timeframe but Marsha’s Marsh is low risk and no action is needed. All other wetlands are presumed to not be at risk since they have no surface water connectivity.

Figure 34 displays 8 wetlands as “strongly suspected,” because it has not been confirmed that they are invaded by non-native fish due to incomplete surveys or location on private land. However, it is highly likely that they contain non-native fish given their connection to known invaded wetlands upstream or downstream. Figure 35 shows biologists and volunteers in 2013 working to manually remove all the non-native fish in one particular wetland only 0.6 acres in size. After removing 146 sticklebacks and 445 mudminnows, they abandoned the effort and, therefore, concluded manual removal infeasible for any wetland.

**FIGURE 35. FIELD WORKERS CAPTURED 591 NON-NATIVE FISH IN SMALL WETLAND (2013).**

Scientific research has found many instances where non-native fish negatively impact native wetland species (Andersson 2006; Maxell 2000; Pilliod et al. 2008). The primary impact is from predation of insects and amphibian eggs, which can shift species composition. Amphibian inventories conducted on the Flathead National Forest suggest reduced long-toed salamander (*Ambystoma macrodactylum*) density in wetlands with non-native fish, but the inventories are not rigorous enough to confirm this correlation. Therefore, given the pattern of negative effects described in the literature, it is assumed that non-native fish are adversely impacting aquatic species in about 17 wetlands in the analysis area (6 percent of total) to some degree. Two of the five ecologically valuable GDE wetlands have been compromised by non-native fish.

The “Willow Creek Beaver Ponds” create another interesting non-native fish situation. These Ponds are created by beavers periodically building dams in this tributary to Beaver Creek in an ever-changing mosaic of dams and ponds. Currently, there are about four wetlands in this drainage. The headwater of “Willow Creek” is situated on a low, poorly-defined watershed divide between the Swan River and the Clearwater River watersheds. Beavers have periodically dammed the headwaters, such that the resultant wetland can drain either into the Swan River or Clearwater River, known as an “inter-basin transfer.” The Willow Creek inter-basin transfer happens intermittently depending on beaver populations, but a 2014 field investigation found this watery link is currently plausible. The recent discovery of brook sticklebacks in upper Clearwater River basin is likely due to the fish moving from Beaver Creek to Willow Creek and then into the Clearwater River basin.

During the most recent cycle of dam building (roughly 15 years ago), the wetlands had deep, oxygenated waters that allowed brook trout to colonize the area in large enough numbers to provide a recreational fishery. As the wetlands age, plant growth and decomposition has reduced the depth and oxygen levels, and brook trout numbers have sharply declined. This is a normal progression of beaver pond ecology. It is possible that brook trout would die out completely in the beaver ponds for a period. Eventually, the dam would fail, the wetland would convert back to a stream, and then a new beaver would create a new dam, starting the cycle all over again. Brook trout can re-colonize the new beaver dams with ease. Meanwhile, brook stickleback, central mudminnows, and fathead minnows could colonize these wetlands, if they haven’t already done so. These species can tolerate warm, stagnant waters and are less sensitive to the age and condition of the beaver pond. The inter-basin transfer could allow them to migrate into the

Clearwater River basin. It appears this has already happened for brook sticklebacks, but not central mudminnows or fathead minnnows.

# ENVIRONMENTAL CONSEQUENCES

## ALTERNATIVE 1 - NO ACTION ALTERNATIVE DIRECT, INDIRECT, AND CUMULATIVE EFFECTS

### HYDROLOGIC PROCESSES

Alternative 1 is the No Action Alternative under which no project activities are proposed and also serves as the existing condition. Under this alternative ongoing and reasonably foreseeable activities would continue, but there are no reasonably foreseeable actions that could directly impact wetlands.

In consideration of cumulative effects, there are several possible factors that could indirectly impact wetland hydrologic processes. First, young saplings would establish along the perimeter of the 3 wetlands on NFS lands that were previously harvested by PCTC. During the analysis timeframe, the return of timber around these wetlands would result in a return to natural hydrologic processes. It is unknown if private landowners would maintain clearings around their wetlands, so the fate of the other 5 wetlands cannot be projected. Second, as fuels continue to increase, there would be increased risk of a large, severe wildfire. A severe wildfire would likely kill most trees surrounding a wetland and, thereby, reduce evapotranspiration. This, in turn, would cause the water level to increase beyond current norm during snowmelt. It may also mean faster evaporation and drying out during summer. This would be within normal variability for wetlands that have evolved with severe wildfires periodically.

However, there is some concern that severe wildfire can aggravate a problem posed by a potentially changing climate. If snowmelt ends earlier and the surrounding trees are also dead, it is possible that the wetlands would have even faster drying time. It is difficult to forecast what role, if any, climate change could have on each wetland (Pilliod et al. 2008). Winter (Winter 2000) notes how each wetland would likely react differently due to variations in surrounding topography, elevation, groundwater input, and surface water input. It is impossible to model this for each of the 266 wetlands given uncertainty of each one's hydrology and uncertainty about climate change. Therefore, this analysis concludes that Alternative 1 may have a risk of some wetlands drying out faster in the summer, at least to some degree, but does not assume widespread or catastrophic degradation.

### WATER QUALITY

Alternative 1 does not propose any management activities, and there are no reasonably foreseeable activities that could impact water quality in wetlands. The Holland Grazing Allotment would likely continue, but would not impact water quality in wetlands just like it does not currently impact them. Alternative 1 does have increased risk of a severe wildfire, but given that severe wildfires happen from time to time in this fire regime, it is not outside of the wetland's natural sediment delivery. Given that there are no activities or reasonably foreseeable changes, water quality in wetlands would remain unchanged from current condition.

### AQUATIC SPECIES

Alternative 1 does not propose any management activities and serves to illustrate the existing conditions in the analysis area. The non-native brook stickleback, central mudminnows, and brook trout that are well established would likely remain in abundant numbers throughout the analysis timeframe. It is uncertain if fathead minnows would spread beyond the single wetland they occupy. There would be no reasonably foreseeable actions to suppress or eradicate any of these species. The non-native fish are likely to invade and colonize the last remaining vulnerable wetland, Cur Pond. Alternative 1 would mean that non-native fish would adversely impact aquatic species in 18 wetlands.

Under Alternative 1, the No Action Alternative, the Willow Creek Beaver Pond cycle would continue and increase the risk for non-native fish species to enter into the Clearwater River watershed.

## ALTERNATIVE 2 - PROPOSED ACTION DIRECT, INDIRECT, AND CUMULATIVE EFFECTS

### HYDROLOGIC PROCESSES

Although Alternative 2 includes some riparian vegetation management, the alternative would not be anticipated to impact wetland hydrology. Vegetation management is proposed within the Riparian Habitat Conservation Areas (RHCA)s of 11 individual wetlands, shown in Figure 36. Riparian Habitat Conservation Areas are established in the Inland Native Fish Strategy (INFISH) amendment to the Flathead's Forest Plan. Riparian Habitat Conservation Areas are zones around streams and wetlands that are intended to meet various goals, including "*natural timing and variability of the water table elevation in meadows and wetlands*." The width of an RHCA around a wetland is either 50 feet from the edge of a small wetland (less than 1 acre) or 150 feet from the edge of large wetlands (greater than 1 acre).

Normally, timber management is precluded from RHCAs but INFISH does note on page A-7

> "Apply silvicultural practices for RHCAs to acquire desired vegetative characteristics where needed to attain Riparian Management Objectives. Apply silvicultural practices in a manner that does not retard attainment of Riparian Management Objectives and that avoids adverse effects on inland native fish."

Riparian Management Objectives are pertinent only to streams and none are specific for wetlands. This implies that timber management could be acceptable as long as it meets the INFISH goals, including "*natural timing and variability of the water table elevation in meadows and wetlands*." Additional information on the INFISH plan and analysis of the project compliance are found in the Project File (Exhibit M-7).

District Silviculturalists identified several areas where it would be desirable to expand upland vegetation restoration into RHCAs. These RHCA treatments would be identical to their neighboring upland treatments and would allow a more seamless restoration across the landscape. This would better mimic natural disturbance patterns, such as wildfire, which historically burned into wetland perimeters and would offer an opportunity to protect large legacy trees within RHCAs from potential high severity wildfire.

Chadde et al. (1998) recommends timber management adjacent to GDEs retain adequate buffer to conserve the water table (i.e., wetland hydrology), but did not provide recommendations of what this width should be and urged further research. This project proposes no vegetation management activities within the RHCAs of GDE wetlands. Reeves et al. (2004) modeled the water budget of four Swan River Valley wetlands with the plant *Howellia aquatilis,* and concluded that complete removal of all timber in a wetland's micro-watershed basin would adversely impact the natural hydrologic process. This project proposes no vegetation removal within the RHCAs of ponds with suitable habitat for *Howellia aquatilis,* and none of the micro-watershed basins would have complete removal of all timber. No timber management is proposed in the RHCAs of the eight wetlands that had previously had more than 70 percent of the perimeter cleared.

To ensure there are no potential effects to wetland hydrology from management activities, project design of management activities in the RHCAs followed four recommendations:

- Timber management would not take place within RHCAs of GDE wetlands.
- The complete removal of timber would not occur within a wetland micro-watershed basin.
- Previously degraded (ditched and drained) wetlands would not have timber management within the RHCA, to reduce the potential for additional impacts.
- Temporary roads will not be constructed within the RHCA, to prevent potential soil compaction which could indirectly modify groundwater input to wetlands.

A total of 11 individual wetlands have some timber management proposed within their RHCAs, as shown on Figure 36. Units 449, 429, 430, 431, and 432 propose commercial thinning and Unit 419 proposes an improvement cut, all of which are within RHCAs of two wetlands. These treatments would be implemented with ground-based equipment, but would not require temporary roads. Design Criteria for these units would require a minimum 50-foot setback from wetland perimeter where topography is greater than 25 percent slope, but otherwise allow treatments to the ordinary high water mark or edge of sensitive soils.

Units 4225, 4226, and 4262 propose to use hand crews only to conduct improvement cuts, pre-commercial thinning, or daylighting within the RHCAs of some wetlands. Unit 4222 proposes to conduct fill planting in an RHCA with the use of hand crews. These units meet the four recommendations above and would not impact wetland hydrology.

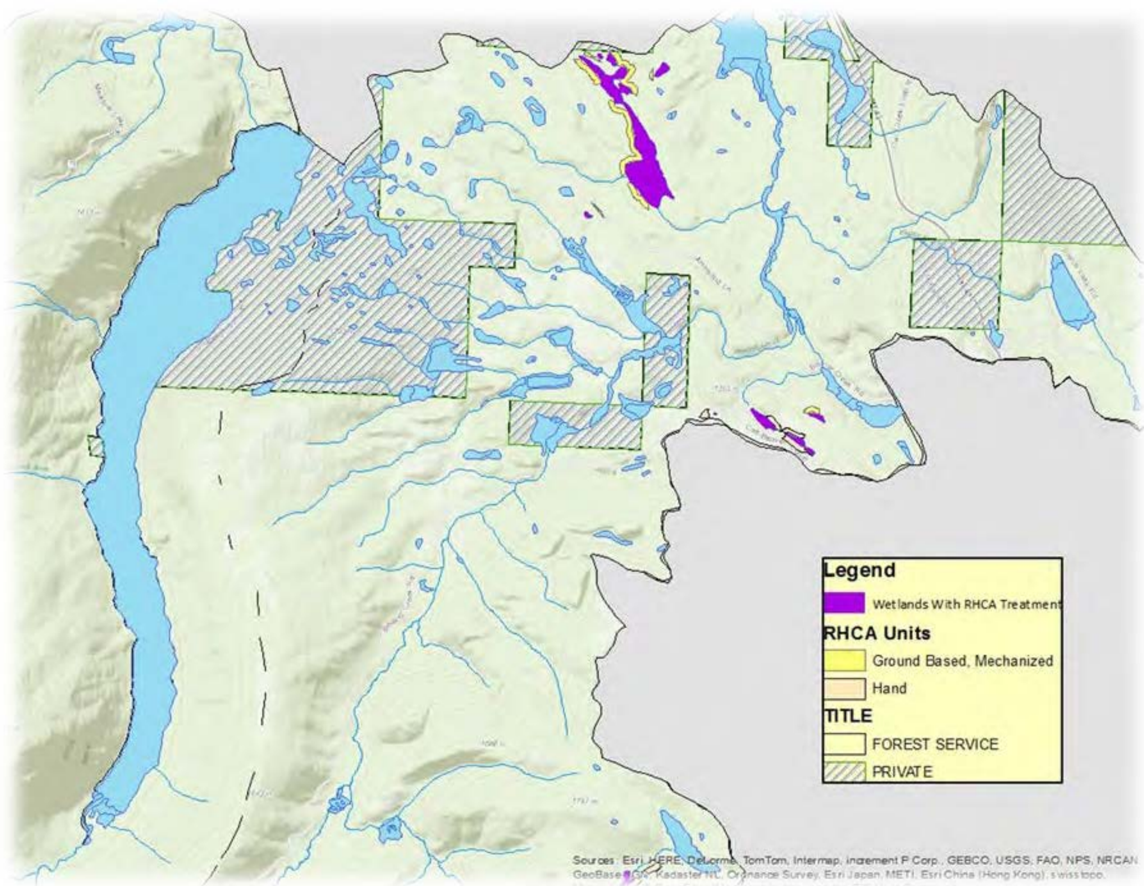


**FIGURE 36. WETLANDS WITH VEGETATION MANAGEMENT ACTIVITIES PROPOSED WITHIN RHCAS (ALTERNATIVE 2).**

There is no other direct or indirect effect to wetland hydrology from Alternative 2. Alternative 2 would be expected to reduce the risk of a severe wildfire and restore the mixed-severity fire class. A changing climate is predicted to increase the potential for severe fires and potentially reduce snowmelt, both of which could add stress to the wetland hydrology during summer months.

Alternative 2 reduces that stress to all wetlands in the analysis areas. Those three wetlands that were previously cleared by PCTC would have sapling vegetation naturally return around their perimeter and, thus, natural return of hydrologic processes. Alternative 2 would not affect or hinder that natural recovery.

All present and reasonably foreseeable activities have been considered for their impacts to wetland hydrology, and none of the activities displayed in Tables 16 and 17 are expected to have effects to wetland hydrology (Project File Exhibit M-1).

## WATER QUALITY

Alternative 2 would help return several wetlands to a natural pattern for nutrient input, although it also has some minor, short-term impacts as well. As described earlier, in this analysis area the greatest source of nutrients to wetlands has been from erosion generated by wildfire or floods. The absence of wildfire has not yet been so prolonged that the wetlands are sediment starved, but returning fire to the landscape is desirable. Keddy (2010) advocates minimizing human-caused nutrient inputs while allowing natural disturbance as an essential tool to protect wetland water quality and native plant communities. He notes that this management appears to be especially important to wet meadows, which are common in this analysis area.

Alternative 2 includes three areas where broadcast burns are proposed following harvest activities or as the only type of vegetation management. These broadcast burns are intended to mimic a low intensity wildfire. The other proposed broadcast burning would occur in upland areas that have no potential effects to wetlands. These three burn areas with potential effects to wetlands are Unit 300, the combined Units 19 and 25, and the conglomeration of Units 233, 241, 244, 244, 243, 74, 314, and 313. These three broadcast burn areas are located nearby or upstream of five wetlands. Broadcast burns would avoid ignition adjacent to wetlands or stream channels, but could be allowed to burn through them. The fire would not actually burn marshes or open water wetlands, but may burn into wet meadows and consume plant litter. This would leave behind a natural mosaic of burnt vegetation that mimics a natural low-intensity wildfire. Allowing the burn to move through RHCAs avoids an artificial straight line and helps achieve the INFISH goal of "*diversity and productivity of native and desired non-native plant communities in riparian zones*."

During the prescribed burn, some ash could fall into the five wetlands. This, in turn, could result in a short-term spike of phosphorus and nitrogen (Spencer et al. 1990), thus the wetlands could experience a short-term increase of nutrients. The following spring after the burns are completed, there could be patches of ground without vegetation and snowmelt could allow some erosion to be transported to wetlands, which again would increase nutrients. However, it is anticipated that vegetation would return to these areas in the subsequent growing season. Given that wetlands have evolved with a natural fire cycle and these short-term flushes of nutrients would not lead to eutrophication, low intensity prescribed fire could be beneficial to wetlands. Four of the five wetlands that are within prescribed burn areas are forested and have no roads within 50 feet and, thus, considered to have natural water quality. One of the five wetlands is a wetland that has already had most of its perimeter cleared of timber.

Alternative 2 could have other short term effects to water quality. Several road culverts would be installed or removed on intermittent streams that flow into wetlands. Six culverts would be installed on NFS road #11636 to facilitate timber haul and implementation of a fish barrier. One culvert would be installed on NFS road #11647 to facilitate timber haul and would then be removed when the road is placed into ISS. One culvert would be removed from NFS road #10589 prior to its placement into ISS. Design Criteria for all of these projects require the intermittent streams to be dry to prevent any immediate impact. However, during the following spring when water returns to the streams, a small amount of in-channel erosion could occur at the project site and be transported downstream to a wetland until new vegetation gets rooted. The small amount of sediment transport for a short duration will not cause excessive nutrient loading or eutrophication of that wetland.

Alternative 2 also includes BMP work on NFS roads #906 and #9651. These roads have segments that pass very close to 3 individual wetlands (3 of the 18 previously noted with roads within 50 feet of their perimeter). This BMP work includes clearing ditches, reshaping drain dips and clearing ditch relief pipes, activities that could mobilize fine sediment particles. These sediments could transport during the next precipitation event; and since the roads are within 50 feet of wetlands, it would be possible that some sediment would reach the wetlands. The potential sedimentation would be a temporary event as the road would re-compact and cease eroding within a year. There is no evidence that NFS road #906 and #9651 are currently eroding into the wetlands.

Water quality would not be impacted by vegetation treatments within RHCAs. There is no potential for sedimentation from the treatments to reach the wetlands. Mechanized treatments would have a 50-foot setback where the topography around the wetland is more than 25 percent slope. This would be sufficient to filter and retain any erosion from ground disturbance to reach the wetland. Topography less than 25 percent slope would be too flat to present a risk.

In consideration of cumulative effects, Alternative 2 may result in positive changes for water quality of several wetlands. This alternative would allow natural disturbance and resumption of wildfire role in wetland nutrients. This alternative would also reduce the impact of roads that were constructed within 50 feet of four wetlands. One wetland could benefit from moving a road into ISS and three other wetlands could benefit from BMP work.

However, in consideration of cumulative effects, one particular 0.47-acre wetland may be adversely impacted by Alternative 2 for a short time. This small wet meadow had most of its surrounding timber cleared by PCTC, prior to its acquisition into NFS lands. It may have experienced increased sedimentation from that action. The wetland is situated within prescribed burn Unit 300 and, thus, would be subject to an additional short-term increase of nutrients. The wetland is also within the Holland Grazing Allotment. It is possible that after the burn, improved forage would entice cattle towards the wetland for about 3 to 5 years until the lush growth subsides. Animal waste from the cattle could also increase nutrient input. The cumulative effect of past timber harvest, the proposed fire, and possible cattle use may have an undesirable impact to water quality of this single wetland. This scenario is not certain since cattle utilization in the allotment is sparse. It is possible cattle may not find it within the first 3 to 5 years after the burn when forage is most lush and, thus, never find the wetland.

Monitoring of cattle use at this wetland is proposed; and if cattle use appears to be adversely affecting the wetland, an adaptive management strategy could be to temporarily fence off the wetland. This analysis concludes that one wetland may be indirectly adversely impacted by Alternative 2 until the effects are detected and mitigation measures are put into place.

## AQUATIC SPECIES

Alternative 2 would help prevent further invasion of non-native fish into Cur Pond and the Willow Creek Beaver Ponds complex. This helps achieve restoration goals for the Beaver Creek watershed's Watershed Condition Framework, as detailed in Project File M-12.

### CUR POND

This alternative includes the replacement of a culvert on road 11636 that can block upstream invasion of non-native fish into Cur Pond. This culvert would be designed to have a small waterfall at the outlet about 1 foot high so that it blocks upstream passage of sticklebacks, mudminnows and fathead minnow. The culvert would be large enough to withstand 100-year flood events and needs little or no maintenance. Without the construction of this culvert, this marsh/open water wetland would otherwise be vulnerable to colonization of brook stickleback and/or central mudminnows.

#### WILLOW CREEK BEAVER PONDS

The replacement of a culvert on NFS road #906 at the lowest Willow Creek Beaver Pond would block future invasion of brook stickleback, central mudminnows, or fathead minnows. The new culvert would have an outlet drop of about 1 foot, thus blocking upstream movement. The existing beaver dam at culvert inlet would be removed during culvert installation. When the dam is gone and the wetland returns to a single-channel stream, the non-native fish would flush downstream and then be unable to return because of the culvert barrier. Beavers may subsequently rebuild the dam slightly upstream of NFS road #906, but the new culvert itself would be less likely to be plugged by beavers. The other beaver ponds further upstream would come and go over time. When the non-native fish wash downstream during time intervals without beaver ponds, they would be unable to re-colonize at a later date. The culvert would not block re-colonization of brook trout, because this species has a greater jumping ability and could swim past the culvert. Brook trout are already present in the Clearwater River basin so blocking them has little benefit.

There are no other reasonably foreseeable actions that could change aquatic species composition in wetlands. The cumulative effect of Alternative 2 would be that it does not allow non-native fish from invading any more wetlands and impacting native species. It may also recover about four wetlands from non-native sticklebacks and mudminnows over time as the beaver dams collapse and fish flush out, unable to return when new beaver dams create new wetlands.

## ALTERNATIVE 3 – ACTION ALTERNATIVE DIRECT, INDIRECT, AND CUMULATIVE EFFECTS

### HYDROLOGIC PROCESSES

Alternative 3 defers nearly all the vegetation treatment in RHCAs by wetlands, but it would have similar effects on wetland hydrology to those described above for Alternative 2. This is because, as described earlier, the proposed RHCA units are not expected to have effects to wetland hydrology. The only RHCA unit retained in Alternative 3 is Unit 4222, a 1-acre planting unit on a former PCTC landing. Planting trees in this area will reduce soil compaction, improve water absorption, and reduce invasive plant species. This activity has no effect to the to the nearby wetland’s hydrology.

Similar to Alternative 2, this alternative would be expected to reduce the risk of a severe wildfire and restore the mixed-severity fire class. In consideration of potential climate change, either Alternative 2 or 3 may reduce the cumulative effect to wetlands by potentially reducing stress to the wetland hydrology during summer months.

### WATER QUALITY

Alternative 3 would prevent fire from moving into and across a wetland, by not allowing fire to enter any RHCA. Firefighters would dig a line along the RHCA perimeter, defer lighting near the wetland, and suppress any spots that ignite in the RHCA. This action would remove any short-term nutrient input from the fire by means of ash fall or soil erosion next spring. The hand line built by firefighters would be too small and distant from the wetland to be an erosion point-source. However, Alternative 3 does not achieve the INFISH goal of *“diversity and productivity of native and desired non-native plant communities in riparian zones.”* While delaying fire in riparian zone would not be directly harmful, it would leave an abrupt and artificial edge between upland restoration and riparian restoration. It also falls short of Keddy (Keddy 2010) recommendation to restrict human-caused nutrient loading to wetlands, while also allowing natural disturbance.

Alternative 3 has similar short term, road-related impacts to wetland nutrients as Alternative 2. This alternative also includes the same installation of four culverts on NFS road #11636, removal of one culvert on NFS road #10589 and BMP work on NFS roads #906 and #9651. This alternative also includes the Design Criteria for these projects to require the intermittent streams to be dry. The consequence of these activities would be very small inputs of nutrients, but within natural historic range. However, Alternative 3 does not propose to install a culvert on NFS road #11647 and two on NFS road #11636, which would eliminate any short-term impact to two particular wetlands.

In consideration of cumulative effects, Alternative 3 would help restore the impact of roads located too close to four particular wetlands by either moving roads into ISS or BMP. However the alternative would not restore the beneficial role of wildfire disturbance to wetlands.

Alternative 3 would avoid the potential cumulative effect associated with past timber harvest, the broadcast burn, and the Holland Grazing Allotment on one particular 0.47-acre wetland. Without the burn and the clearing of undergrowth in the riparian area, cattle would not be attracted to the wet meadow in Unit 300 any more than they are now. Water quality in this particular wetland would be unaffected.

### AQUATIC SPECIES

Alternative 3's effects to aquatic species would be the same as Alternative 2. The alternative would prevent non-native fish from colonizing Cur Pond and will restore four Willow Creek Beaver Pond wetlands from brook stickleback or central mudminnow invasion over time.

# BEAVER CREEK

## EXISTING CONDITION

### HYDROLOGIC PROCESSES

Average annual precipitation in the Beaver Creek watershed ranges from 20 inches on the valley floor to 80 inches in the extreme headwaters along Sunset Ridge. Most of this precipitation comes as snow during the winter months. Approximately two-thirds of annual precipitation is lost through evapotranspiration and the rest seeps into the soil. Like most forested areas, infiltration capacities far exceed rainfall intensity associated with most storms. As a result, the dominant runoff process is saturation overland flow. Snowmelt within the Beaver Creek watershed typically begins in April and peak discharge occurs in May or June. State records indicate there is one water diversion from Beaver Creek on private lands for up to 219 gallons per minute (Project File Exhibit M-11). This water right dates to 1937, and the current status is uncertain. Because of the diversion's small volume, this analysis assumes no substantial change to Beaver Creek's in-stream flows.

Changes in water quantity, particularly changes in the magnitude and frequency of peak flows, may contribute to increased erosion and scour of the streambed and banks, which could compromise habitat conditions for aquatic organisms. Vegetation disturbance is linked with hydrologic response (i.e., peak flows and water yield). A model called Equivalent Clearcut Acres (ECA) is utilized to compare natural range of variability to proposed actions. This model is used to gage the relative proportion of a watershed that consists of young stands. Comprehensive literature reviews conducted by MacDonald and Stednick (MacDonald et al. 2003), Stednick (Stednick 1996), and Bosch and Hewlett (Bosch et al. 1982) indicate that an ECA of at least 15 to 25 percent is needed to produce a measureable water yield increase during wet years.

Studies have shown that the magnitude of change in water yield is most strongly related to the amount of precipitation and the proportion of forest cover that is removed (Troendle et al. 2009). Forest cover is impacted by either natural disturbances, such as wildfire, insects, and pathogens or anthropogenic disturbances, such as timber harvest, road building, and agricultural clearing. Historically, fire has been the dominant disturbance variable in the Upper Swan Valley. Fires in the valley bottoms tended to burn slowly through ground fuels keeping stands open and supporting large old-growth stands of ponderosa pine, larch and Douglas fir (Swan Ecosystem Center 2004). The most recent fire of any significance within the project area occurred in 1919 and burned roughly 40 percent of the Beaver Creek watershed. Because of frequent natural disturbances, mature forest canopies never occupied 100 percent of a watershed. Historic ECA values in Beaver Creek (prior to most homesteading) is calculated to between 5 and 24 percent, based on typical seedling/sapling age classes and non-stocked areas observed in local cover types. This 5 to 24 percent baseline ECA excludes non-forested landscapes, such as rock outcrops, water and brush fields. Details are provided in the Project File (Exhibit M-8).

As of 2015, approximately 12 percent of the entire Beaver Creek watershed exists in an ECA (Figure 37). A 12 percent ECA value is well within the estimated historic range (5 to 24 percent). Figure 37 illustrates approximate changes in ECA over time; the arrows represent the existing condition, as well as historic peak ECA values. Equivalent clearcut acres in the Beaver Creek watershed were estimated to be the highest just after the1919 wildfire (38 percent). A secondary peak in the data set occurred in 2000 indicating management effects associated with timber harvest and road building. This figure also illustrates the recovery over time as vegetation grows. The ECA modeling found no impact from the two timber harvest activity projects by TNC, Beaver Highway (341 acres) and Two Bears (203 acres) conducted in 2011 and 2012. Details on the calculations of these results are in the Project File (Exhibit M-8).

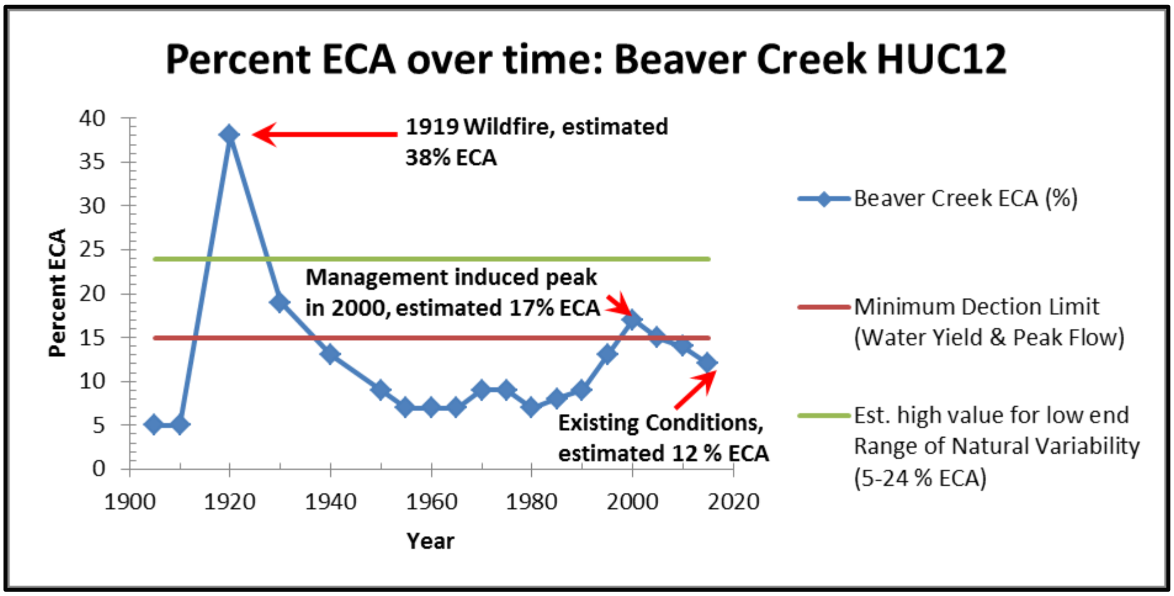


**FIGURE 37. ESTIMATED ECA VALUES (%) OVER TIME IN THE BEAVER CREEK HUC 12.**

## WATER QUALITY

The DEQ is responsible for implementing delegated components of the Federal Water Pollution Control Act (commonly referred to as the Clean Water Act) for Montana waters. Numeric criteria define precise, measurable concentrations of pollutants that are allowable in a waterbody. Beaver Creek is classified as “B-1,” meaning it is suitable for 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; as well as agricultural/industrial water supply. Beneficial uses in Beaver Creek are not identified as threatened or impaired (Montana Department of Environmental Quality 2014).

In order to characterize the water quality requirements of diverse aquatic species, the Forest Service relies on the use of management indicator species (MIS). Analyzing the impacts to these particular species is considered adequate surrogates for all others. The Flathead Forest Plan has identified westslope cutthroat trout (*Oncorhynchus clarki lewisi*) and bull trout as MIS for all aquatic species. Therefore, this analysis focuses on three parameters of water quality that are important to these native trout and could be potentially impacted by the project. The three parameters are sedimentation, water temperature, and habitat complexity.

## SEDIMENTATION

Sedimentation into trout streams is considered a key concern, and the most frequently cited type of pollutant in streams of the Pacific Northwest (Bauer et al. 2001). Sedimentation refers to the deposition of fine materials like silt, sand, clay, and small gravels on the surface of the stream bed. Sediments are not necessarily bad, and all streams naturally transport sediment and water downhill. However, if the sedimentation becomes excessive, it could reduce insect diversity, simplify habitat, and reduce fish spawning success. Even though sedimentation is an important parameter, there are no numeric regulatory standards, and no consensus on how to quantify the effects (Bauer et al. 2001). The challenge comes from the extremely dynamic nature of substrate conditions as it can vary naturally from stream to stream, riffle to riffle, and even year to year (Everest et al. 1987). Likewise, studies conducted by Maturana et al. (Maturana et al. 2014) indicate channel geometry, the nature of sediment delivery (pulsed vs chronic), as well as the proximity of sediment delivery to spawning habitats, are important factors in determining the spatial and temporal extent of impacts. This study concluded that chronic sediment supplies in low gradient streams resulted in more severe and persistent effects to stream habitats than pulse sediment supplies. It also concluded that stream habitats nearest sediment sources were more severely affected that those distant from the source. Due to the complexity of stream habitat, there is no one simple value that can describe the entire stream. A stream flowing down a steep mountainside would tend to have less sedimentation than when it is in a slow-moving beaver pond area. Therefore, a stream is dividing into a series of reaches (a length of stream) bounded by a change in channel morphology or gradient. Beaver Creek has 13 reaches, shown in Figure 38.

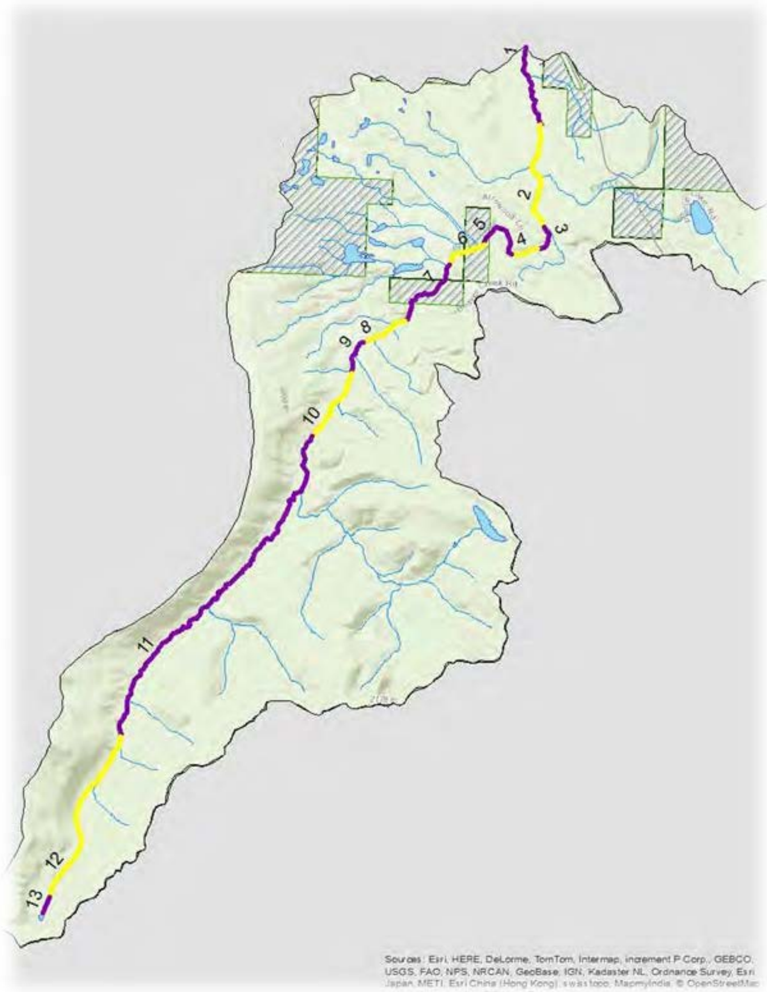


**FIGURE 38. STREAM REACH LOCATIONS WITHIN THE BEAVER CREEK ANALYSIS AREA.**

Within the Beaver Creek analysis area, the condition of sedimentation and stream substrates has been assessed from a protocol called pebble counts. Pebble counts measure the average diameter of substrate at evenly spaced intervals across the channel within riffle habitats. Pebble counts are a reasonably effective method to monitor substrate changes in gravel or cobble streams like Beaver Creek (Bunte et al. 2001), but they are poorly suited for monitoring the percentage of the total fine sediments. Archer et al. (2004) described too much variance between observers and streams in recording fine sediment percentages, but rather found statistical confidence could be achieved by monitoring the trend of $D_{50}$. A $D_{50}$ is the median category of all pebbles measured (i.e., 50 percent of pebbles are equal to or smaller than that category). A stream reach with a large size $D_{50}$ has relatively little fine sediments. If the $D_{50}$ decreases over time, the stream substrate are becoming smaller and, thus, indirectly suggest fine sediments are increasing or even becoming excessive. Utilizing $D_{50}$ instead of percentage of fine sediments also avoids defining what exactly fine sediment is. Fisheries studies on fine sediment impacts to bull trout have varied in their definition of fine sizes (Bowerman et al. 2014; Weaver et al. 1991).

Unfortunately, there is no data of Beaver Creek's historic stream condition prior to any land management. The oldest data available dates to a 1968 pre-curser of modern pebble counts, which was conducted several decades after pioneer roads were built in the watershed. Information of trends is available from three DMRs where specific riffles have been monitored over time. Data is available in the Project File (Exhibit M-10) and is summarized in Table 62 below. It appears that the lower reaches of Beaver Creek (reaches 3 and 4) are trending towards coarser $D_{50}$ and reduced fine sediments, whereas the upper reach (reach 11) is unchanged. Since the lower reaches are lower gradient and less confined, these reaches are expected to be more sensitive to change than the upper reaches. These results suggest that Beaver Creek is indeed changing. In Table 62, the 1968 data are included, but caution is needed. This survey did not precisely record location and used broader categories than modern surveys.

**TABLE 62. PEBBLE COUNT $D_{50}$ RESULTS IN THE BEAVER CREEK ANALYSIS AREA.**

| REACH | YEAR | NUMBER OF RIFFLES EXAMINED | $D_{50}$ | COMMENT |
|---|---|---|---|---|
| 3 | 1968 | 4 | 76 - 152 mm | 1968 survey suggests coarser $D_{50}$ than present. From 2000 to 2014, stream is coarsening (less fines). Change from year 2000 – 2014 is statistically significant. |
| 3 | 2000 | 1 | 16 – 24 mm | |
| 3 | 2004 | 1 | 24 – 32 mm | |
| 3 | 2009 | 4 | 24 – 32 mm | |
| 3 | 2014 | 4 | 32 – 48 mm | |
| 4 | 2006 | ~ 4 | 8 - 12 mm | Change is statistically significant. Stream is coarsening (less fines) |
| 4 | 2011 | ~ 4 | 16 - 24 mm | |
| 11 | 2008 | 4 | 48 – 64 mm | No change |
| 11 | 2012 | 4 | 48 – 64 mm | |

Whether or not this change is within normal variation is inconclusive. In lieu of historic condition, it is a commonly accepted procedure to determine condition by comparison to similar streams that are unmanaged or pristine (Kershner et al. 2004). In order to make comparisons between stream reaches with varying geologies, sheer stress is utilized to standardize the data. Sheer stress is an expression of a stream's ability to move substrate, and it is calculated by multiplying gradient, channel width, and the specific weight of water (62.41 pounds per cubic foot at 50°F). The greater the sheer stress, the greater the ability to move sediments and, therefore, the greater the $D_{50}$ size. In the Swan River watershed, 15 stream reaches in unmanaged watersheds have been monitored several since 1997. Figure 39 illustrates that Beaver Creek falls within range of $D_{50}$ of reference streams. It also illustrates the wide natural range and, therefore, the weak ability to predict $D_{50}$. Another study by Kendall (Kendall 2014) summarized 80 monitored reaches throughout the Flathead National Forest (including 1 of the 3 Beaver Creek monitored areas) and concluded that watersheds with forest roads do have smaller $D_{50}$ than unmanaged streams. However, Gardner (2013) summary of 42 reaches just in the Swan River watershed (including all three Beaver Creek monitored areas) did not find any statistically significant difference.

Figure 39 below shows a scatter plot of $D_{50}$ reference streams compared against bankfull width gradient, which serves as a surrogate of sheer stress. The median values are shown with a red line and values within 25th and 75th percentile are show with a dashed line. The data gathered in Beaver Creek are displayed as solid blue points and all other streams are hollow points.

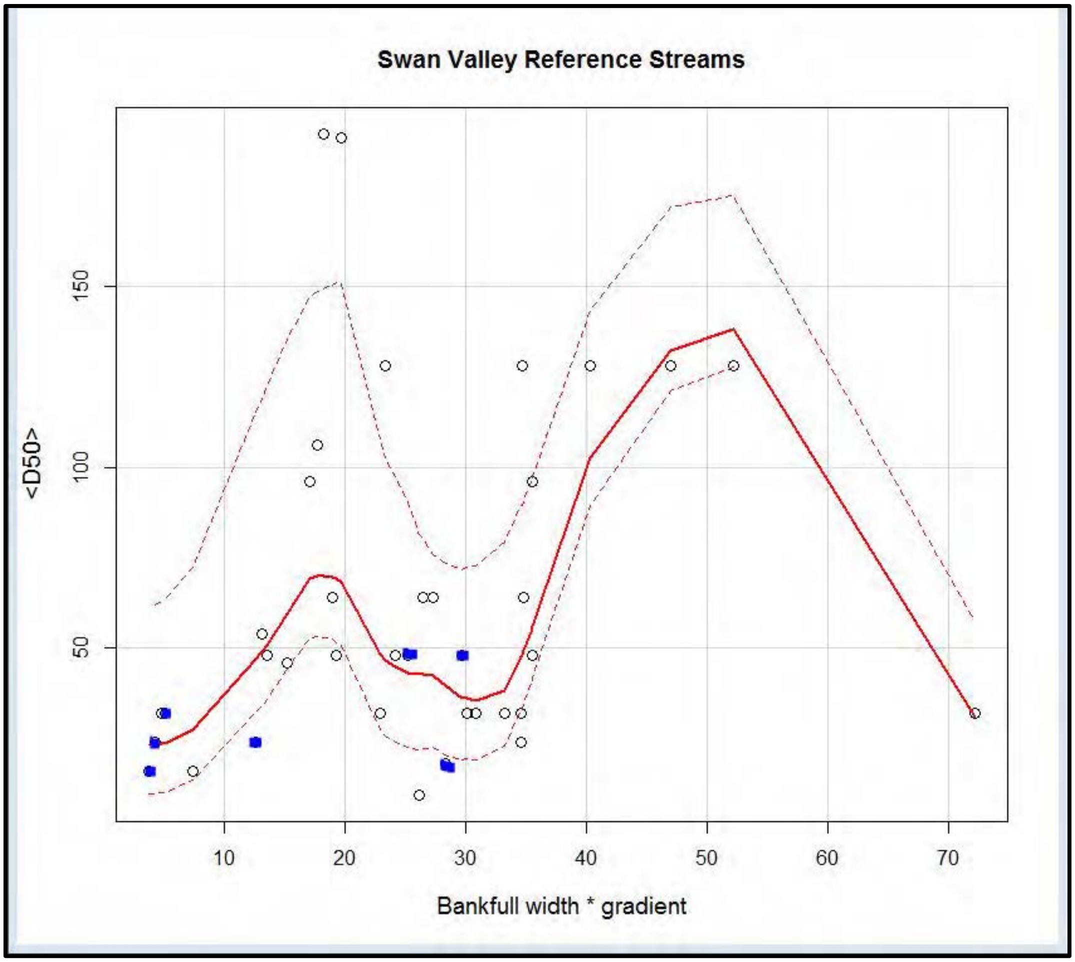


**FIGURE 39. $D_{50}$ REFERENCE STREAMS AGAINST BANKFULL WIDTH X GRADIENT**

The data gathered suggests that the sedimentation of Beaver Creek is currently trending to less sedimentation. It is unknown if the current trend is just natural variation or actually moving towards restoration of historic condition. The large 1919 wildfire undoubtedly created a large pulse of sediment that could still be slowly diminishing. Possible anthropogenic sources of sediment include forest roads and commercial timber harvest. Other activities, such as wildfire suppression, noxious weed control, and recreation, have not contributed sediments (Project File Exhibit M-1) and will not be discussed further.

As forest roads are constructed, they could cause erosion into streams, especially where the roads approach or cross streams (Everest et al. 1987). The watershed currently has 85.26 miles of roads (including NFS roads, private roads, and Montana Highway 83), which equates to about 3.45 miles per square mile. This high road density is one of the reasons Beaver Creek is considered functioning at risk in the national ranking of Watershed Condition Framework (Project File Exhibit M-12). Most of these roads were constructed from 1950 to mid-1980. Therefore, sedimentation from road construction undoubtedly was delivered into Beaver Creek, but it is unknown if any remains or if it has since been flushed downstream.

The current condition of the road network is a minor source of sediment. A 2004 TMDL report urged restoration of 70 road/stream crossings scattered around the Swan River Valley as a means to reduce sediment input into Swan Lake (Montana Department of Environmental Quality 2004). Several of the 70 problem road/stream crossings were located in the Beaver Creek watershed, and the report estimated that Beaver Creek roads annually erode approximately 26,000 pounds of sediment. In 2008, approximately 8 miles of roads were decommissioned and another 1.4 miles were placed in ISS. Several culverts on intermittent streams were removed during the project, and this generated a small amount of sedimentation during the first runoff afterwards. In 2010, a collaborative group implemented erosion reduction measures called BMPs on about 6 miles of roads in the Beaver Creek watershed. This BMP work involved adding drain dips, clearing ditches, installing ditch relief pipes, and replacing undersized stream culverts. While this activity ultimately reduced erosion, it generated a small amount of sedimentation during project work. Furthermore, a wooden bridge on NFS road #906 was replaced in 2015 and this also generated a small amount of sedimentation during work.

A follow up inventory was conducted in 2012 on approximately 70 percent of all NFS roads in the Beaver Creek watershed (Project File Exhibit M-5). This inventory found that all surveyed Beaver Creek road/stream crossings contributed 952 pounds of sediment annually, a 96 percent reduction from the 2004 inventory. In fact, 60 out of 66 road/stream crossings had essentially no chronic sediment. The 6 remaining locations with chronic erosion ranged from 50 to 202 pounds of sediment, and their locations are illustrated on Figure 40. This low chronic erosion rate is currently typical of the Swan River Valley. A 2011 inventory of the original 70 problem road/stream crossings scattered across the Swan River Valley found they were no longer an issue (Atkins 2012). Research conducted in nearby Cold Creek of the Swan River Valley found the road network contributes just 1 percent of the stream's natural sediment load (Cissel et al. 2013). These authors estimate that streams of local geology would normally transport 9.2 megagrams per square kilometer per year, which means that Beaver Creek normally transports 1,298,875 pounds per year (i.e., 649 tons). Therefore, the annual erosion from Beaver Creek roads is only 0.01 percent increase over natural sediment load.

Figure 40 shows the locations and results of a 2012 road erosion inventory in the Beaver Creek watershed. The yellow and red squares shown on the map indicate chronic erosion greater than 50 pounds per year.

Commercial timber harvest may have resulted in erosion into Beaver Creek where harvest activities were located very close to the stream. Some timber harvest was conducted in riparian areas by the Forest Service and PCTC (who formerly had lands in the watershed) prior to the 1991 Montana Streamside Management Zone Act. In recent years, commercial timber harvest has largely avoided riparian areas including both the Forest Service and PCTC. The Nature Conservancy also completed two timber harvest projects in the analysis area in recent years and these also completely excluded all riparian areas. Field review has not observed bare grounds or slumping hillsides in riparian areas, indicating that erosion is not occurring in past timber harvest.

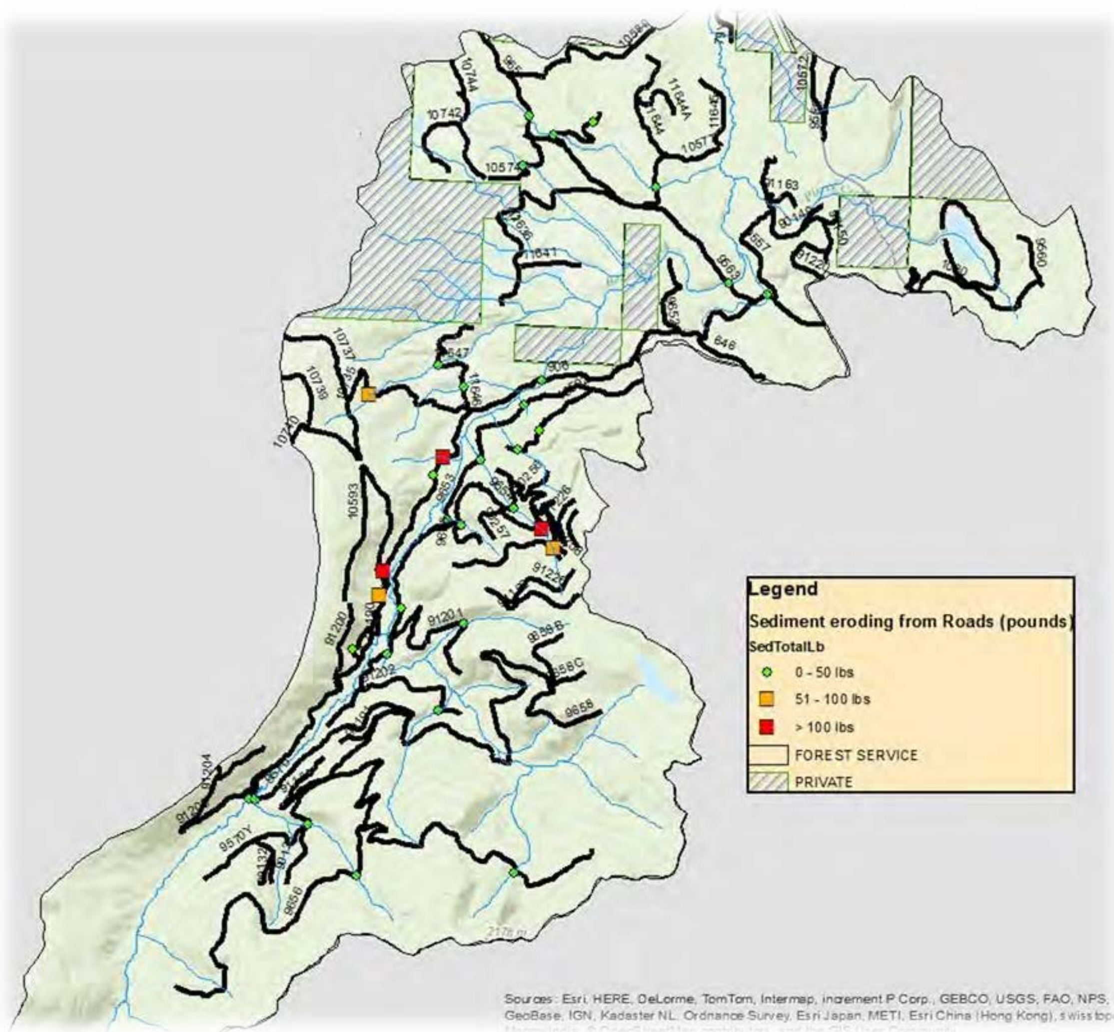


**FIGURE 40. LOCATIONS AND RESULTS OF 2012 ROAD EROSION INVENTORY.**

## WATER TEMPERATURE

Water temperature delineates Beaver Creek into several ecological zones. Temperature data has been collected during low flow, summer periods using submerged devices that record hourly. The warmest 7 consecutive days are then calculated for their average temperature, called Maximum Weekly Average Temperature (MWAT). Seven data recorders have been deployed at varying locations since 2000. No upward or downward trend has been detected from the monitoring that has occurred between 2000 and 2014.

Using cutthroat trout as an MIS, Beaver Creek can be divided into three water temperature zones, as displayed below in Figure 41. The lower reaches of Beaver Creek (reaches 1 through 4) have many beaver dams and MWAT ranges from 16.3 to 17.1°C (61.3 to 62.6°F). The temperature fluctuates daily by 5°C (41°F) during the summer, which indicates little influence of groundwater. Although the wetlands in this lower watershed have warm water, they have no impact on stream summer water temperature since the outlet streams are dry in the summer. The summer water temperatures are warmer than optimal condition for cutthroat trout, although not outright lethal (Hickman et al. 1982; McIntyre et al. 1995). Cutthroat trout may survive by seeking small pockets of cooler water or simply leaving the area during the summer. The lower reaches are warmer than INFISH Riparian Management Objectives for both adult trout habitat (15°C, 59°F) and spawning habitat (9°C, 48°F).

The middle reaches of Beaver Creek (reaches 5 through 10) are transitional with MWAT around 12.4°C (54.3CF) and daily fluctuation of about 3°C (37.4°F) during the summer. This is optimal conditions for cutthroat trout (Coleman et al. 2007; Hickman et al. 1982). The middle reach meets INFISH objectives for adult trout habitat, but is too warm for spawning habitat.

The upper reaches (reaches 11 through 13) are colder with MWAT ranging from 9.8 to 10.3°C (49.6°F to 50.5°F), and possibly even colder at highest elevation. These reaches do not appear to have much groundwater influence either with daily fluctuations around 3°C (37.4°F), therefore the colder temperatures are likely due to colder air temperature at that elevation. This is colder than cutthroat trout optimal condition. Cutthroat trout can tolerate this cold water, but juvenile survival is reduced and growth rates are slow (Coleman et al. 2007; Hickman et al. 1982). However, the upper reaches do meet INFISH objectives for water temperature. Data used to develop Figure 41 is available in the Project File (Exhibit M-7).

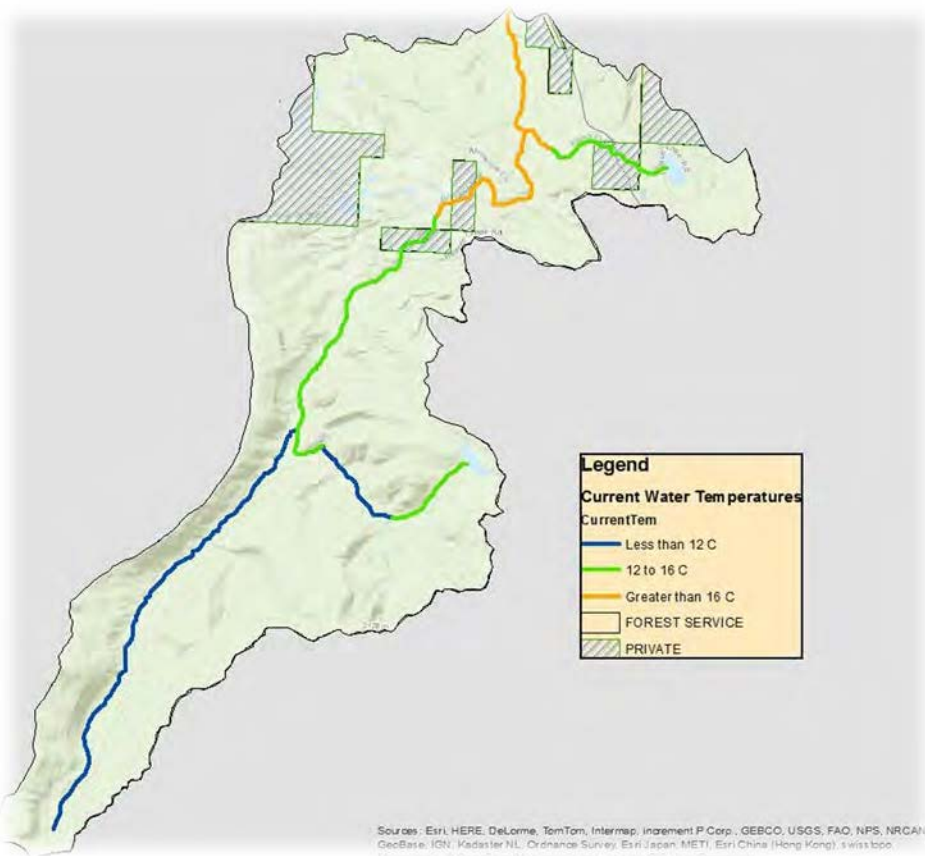


**FIGURE 41. EXISTING CONDITION OF BEAVER CREEK WATER TEMPERATURE.**

There are three possible factors that may have impacted Beaver Creek's water temperature, including: climate change, past riparian timber harvest and certain roads. Local data only extends to year 2000, which is too short to detect gross trends of water temperature. However, ambient summer air temperatures in northwest Montana have trended upwards in the past century (Pederson et al. 2010). A 50-year study of river temperatures throughout the nation also found an upward trend (Kaushal et al. 2010). Thus, it is likely that climate change has had some impact to Beaver Creek in recent decades.

A review of aerial photographs suggests PCTC conducted some riparian harvest along a 0.3-mile length of Beaver Creek (reach 9), since the canopy density is reduced from surrounding areas. The loss of some overhead shade may have impacted water temperature, but this area currently has optimal thermal conditions for cutthroat trout. Other riparian harvests conducted by PCTC on intermittent tributaries have not impacted Beaver Creek's water temperature, since those tributaries contribute no water during the summer. Historic and recent timber harvests by either the Forest Service or TNC have avoided riparian areas and have not impacted water temperature.

Although roads occupy a small portion of the landscape, they can have an adverse impact on groundwater input to streams (Wemple et al. 2003). Forest roads have impervious surfaces and can also intercept subsurface flows. This results in more surface flows and less groundwater recharge to streams. If streams have less groundwater, they are more sensitive to air temperature, and this can lead to warmer water temperatures in summer months. However, not all roads have equal impact to groundwater input. Roads with long ditches, unstable cut slopes, deep cuts into the soil profile, and evidence of seeps can impact groundwater movement, much more so than other roads (Luce et al. 2001; Wemple et al. 2003).

Monitoring trend data of Beaver Creek water temperature prior to the period of road construction does not exist. However, the 2012 inventory of roads searched for roads that may be adversely impacting hillslope hydrology and groundwater movement, following protocols described by Napper (2008). This survey found just two roads that appear to adversely impact groundwater movement, NFS road #91162 and #9656. These two roads total 3.5 miles or 4 percent of total road mileage in the watershed.

## HABITAT COMPLEXITY

The habitat complexity of Beaver Creek is strongly influenced by the abundance of large woody debris that has fallen into the stream, the distribution of large cobbles or boulders, and the stability of stream banks. These factors, in turn, create diverse and complex habitat features, such as pools, side channels, "pocket pools" (small resting areas downstream of boulders), and undercut banks. Generally the more large woody debris, the more cobbles, and the more stable the stream banks would mean the more habitat complexity. Streams are not static. Eventually the stream would wear down or move wood and rocks, and eventually, the stream banks would crowd into the channel. Fresh new wood and materials are needed. Habitat complexity depends on periodic landscape disturbance events, such as wildfire or floods. Fires and floods kill riparian trees and allow the stream to migrate across the floodplain, capturing new wood, new rocks, and carve new banks.

Fish habitat complexity in Beaver Creek and its tributary, Sunset Creek, have been inventoried and monitored at various locations since 2004 (Project File Exhibit M-10). Large woody debris is very abundant, averaging between 100 and 600 pieces per mile. This is well above the INFISH Riparian Management Objective of 20 pieces per mile. Pools are abundant, ranging from 14 to 95 pools per mile. The INFISH Riparian Management Objective for pools varies by stream width and most of the Beaver Creek analysis area meets the INFISH objective. However, even those reaches that fall short of the INFISH objective are within range of unmanaged, reference streams (Gardner 2013). Data also indicates that stream banks are stable throughout the analysis area. Therefore, this analysis assumes that fish habitat complexity is in good condition in Beaver Creek and has been unaltered by land management. Even though Beaver Creek has not experienced a large wildfire since 1919, habitat complexity has remained healthy.

**FIGURE 42. EXAMPLE OF HABITAT CONDITIONS IN THE UPPER REACHES OF BEAVER CREEK.**

The summary conclusion is that the water quality of Beaver Creek analysis area is largely in good condition. Past road construction and riparian harvest may have caused sedimentation, but the current stream condition is within the natural range and is potentially improving. Water temperature supports native fish, but may be increasing due to climate change and minor impacts from NFS road #91162 and #9656 . Habitat complexity is good condition.

## AQUATIC SPECIES

The aquatic species of Beaver Creek can be divided into two communities. The community in the lower reaches of Beaver Creek (reach 1 to 4) are warmer and low gradient. Non-native brook trout are the most numerous of all fish species sampled. Brook trout average 63 fish per 100 meters (age 1+ years) (95 percent Confidence Interval = 39 fish per 100 meters on the low end to 117 fish per 100 meters at the high end) and, thus, the entire area may have about 2,900 brook trout. Low numbers of cutthroat trout are found. The cutthroat trout are likely emigrants from Pierce Lake or Sunset Creek, and it is doubtful if any natural reproduction takes place in lower Beaver Creek. Sparse numbers of native finescale sucker (*Catostomus catostomus*) and an undescribed sculpin species (*Cottus* spp.) are also present in lower Beaver Creek. Sculpin distribution in the Pacific Northwest has been recently re-classified; and at the time of writing, the species delineation in Beaver Creek and the whole of the Swan River Valley is unknown. Non-native central mudminnow and rainbow trout (*Oncorhynchus mykiss*) have also been detected in patchy distribution.

The lower reach also contains the endemic mayfly *Caudatella edmundsi*. This mayfly is considered a potential species of concern due to uncommon distribution in Montana. To date, Beaver Creek is the only observation of this species on the Flathead National Forest (Stagliano et al. 2010). However, in recent years, *Caudatella edmundsi* has also been documented in Oregon and California. The Montana Natural Heritage Program currently ranks the species as a G3/G4 meaning it is somewhere between “vulnerable” and “apparently secure.” To conserve the mayfly, the Natural Heritage Program recommends “protect critical watershed habitats for these species from future road development and habitat degradation *…”* (Stagliano et al. 2010).

The upper community of Beaver Creek dwells in moderate gradient with cooler water temperatures. The most numerous species is brook trout (no population estimate). Cutthroat trout of unknown genetic purity are present and sculpins have been observed in some samples. Tailed frogs (*Ascaphus truei*) are present, but their distribution and numbers are unstudied. The current distribution of fish in the Mission Mountains Wilderness is not certain. Geographic Information

System modeling of stream gradient suggests the wilderness has the same moderate gradients as downstream. Therefore, this analysis assumes brook trout have pioneered all habitats, and there is no cutthroat trout refuge in the wilderness.

Brook trout have a deleterious impact on cutthroat trout. Brook trout were initially stocked in the Swan River Valley in the early 1940s and have since become widespread and invasive. Juvenile brook trout have a competitive advantage over juvenile cutthroat trout (Novinger et al. 1999), and they also can mature much quicker (Dunham et al. 2002). This gives brook trout a demographic advantage, and they can quickly overwhelm cutthroat trout populations.

One remnant cutthroat trout population remains in the analysis area. The headwaters of Sunset Creek contain cutthroat trout that have not been invaded by brook trout. This population appears to be endemic, but has been bolstered by occasional stocking of cutthroat trout of its headwater lake, Beaver Lake. Investigation of this stream in 2012 found the population consists of about 236 fish per 100 meters (age 1+) (95 percent Confidence Interval = 205 to 268). Genetic samples collected from the population found they are 99.2 percent genetically pure. Roughly two-thirds of the individuals were pure and one-third of the individuals were very slightly hybridized with rainbow trout alleles. Although small in numbers, this population exhibits normal heterozygosity (meaning it is not inbred). This population is one of the 22 known remnant cutthroat trout populations with conservation value in the Swan River Valley (Swan Native Fish Committee 2014). The Sunset Creek cutthroat trout occupy about 1.8 miles of stream. Because cutthroat trout only occupy about 1.8 miles out of 14 miles of available fish habitat (13 percent of total), this scarcity is one of the reasons why Beaver Creek is considered functioning at risk by the Watershed Condition Framework (Project File Exhibit M-12).

A 2012 habitat inventory of Sunset Creek found excellent spawning and rearing habitat (Project File Exhibit M-10). There are two limiting factors in Sunset Creek. The primary factor is the small size of the stream and the inability to support more numerous fish, especially larger adults that require deep pools. A second limiting factor is the culvert on NFS road #9658, which has a small waterfall on the outlet that blocks juvenile fish from moving upstream. Adult fish can negotiate the culvert but juvenile fish hatched downstream of the culvert cannot access the entire stream. This reduces juvenile survival and harms population demographics.

Brook trout are numerous in lower Sunset Creek, but their invasion upstream appears to be stymied by a small waterfall created by a debris jam. The waterfall is not an absolute barrier to upstream fish passage and four individual brook trout were captured shortly upstream of the waterfall in the 2012 sample, but none further than that. This implies that brook trout are attempting to invade upper Sunset Creek, but have not yet successfully colonized it, a situation observed in a few other locations (Adams 1999). Brook trout may be stymied by the challenging leap over the waterfall, higher gradient in the immediate area preventing rest, or colder water, or a combination of the three.

Bull trout have never been documented in Beaver Creek, presumably due to the natural warm water conditions in the lower reaches created by beaver dams. The watershed does not contain any designated critical habitat for bull trout.

## ALTERNATIVE 1 - NO ACTION ALTERNATIVE DIRECT AND INDIRECT EFFECTS

### HYDROLOGIC PROCESSES

Currently, the modeled ECA value for Beaver Creek is 12 percent (Figure 37), which is within the estimated range of natural variability (5 to 24 percent). Existing disturbances would continue to recover hydrologically, while new, natural disturbances would likely keep ECA and water yield within the estimated natural range of variability. No measurable change in water yield would be realized with Alternative 1.

## WATER QUALITY

### SEDIMENTATION

No activities are proposed with Alternative 1, but there is an indirect effect to sedimentation. During the 2012 inventory of Beaver Creek's forest roads, field crews evaluated the condition of stream culverts. This information was queried to search for culverts that could wash out or collapse due to debris blockage, channel constriction, or structural problems. One culvert out of the 66 culverts examined was determined to be at risk of failure. This culvert is on NFS road #906 at an unmapped, intermittent stream that discharges to Beaver Creek. Surveyors found it has water piping underneath the culvert and is no longer capable of transporting all the water. Catastrophic culvert failures are rare; but if it happens, it can erode considerable sediment (Hammer 2000). Should this culvert wash out, it is estimated it would erode about 25 cubic yards of road fill. Given an average weight of local soils of 2,384 pounds per cubic yard (Milner 2012), this equates to 59,600 pounds of sediment that could reach Beaver Creek. Thus, although it may never happen, this potential indirect effect could have 60 times more sediment than the existing chronic erosion from the road network.

Alternative 1 may also mean increased potential for a severe wildfire. Wildfires are typically the greatest source of sediment in western streams. Historically, Beaver Creek has experienced multiple wildfires and fire is part of the natural variability of the aquatic ecosystem.

### WATER TEMPERATURE

In regards to water temperature, even though Alternative 1 has no activities, there is a greater probability of a severe wildfire burning in the Beaver Creek drainage. Wildfires do not directly change stream water temperature (during the fire) due to the physics of water's specific heat property. However, wildfires can indirectly elevate stream water temperature for at least 10 years after the fire due to loss of stream shade and increased channel width. Although this is by itself unremarkable since Beaver Creek has experienced many wildfires, this could have increased consequence in consideration of future climate change.

### HABITAT COMPLEXITY

There are no activities in Alternative 1 that can impact habitat complexity. This alternative does have increased potential of a wildfire. Wildfires are one of the key disturbance features for habitat complexity; the other is floods. Fires kill riparian trees and when they topple into the stream, they greatly bolster fish habitat complexity. Alternative 1 maintains this natural disturbance cycle. There are no other reasonably foreseeable actions that would impact habitat complexity.

In summary then, Alternative 1 has mixed impacts to water quality. Sedimentation may increase due to the potential of a culvert failure or a wildfire. Water temperature may increase due to climate change and a wildfire. Habitat complexity, however, would remain healthy due to the potential of a wildfire or flood.

## AQUATIC SPECIES

This alternative has no activities that would directly alter the aquatic species distribution in the Beaver Creek watershed. Brook trout would remain the most numerous species in upper and lower Beaver Creek, but sparse numbers of cutthroat trout, finescale suckers, sculpin, tailed frogs, and rainbow trout would remain. The mayfly *Caudatella edmundsi* would also remain present in lower Beaver Creek. Bull trout are not present in this watershed.

# ALTERNATIVE 1 -NO ACTION ALTERNATIVE CUMULATIVE EFFECTS

## HYDROLOGIC PROCESSES

Past and present actions that cumulatively affected hydrologic processes were discussed in the Existing Condition Section. There are no reasonably foreseeable actions that would modify hydrologic processes. Road densities would remain unchanged in this alternative. The road network potentially contributes towards watershed drainage efficiency, thus increasing the magnitude and frequency of moderate-peak flow events in sub-watersheds. However, modeling of all cumulative effects found that any peak flow increase from these smaller watersheds is unlikely to be detectable near the outlet of Beaver Creek, because the larger area tends to have a muting effect on single peak flow events from smaller contributing watersheds. Hydrologic processes would remain within natural range. Further information is found in the Project File (Exhibit M-8).

## WATER QUALITY

As was discussed in the Existing Conditions section, aerial photographs suggest that PCTC may have conducted riparian harvest along a 0.3 miles section of Beaver Creek in Reach 9. The loss of this shade may have led to an increase in water temperature but the current temperatures remain optimum for cutthroat trout. Other activities conducted by PCTC, Forest Service, and TNC (Beaver Highway and Two Bear timber sales) have avoided riparian areas and would not have affected water temperature. The Forest Service is not aware of any proposed harvest by TNC on the lands encumbered by the Fiber Supply Agreement.

There are no reasonably foreseeable activities that would impact sedimentation or habitat complexity. Sedimentation is not a concern in Beaver Creek, although one particular culvert is at risk to wash out and could contribute sediments. The increased risk of a fire could also result in increased sedimentation. Habitat complexity in Beaver Creek is good and would remain in good condition, even in the event of a wildfire.

It is reasonably foreseeable that the climate change would contribute to cumulative effects to water temperature. An interagency work group assembled thousands of water temperature recorder data and overlaid this with projected air temperature changes in order to model water temperatures in 2040 (Project File Exhibit M-7). Some error is found in their baseline modeling of Beaver Creek. The model underestimated current water temperature in reaches 1 through 4 and also overestimated the input of intermittent tributaries. Their 2040 projection is illustrated on Figure 43, with local corrections to improve accuracy, detailed in Project File Exhibit M-7.

This model cannot estimate the role of wildfire and, therefore, may be more conservative than change that could occur in the event of a wildfire. The cumulative effect of increased wildfire potential and climate change would result in increased water temperatures. This would be most noticeable in the middle reaches of Beaver Creek and the “Sunset Creek” tributary, which is where the model shows change.

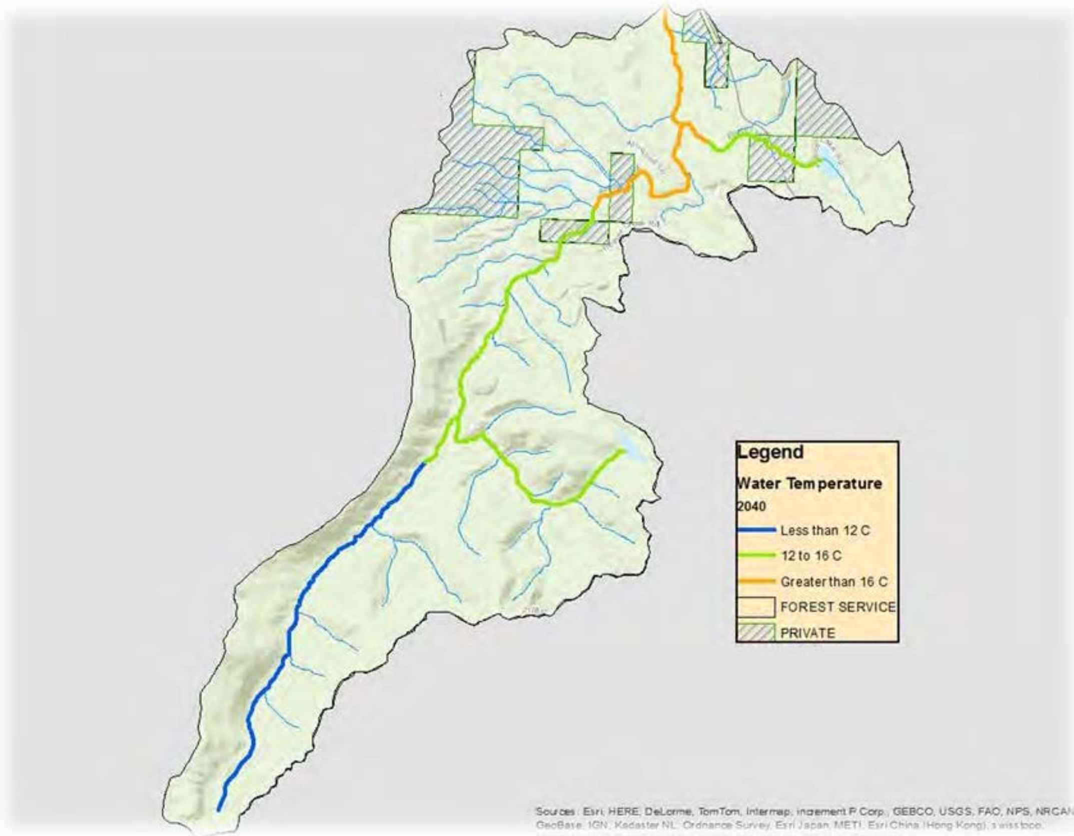


**FIGURE 43. PROJECTED WATER TEMPERATURES IN BEAVER CREEK FOR THE YEAR 2040.**

## AQUATIC SPECIES

Past actions of non-native fish stocking that affected fish species distribution were discussed in the Existing Condition. There are no reasonably foreseeable activities that would alter aquatic species. Even though Alternative 1 has no activities, this would indirectly allow cumulative effects to reduce the distribution of cutthroat trout.

The debris jam in Sunset Creek would eventually crumble or wash out. This would then allow brook trout much easier access to colonize upper Sunset Creek. Meanwhile, as described above, the water temperature in the middle area of Sunset Creek is anticipated to become warmer and more optimal for brook trout. Thus, two out of three impediments to brook trout invasion are removed. The only challenge left is the short length of high gradient in the debris jam area. It is assumed that brook trout would eventually conquer the high gradient area just like they have done in other streams. Brook trout would also move upstream of the culvert on NFS road #9658 since it does not block adult fish passage.

Peterson et al. (2008) developed a model to estimate the persistence of cutthroat trout in light of brook trout invasion. This model is not a population viability analysis, but rather a helpful tool for alternative comparisons. The model indicates that the cutthroat trout of Sunset Creek have only a 10 percent likelihood of persisting in 20 years under Alternative 1 (Project File Exhibit M-9). The model result is not surprising given the replacement of cutthroat trout by brook trout in many local streams, including Beaver Creek itself. This analysis predicts that the only cutthroat trout left in the Beaver Creek analysis area would be in Beaver Lake and Pierce Lake. These lakes are maintained by periodic stocking. The cutthroat trout endemic to Beaver Creek analysis area would be lost. The total number of cutthroat trout populations in the Swan River Valley with conservation value would be reduced from 22 to 21.

# ALTERNATIVE 2 -PROPOSED ACTION DIRECT AND INDIRECT EFFECTS

## HYDROLOGIC PROCESSES

Alternative 2 proposes 3,644 acres of vegetation management (both commercial and non-commercial products). The modeled ECA value of these actions indicates that Beaver Creek's ECA would increase from about 12 percent to approximately 24 percent (Figure 44). This value is within the estimated low end range of natural variability for ECA and well below modeled ECA value of 38 percent following the 1919 wildfire. Predicted ECA values would fall below the minimum detection level (15 percent) within approximately 7 years and would return to pre-treatment levels within approximately 15 years. Please note that water yield analysis is run on 10-year increments. Although implementation of Alternative 2 could occur after 2015, this date was selected as best representation for the years between 2015 and 2020.

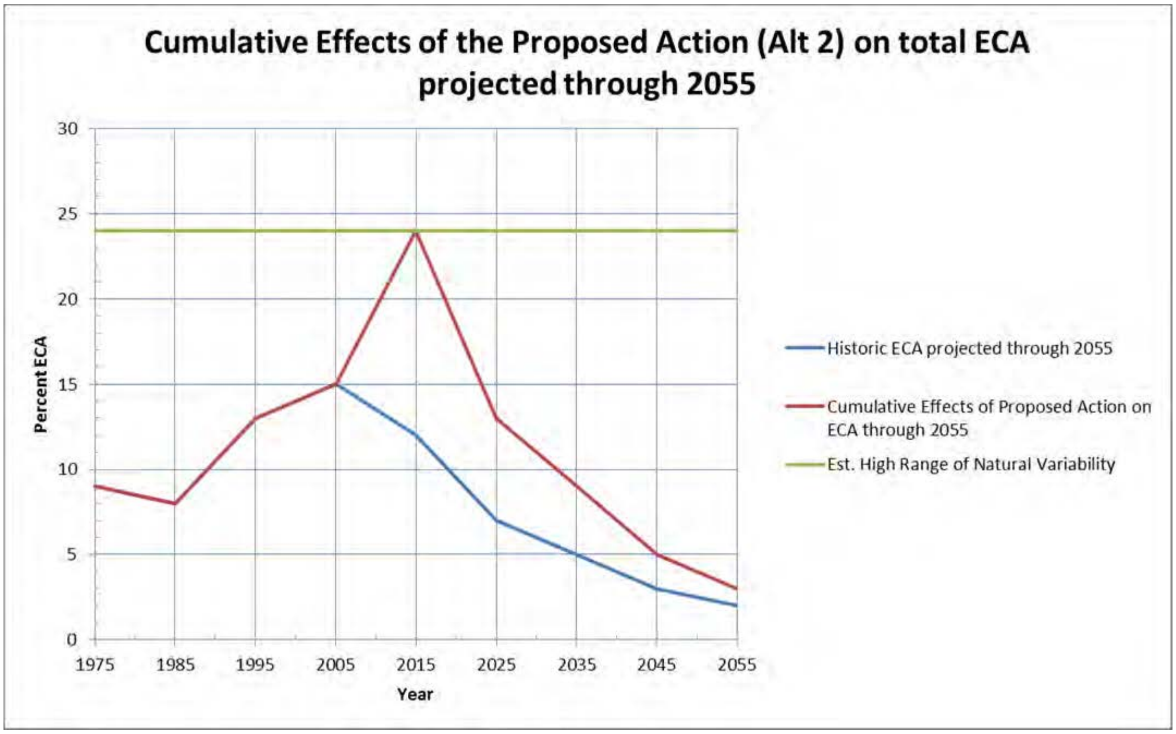


Figure 44. Modeled ECA of Beaver Creek Over Time with the Cumulative Effects of Alternative 2.

Model results indicate post-harvest ECA values would remain within the range of natural variability. Furthermore, recent literature indicates that water yield changes diminish further downstream (Hubbart et al. 2007).

## WATER QUALITY

### SEDIMENTATION

Alternative 2 has several direct and indirect effects to stream sedimentation, both positive and negative. These are described below in decreasing order of importance.

The primary impact to sedimentation is a positive change. This alternative addresses chronic erosion on the road network and prevents the potential of a culvert failure. All six chronic erosion point sources would be corrected by BMP work proposed on haul routes. This work would mostly be accomplished by installing drain dips, so the road surface does not erode into the stream, but other minor work, such as ditch clearing, would also benefit. Alternative 2 also would replace the culvert on NFS road #906 that is at risk of failure. These actions would halt 952 pounds of chronic erosion and may also prevent 59,600 pounds of erosion from potentially reaching Beaver Creek if the culvert were to fail.

Alternative 2 includes road decommissioning, intermittent stored service of roads, construction and rehabilitation of temporary roads and Best Management Practice work. Most of this would have no direct or indirect effect to sedimentation since most of the work is on upland roads far from streams. However the alternative does include culvert or bridge work that could impact sedimentation. Table 63 summarizes the culvert work and the potential effects are discussed below.

**TABLE 63. SUMMARY OF CULVERT WORK AND EFFECTS PROPOSED WITH ALTERNATIVE 2.**

| NFS ROAD NO. | ACTION | CULVERT ACTIVITY | STREAM TYPE | DISCHARGES TO |
|---|---|---|---|---|
| 91162 | Decommission | 1 culvert removed | Intermittent | Beaver Creek |
| 9656 | Decommission | 3 culverts removed | Perennial (most years) | Beaver Creek |
| 9570Y | ISS | 1 culvert removed | Perennial | Beaver Creek |
| 9570 | ISS | 2 culverts removed | Intermittent | Sunset Creek |
| 9658 | ISS | 1 culvert removed | Intermittent | Sunset Creek |
| 10589 | ISS | 1 culvert removed | Intermittent | Wetland |
| 10590 | ISS | 1 culvert removed | Intermittent | Wetland |
| 11646 | ISS | 1 culvert installed, then removed. One removed | Intermittent | Beaver Creek |
| 11647 | ISS | 1 culvert installed, then removed | Intermittent | Wetland |
| 90131 | ISS | 1 culvert removed | Perennial | Beaver Creek |
| 11636 | Move from ISS to ML1 | 6 culverts installed | Intermittent | Several wetlands |
| 10735 | Move from ISS to ML1 | 2 culverts installed | Intermittent | 1 to wetland, 1 to Beaver Creek |
| 9658 | BMP | 1 culvert replaced | Perennial | Sunset Creek |
| 91202 | BMP | 1 bridge replaced | Perennial | Sunset Creek |
| 906 | BMP | 2 culverts replaced | 1 Perennial, 1 intermittent | Beaver Creek |
| Temp Road F1 | | 1 culvert installed, then removed | Intermittent | Sunset Creek |
| Temp Road G1 | | 1 culvert installed, then removed | Intermittent | Sunset Creek |

Alternative 2 includes the replacement of 2 existing culverts on perennial streams, 1 to facilitate fish passage and the other to block invasive fish, plus a bridge replacement. A study of culvert replacement on the Bitterroot National Forest estimated this work generates 3,400 pounds of sediment (Jakober 2002). A key mitigation recommended by Foltz et al. (Foltz et al. 2013) is to divert water during implementation, and then gradually allow it to return into the channel upon completion (instead of abrupt return). This mitigation is part of Design Criteria, along with requirement that the new culvert would be large enough for 100-year flood events and aligned with the natural channel direction. An existing wooden bridge would be replaced as well, although this work is anticipated to generate far less sediment, since the stream bed is largely undisturbed. This analysis assumes that the 2 culverts and 1 bridge replacement cumulatively would add about 7,000 pounds of sediment to Beaver Creek.

Alternative 2 also includes removing 5 culverts on perennial streams that discharge into Beaver Creek. These culverts are being removed because the roads would be decommissioned or placed into ISS, as outlined on Table 63. The work has Design Criteria to minimize sedimentation to the stream. Design Criteria include requirements that: work would only be done during low flows (typically early July to November); the newly exposed channels be reshaped to match their historic shape; road spoils would be placed outside of the floodplain; the area would be seeded and mulched; sediment mats or straw bales would utilized; and any other mitigations suggested by the MFWP permit process. A culvert removal on a stream on the Hungry Horse Ranger District, with similar Design Criteria, was monitored by Sirucek (Sirucek 2007). That project generated about 1,300 pounds of sediment. Research by Fotlz et al. (Foltz et al. 2013) that the mitigation of placing either straw bales or sediment mats (woven fabric) into the stream eliminates about half of sedimentation. Since Sirucek's (Sirucek 2007) study did not incorporate sediment mats or straw bales, this analysis assumes that each culvert removal on a perennial stream would generate about 650 pounds each with the use of sedimats and straw bales. Therefore, Alternative 2 would result in a total of 3,250 pounds entering Beaver Creek due to perennial stream culvert removals.

Alternative 2 includes the construction of a free-standing cement fish barrier in Sunset Creek to protect a remnant cutthroat trout population. This would require heavy equipment to access the stream and disturb about 0.5 acre, about half of which is riparian habitat. All riparian vegetation on the south side of the project would be cleared and stockpiled, plus a minor amount would be removed on the north side for safety consideration. This 0.5-acre area would be disturbed for 6 weeks until the site is re-shaped, seeded, and mulched. This work would take place during the summer, which is normally dry, but it is reasonable to assume at least one rain event (summer thunderstorm) would happen. Raindrop splash would be likely to mobilize finer materials during the storm, and then cease after rains stop. In-channel work would take about 4 weeks and Design Criteria would require the site to be dewatered with a coffer dam (sand bags, plastic) and water piped around the job site. Even with these Design Criteria in place, some seepage is inevitable, and this would result in a small, continuous amount of turbidity. When the project is complete, Design Criteria would require the coffer dam to removed slowly to minimize sedimentation as described by Foltz et al. (Foltz et al. 2013). As the dam is removed and water returned to the new channel, fine materials would be suspended and washed downstream. While there is no available literature on this type of project, the closest parallel would be Sirucek's (Sirucek 2007) study of a culvert removal. Given that this project would take longer to complete than a culvert removal, the net sedimentation is assumed to be doubled, thus 2,600 pounds. This estimate seems within range of visually observed impacts during the 2014 construction of a similar fish barrier on nearby Red Butte Creek. This erosion would cease after project completion, since slash and woody debris placed in the area would capture sediments.

There are 10 culverts that would be removed on intermittent streams that discharge to Beaver Creek, but these would result in almost no sedimentation to fish habitat. Design Criteria would be that work would be completed with the channel is dry to avoid the sedimentation modeled in the previously described studies. The only potential impact is when a newly-exposed stream bed (following culvert removal) is re-wetted the following spring runoff. No literature is available to estimate this impact, but it is assumed to be a small, undetectable amount of sediment. An additional 10 culverts would be installed or removed on intermittent streams that discharge to wetlands and will not have an effect to Beaver Creek because the wetlands would store any sediment generated by that work.

Beyond road work, this alternative completes various vegetation management projects, including nine units with mechanized treatments and four units with hand treatments that are within RHCAs beside Beaver Creek or its tributary, Sunset Creek. Because Beaver Creek and Sunset Creek are fish-bearing, the normal RHCA width is 300 feet from either side of the stream. Normally, timber management would be precluded from RHCAs but INFISH does note:

> "Apply silvicultural practices for RHCAs to acquire desired vegetative characteristics where needed to attain Riparian Management Objectives. Apply silvicultural practices in a manner that does not retard attainment of Riparian Management Objectives and that avoids adverse effects on inland native fish"

Vegetation management in these RHCA units is proposed to benefit landscape forest health as long as it does not have adverse impacts to native fish and their habitat.

Five units (Units 4110, 4108, 498, 491 and 459) involve commercial thinning inside the normal RHCA, totaling 42 acres. Three units (Units 495, 494, and 412) are improvement cuts in the RHCA that total 14 acres. Unit 4209 is a 3-acre pre-commercial thin that would be accomplished with mechanized equipment. Most of these units are uphill of a road and deferring the RHCA portion would render the rest of the unit inaccessible or infeasible due to small remaining size.

Units 4110, 4108, and 412 are different in that they extend downhill from an upland unit into the RHCA. By extending the vegetation restoration proposal into RHCAs, it provides a more vegetation restoration rather than halting work 300 feet from the stream. Design Criteria for all 9 mechanized units are that no harvest would take place within 50 feet of the stream.

There is slight potential for a small amount of sediment to reach Beaver Creek from implementation of 3 particular units. There is no available literature that computes stream sedimentation in local geologies using these harvest treatments with a 50-feet streamside buffer. However, WEPP modeling can provide some estimate of gross soil movement and then further estimate if this could travel through 50-foot buffers. Modeling for all 8 commercial harvest units found that 5 had no potential for erosion, primarily due to gentle slopes. Units 491, 494 and 495 did have potential. These 3 units are modeled to contribute a total of 121 pounds (Project File Exhibit M-6). However, it also needs to be recognized that all 3 of these units are uphill of NFS road #9653 or NFS road #906. Sediment moving down the hillside would not wash across the road but would rather accumulate in the uphill (inside) road ditch. Because these roads are scheduled for BMP work, this work is designed to prevent the ditches from transporting directly to streams. Best Management Practices work typically includes adding/maintaining ditch relief pipes so that they discharge into the forest floor and not into a stream. Therefore, this analysis recognizes a possibility a small amount of erosion (121 pounds), but considers this scenario unlikely due to road BMP work included in this alternative. This impact would be too small to adversely impact water quality and native fish habitat.

One of the broadcast burn conglomerated units has potential for a small amount of sedimentation to reach Beaver Creek. The burns proposed in Units 313 and 314 take place along two small, intermittent tributaries. The project would not ignite in the riparian areas; but if it enters into them, no suppression action would take place. This strategy would allow a more natural disturbance pattern, but does have potential for the stream to scour through the area the following spring before it is fully recolonized with forbs and vegetation. It is not possible to quantify this sedimentation since the variables of fire perimeter, post-fire weather, and stream flow are unpredictable. The sedimentation potential is small because the stream size is small, and the low intensity of the prescribed fire. All of the other broadcast burns are in tributaries to wetlands. These wetlands would capture and store any sediment, thereby preventing the sediment from reaching Beaver Creek.

The remainder of the proposed vegetation management is in upland areas and without potential to erode into streams. The remainder of temporary roads and also the short road realignment on NFS road #91160 are in upland areas that would prevent erosion into streams. National Forest System road #91221 is located near the Pierce Lake outlet stream but the only work needed is the construction of a barrier to prevent motorized access. The road will re-vegetate naturally and prevent sedimentation. The hand treatments proposed in RHCA Units 219, 4262, 4208, and 4209 have no potential to erode since hand crews do not scarify the ground and create surface erosion.

The net impact of all the actions described above is a one-time pulse of about 12,850 pounds of sediment, plus a small unquantifiable addition from culvert replacements on intermittent tributaries and the broadcast burn. At the same time, this alternative would halt 950 pounds of chronic erosion and possibly prevent 59,600 pounds of sediment in the case of culvert failure. All of these figures are much smaller than Beaver Creek's estimated natural sediment load of 1,298,875 pounds per year.

#### WATER TEMPERATURE

Alternative 2 may have some impact to Beaver Creek's water temperature, both positive and adverse.

The primary influence of Alternative 2 may be from the reduced potential of a large wildfire. A wildfire that kills riparian vegetation eliminates shade and exposes the stream surface to solar radiation. Stream temperatures typically increase 2 to 4°C for several years after wildfires

(Minshall et al. 1989). While Alternative 2 does not guarantee against any severe wildfire, the reduced probability of a high severity fire is considered beneficial for water temperature.

Road decommissioning work proposed in Alternative 2 may also have a positive impact on water temperature. As described earlier, NFS road #91162 and NFS road #9656 are assumed to have a small but adverse impact to Beaver Creek water temperature. All 0.7 miles of NFS road #91162 and about 1.2 miles of NFS road #9656 would be decommissioned in Alternative 2. The road prisms for both roads would be completely re-contoured. The remaining 1.1 miles of road #9656 was addressed with BMPs in 2011.

Literature indicates that this work, rather than passively letting the road re-vegetate and fade over time, is more effective in restoring soil properties (Lloyd et al. 2013; Montana State University 2010). Restoring soil properties should, in turn, restore groundwater movement. While there is some evidence of hillslope hydraulic restoration in a re-contouring project in Gallatin National Forest (Montana State University 2010), further research is needed to confirm this is an effective strategy for large-scale stream restoration (Switalski et al. 2004). While these activities would be a positive change for Beaver Creek's water temperature, the scale would likely be too small to detect.

Alternative 2 also includes 9 units with mechanized treatments in the RHCA totaling 59 acres, plus another 4 units with hand treatments. As described earlier, normally vegetation management is precluded from RHCAs unless it is needed to attain Riparian Management Objectives and also does not retard the objective. Vegetation treatment is not proposed as a means to attain thermal Riparian Management Objectives, but rather it is proposed to improve forest health, as long as it does not retard water temperature.

Stream water temperature is influenced by aspect, velocity, groundwater input, solar radiation, and ambient air temperature in the riparian microclimate (Larson et al. 1996). Streamside trees influence two of these factors. They provide shade (block water surface from solar radiation), and they moderate the microclimate air temperature. Larson et al. (Larson et al. 1996) model how taller trees (50 feet or more) provide more shade, especially those on south or west banks. Water temperature of smaller, headwater streams is more dependent on riparian trees than downstream reaches (MacDonald et al. 2007). The Anderson et al. (2007) study of Pacific Northwest headwater streams found trees within the first 10 meters (33 feet) had the greatest influence on microclimate. This influence gradually decreased at distance until a topographical break. Further work on those headwater streams found that one tree height buffer or variable width (matching changes in vegetation type) was sufficient to protect microclimate when adjacent to commercial thinning, but not when adjacent to regeneration harvest (Anderson et al. 2014). A literature review by Ellis (Ellis 2008) found buffer width recommendations to protect water temperature ranged from 33 feet to 125 feet.

Based on these considerations, most of the 13 proposed RHCA units would have no potential impact to water temperature. Design Criteria for all mechanized RHCA units is a minimum 50-foot unharvested buffer adjacent to the stream. Hand treatments would only remove smaller trees, which have much less influence on shade; and therefore, they may extend to the stream bank. No RHCA unit is adjacent to regeneration harvest. However, Units 4108 and 4110 do have some potential to adversely impact water temperature. These commercial thin units are located on smaller headwater streams that are more sensitive to change. The 50-foot setback is less than the one tree height recommended by Anderson et al. (2014) and Ellis (Ellis 2008). Unit 4108 could be particularly impactful due to its positon on the west bank and the importance of afternoon shade.

The free-standing fish barrier on Sunset Creek could have an impact on water temperature, because all trees on the western bank would have to be removed to facilitate construction in an area about 200-feet long. The net length of the two harvest units and the clearing for the fish barrier is about 0.6 miles. Given that the total length of fish habitat in the analysis area is about 14 miles, these units and the fish barrier may impact water temperature in the immediate area, but are assumed too limited to detect downstream. This adequately conserves the INFISH thermal

Riparian Management Objective. Ultimately it is concluded that the negative impact from the two riparian harvest units and the fish barrier is just as minor and impossible to detect as the small positive impact by decommissioning the roads.

#### HABITAT COMPLEXITY

Alternative 2 would have a minor, direct impact on habitat complexity. As described earlier, habitat complexity is strongly dependent on a supply of large woody debris, boulders and stable banks, plus it requires periodic disturbance event to allow streams to access these materials. Alternative 2 has no impact to boulders since it does not add or remove any. It also has no impact to stream bank stability since, as described earlier; the anticipated water yield changes are too small to impact channel morphology.

However, Alternative 2 would reduce large woody debris input in some areas. Ellis (Ellis 2008) literature review of recommended riparian buffer widths, found studies that recommended between 50 feet and 328 feet is needed to maintain woody debris recruitment. Although Design Criteria of harvest units would leave all trees within 50 feet of the stream, trees beyond that would be partially harvested (varies by prescription). Three considerations are key. First, small headwater streams are more sensitive to wood recruitment than larger streams because small streams only receive wood from adjacent forests, and they are too small to get floating wood from upstream. Second, the average diameter of woody debris in Beaver Creek is between 0.23 to 0.31 meters (9 to 12 inches) (Project File Exhibit M-10). Therefore, harvest of trees smaller than this diameter, pre-commercial thinning and daylighting treatments, has no impact to habitat complexity. Third, harvest uphill of an existing road would not affect woody debris recruitment. Any trees that normally would have fallen towards the stream cannot enter the stream because of the road and, thus, harvest activity uphill of a road would have no further impact.

With these considerations, there are three locations that would have reduced woody debris input. About 200 feet of the west bank of the free-standing fish barrier on Sunset Creek would have all trees removed during construction (the east bank would be undisturbed). This would result in a small area of reduced habitat complexity. Also Units 4108 and 4110 are commercial thin units along one side of the headwaters of Beaver Creek and Sunset Creek. These units would likely reduce recruitment of some trees, even though all wood within the first 50 feet of the stream would remain. The net effect of tree removal in all three locations, however, is very minor. The Beaver Creek analysis area has considerable large woody debris in the channels, ranging from 100 to 600 pieces per mile (Project File Exhibit M-10). The reduction of woody debris input on one side of the stream in these three small areas would be too small to affect habitat complexity. The INFISH Riparian Management Objective of 20 pieces per mile would be maintained.

Alternative 2 would reduce the likelihood of a large wildfire but may allow for more low intensity fires to be allowed on the landscape. This would defer a normal disturbance event that provides habitat complexity to streams, but might allow occasional contribution of debris through low intensity fires. Although the alternative has no impact on floods (the other disturbance event), delaying a wildfire may prolong the intervals between disturbance.

### AQUATIC SPECIES

Alternative 2 would conserve and bolster the remnant cutthroat trout population in upper Sunset Creek. This alternative has two actions that benefit the cutthroat trout:

1. It builds a barrier to prevent brook trout invasion, and
2. It removes a partial barrier in the middle of the population that hinders juvenile cutthroat trout movement.

This further helps achieve restoration and moves the watershed to functioning appropriately as characterized with the Watershed Condition Framework.

The free-standing barrier structure would be situated slightly downstream (less than 50 meters) from the existing debris jam at a location with narrow canyon walls to minimize the size and cost of the structure. Design Criteria for the barrier would be to block upstream fish passage for all flows up to 25-year flood events (presumably fish would not attempt to swim upstream in extreme events). Any remaining brook trout above the new structure would be captured and released downstream of the barrier. The natural debris jam would be left untouched and allowed to decay normally. The structure would be designed to withstand a 100-year flood event and would not need any regular maintenance; thus, protecting the cutthroat trout population for the analysis timeframe.

**FIGURE 45. LOCATION OF PROPOSED BARRIER ON SUNSET CREEK**

The culvert on NFS road #9658 would be replaced with a larger culvert with stream bed materials placed inside to facilitate fish passage at all flows for all sizes. This passage would only benefit cutthroat trout since brook trout would not be present. Improved passage for juvenile fish would allow those fish to access the entire stream for foraging and improve their survival. The District Fisheries Biologist estimates that the cutthroat trout population would likely increase from 236 fish per 100 meters age 1+ fish currently present to about 300 age 1+ fish.

## ALTERNATIVE 2 – ACTION ALTERNATIVE CUMULATIVE EFFECTS

### HYDROLOGIC PROCESSES

Past actions such as timber harvest and road building by Forest Service, PCTC and more recently TNC contributed to cumulative effects and the current estimated ECA of 12% in the Beaver Creek watershed. There are no reasonably foreseeable activities that would modify hydrologic processes. The cumulative effect of past and present work, along with vegetation management proposed in Alternative 2, is modeled in Figure 44 indicates that ECA would remain within natural variability and there would be no impact to Beaver Creek’s channel morphology.

### WATER QUALITY

As was discussed in greater detail in the Existing Conditions section, the watershed currently has about 3.45 miles per square mile and contributes to the current Watershed Condition Framework ranking of “functioning at risk”. The decommissioning work that took place in the watershed in 2008 and the Best Management Practice work that was completed on 6 miles of road in 2010 appears to have achieved a 96 percent reduction in sediment. The timber harvest that was conducted in riparian areas by the Forest Service and PCTC prior to the 1991 Montana Streamside Management Zone Act may have contributed erosion to Beaver Creek but in recent years, Forest Service, PCTC, and TNC timber harvest activities has avoided riparian areas. Although the bridge replacement that occurred on Road 906 may have contributed a small amount of sediment in the short term, this effect is no longer detectable.

As described earlier, the stream’s substrate is either within natural range or possibly trending towards less sediment. There is no evidence that fish habitat in Beaver Creek is experiencing a deteriorating trend from past land management activities. Alternative 2 would result in a short-term and small pulse of sediment, followed by a minor reduction of sedimentation and will not impair fish habitat. There are no other reasonably foreseeable actions that would cause sedimentation.

In consideration of potential climate change, the cumulative effects of Alternative 2 may help improve Beaver Creek’s water temperature resiliency in that it reduces the likelihood of a large wildfire. While Beaver Creek has experienced wildfires in the past, the combination of a wildfire with climate change would result in warm water temperatures and, thus, Alternative 2 reduces that risk. The actual direct impacts of Alternative 2, namely the small benefit gained by decommissioning two roads and the small negative impact of riparian harvests and fish barrier, are too minor to make any detectable difference. There are no other reasonably foreseeable actions beyond potential climate change that would impact water temperature.

As was described in greater detail in the Existing Condition section, the habitat complexity of Beaver Creek currently exceeds the riparian management objectives. There are no reasonably foreseeable activities that would change habitat complexity. The cumulative effect of implementing Alternative 2 is that it would reduce the likelihood of a large wildfire, which defers a natural disturbance event that provides habitat complexity to streams. Beaver Creek currently has good habitat complexity and would remain so during the analysis timeframe, but eventually Beaver Creek would require a flood or a fire to replenish habitat complexity.

## AQUATIC SPECIES

Non-native fish stocking has occurred in the past and this has negatively affected cutthroat trout distribution throughout the watershed. There are no reasonably foreseeable activities that would alter aquatic species. In consideration of the non-native fish stocking that has occurred in the past, the construction of the fish barrier and replacement of the culvert on NFS road #9658 would have a cumulative effect on the cutthroat trout distribution in the Beaver Creek watershed.

Using the same model developed by Peterson et al. (2008) described earlier, Alternative 2 would increase the probability of population persistence to 50 percent (Project File Exhibit M-9). While this may seem surprisingly low, the model reflects uncertainty if such a small cutthroat trout population would persist even with conservation efforts. It is important to remember the model is not a true viability model, but rather a means to compare alternatives. The cumulative effects of Alternative 2 have a five times greater chance of persistence than Alternative 1. Alternative 2 greatly improves the likelihood of some endemic cutthroat trout remaining on the landscape, but it cannot guarantee it. Bolder actions, such as installing a barrier far downstream and complete removal of brook trout (via chemical piscicide), would be required to guarantee cutthroat trout persistence in the Beaver Creek analysis area, but this type of action is unlikely to be socially acceptable.

No other change to aquatic species is anticipated with Alternative 2. The brook trout, finescale suckers, sculpin, tailed frog, *Caudatella edmundsi* mayfly, central mudminnow, and rainbow trout would remain unchanged by this alternative. As described earlier, water quality would remain good with this alternative. Since habitat in Beaver Creek is unaltered by this alternative, the aquatic species would remain unaltered. Bull trout are not present in Beaver Creek.

# ALTERNATIVE 3 – ACTION ALTERNATIVE DIRECT AND INDIRECT EFFECTS

## HYDROLOGIC PROCESSES

The ECA model for vegetation management in Alternative 3 found the same results for water yield as Alternative 2. Water yields may increase from 12 percent over baseline to 23 percent for a year and then steadily decline (Project File Exhibit M-8). This is within the natural range of variability of Beaver Creek and will no adverse impacts to stream channel conditions.

## WATER QUALITY

Alternative 3 has both positive and negative effects on sedimentation, but at a slightly less magnitude than Alternative 2. These are described below in decreasing order of importance.

### SEDIMENTATION

The primary effect to sedimentation is positive but minor in scale. This alternative addresses most of the chronic erosion on the road network and prevents the potential of a culvert failure. Five out of six chronic erosion point sources would be corrected by BMP work proposed on haul routes. The chronic point source on NFS road #9654 would remain since this is not a haul route under Alternative 3, and this site is estimated to erode about 74 pounds a year. Just like Alternative 2, this alternative replaces the culvert on NFS road #906 that is at risk of failure. These actions would halt 878 pounds of chronic annual sedimentation and could also prevent 59,600 pounds of erosion from reaching Beaver Creek in event of a culvert failure.

Alternative 3 includes the same road decommissioning, intermittent stored service of roads, construction and rehabilitation of temporary roads and other Best Management Practice work. As described earlier, the only road-relative impact to sedimentation involves replacement of culverts or bridges. The work proposed in Alternative 3 is the same as shown in Table 63 except for two locations. Alternative 3 does not propose to use NFS road #11647 for haul and, therefore, does not need to re-install a culvert on an intermittent stream. Alternative 3 does not extend haul on NFS road #11636 for the same number of miles as Alternative 2 and, therefore, installs four culverts instead of six culverts. This means Alternative 3 has six culvert installations on streams instead of nine. Since the three deferred culverts are on intermittent streams that flow into wetlands, there is no difference to Beaver Creek itself. The road work in Alternative 3 sums to about 9,600 pounds of sediment delivery into Beaver Creek just like Alternative 2.

Alternative 3 defers the free-standing fish barrier on Sunset Creek and the associated sedimentation. The barrier would be located at the new culvert on NFS road #9658. The installation of this barrier culvert has the same sedimentation impact as the culvert replacement proposed in Alternative 2.

Alternative 3 also defers most, but not all, harvest units within RHCAs. There are two units with commercial harvest activity in the RHCA near Beaver Creek. Unit 491 is a 4-acre commercial thin. Unit 460 is a 1-acre improvement cut. Both of these activities are uphill of existing roads that bisect the standard 300-foot buffer. Modeling indicates that Unit 491 could generate 84 pounds of sediment, but nothing is anticipated from Unit 460 (Project File Exhibit M-6). The sediment would be captured by the uphill road ditch. The BMP work on NFS road #9653 would prevent sediment from being delivered to a stream.

No sedimentation is anticipated from the broadcast burns of Units 313 and 314. Although the burns would have otherwise only scoured a small amount of sediment, Alternative 3 Design Criteria would require firefighters to keep the burn out of the riparian areas. To achieve this, firefighters would need to build line 50 feet from the streams. This alternative would keep the riparian area unburnt and, therefore, no sediment could reach Beaver Creek.

The net impact of all the actions described is a pulse of about 9,600 pounds of sediment, plus a small unquantifiable addition from culvert replacements on intermittent tributaries. At the same time, this alternative would halt 874 pounds of chronic erosion and possibly prevent 59,600 pounds in the event of a culvert failure. These positive and negative changes are small in comparison to Beaver Creek's estimated natural sediment load of 1,298,875 pounds per year. While Alternative 3 does create less sedimentation than Alternative 2, the scale of the difference is inconsequential.

#### WATER TEMPERATURE

Alternative 3 has a slight benefit to water temperature. Similar to Alternative 2, this alternative has reduced potential of a large wildfire. A fire would kill riparian trees and, thus, reduce stream shade and expose the stream to more solar radiation. Alternative 3 also includes re-contouring and decommissioning 0.7 miles of NFS road #91162 and 1.2 miles of NFS road #9656, just like Alternative 2. This act would help restore groundwater movement. This would be a positive change for Beaver Creek's water temperature, but the scale may be too small to detect. Only 5 acres of vegetation management is proposed in Beaver Creek RHCAs (Units 460 and 491). These units are uphill of existing roads and not really riparian areas. The vegetation management in these 5 acres would have no impact to water temperature.

#### HABITAT COMPLEXITY

Alternative 3 has no direct impact to habitat complexity, since it defers the free-standing fish barrier and also defers Units 4108 and 4110.

### AQUATIC SPECIES

Alternative 3 defers the free-standing fish barrier on Sunset Creek and instead, replaces the culvert on NFS road #9658 with a barrier culvert. This means that the area remaining to cutthroat trout would decrease from 1.8 miles to 1.2 miles. Since it appears that the cutthroat trout population presently has roughly equal density either above or below the culvert, reducing the total length of the population by a third would correspond with reducing the population by a third. Therefore, the estimated total cutthroat trout population would be about 155 age 1+ fish per 100 meters.

## ALTERNATIVE 3 – ACTION ALTERNATIVE CUMULATIVE EFFECTS

### HYDROLOGIC PROCESSES

Similar to Alternative 2, the cumulative effects of past, present, and future actions along with Alternative 3 would mean that water yields may increase from 12 percent over baseline to 23 percent for a year and then steadily decline (Project File Exhibit M-8). This is within the natural range of variability of Beaver Creek and, therefore, assumed to have no adverse impact to stream channel conditions.

### WATER QUALITY

As described earlier, there is no evidence that stream substrate in Beaver Creek is experiencing a deteriorating trend from past and present cumulative effects. Therefore, implementation of Alternative 3 would likewise not result in impaired fish habitat. There are no other reasonably foreseeable actions that would cause sedimentation. Alternative 3 would reduce the potential for a severe wildfire; but since Beaver Creek normally experienced periods of fire and periods without fire, this action would be within Beaver Creek's normal range of variability.

In consideration of potential climate change, Alternative 3 could help improve Beaver Creek's water temperature resiliency. The alternative reduces the potential of a large wildfire and also has a slight benefit to groundwater movement by removal of two particular roads.

However, the reduced potential of a large wildfire would also mean delaying a normal disturbance event that provides habitat complexity to streams. This is not necessarily desirable, but Beaver Creek would still have good habitat complexity throughout the analysis timeframe. There are no reasonably foreseeable actions that would affect habitat complexity.

### AQUATIC SPECIES

In consideration of cumulative effects from past introduction of non-native species, Alternative 3 would have a positive impact for a short time. The Peterson et al (Peterson et al. 2008) model indicates that with Alternative 3 cutthroat trout would have about a 20 percent likelihood of persistence (Project File Exhibit M-9). This is twice as good as Alternative 1, but less than the 50 percent likelihood modeled for Alternative 2. The culvert barrier would keep out brook trout, but the small cutthroat trout population may succumb to a random event (fire, flood, drought, disease) and not be able to recover. Random events are impossible to predict. It may not happen in the analysis timeframe, and the cutthroat trout might survive just fine. The District Fisheries Biologist is aware of several extremely small cutthroat trout populations (less than 100 individuals) in the Swan River Valley that have persisted for decades above inadvertent culvert barriers, but also aware of one population that did not survive. This analysis assumes that Alternative 3 would "buy some time" for the remnant cutthroat trout population, but does not assume they would persist the entire analysis timeframe.

All other aquatic species in the Beaver Creek watershed would remain the same as described for Alternative 2. As described earlier, the alternative would not alter sediment, water temperature, or habitat complexity, and, therefore, would not alter species composition.

# LINDBERGH LAKE

## EXISTING CONDITION

### HYDROLOGIC PROCESSES

Average annual precipitation ranges from 40 inches around Lindbergh Lake to 110 inches in the extreme headwaters by Lowary Peak and Mountaineer Peak. Most of this precipitation comes as snow during the winter months. There are several permanent snowfields and three glaciers in the analysis area. The upper portions of the watershed are largely exposed bedrock with minimal vegetation, whereas the area surrounding Lindbergh Lake is heavily forested. Runoff typically peaks in early June and base flows are not achieved until late August.

The primary source of water contribution to Lindbergh Lake is the inlet river, the Swan River. Discharge of this river can range from around 570 cubic feet per second (cfs) during normal peak flows to a base flow of about 45 cfs (Ellis et al. 1998). In comparison, the streams along the north and south shores contribute a much smaller amount. Herrick Run, the largest of these, has a peak discharge of about 40 cfs and a base flow of 1 cfs (Ellis et al. 1998). The outlet of Lindbergh Lake, also called the Swan River, averages 98 cfs over the year (Knudson 1994). The inlet and outlet rivers move so much water through Lindbergh Lake that hydrologists calculate it replenishes all its water about every 5 to 6 months (Ellis et al. 1998; Knudson 1994). The inlet river is entirely within the Mission Mountains Wilderness and hydrologic processes are entirely natural. Because the inlet river dominates the lake's water budget, the hydrologic processes of the Lindbergh Lake analysis are assumed to be in reference condition. A 2-year study of the inlet river found 21 percent change in peak flows between the years, indicating that the natural hydrologic process accepts a wide natural variation (Ellis et al. 1998).

## WATER QUALITY

The water quality discussion for this analysis area focuses on physical water quality of Lindbergh Lake and sedimentation. These are the only factors that could be potentially impacted by the project.

### PHYSICAL WATER QUALITY

The physical water quality of Lindbergh Lake is excellent. Lindbergh Lake is 817 acres with the deepest spot at about 125 feet. It rests in a U-shaped, glacial formed valley with steep adjacent slopes. Lindbergh Lake is considered an oligotrophic lake (Ellis et al. 1998), which means it has low nutrient content and relatively unproductive for plant and animal life. Oligotrophic lakes tend to have clear water, low total phosphorus, low total nitrogen, and low chlorophyll *a* concentrations (common indicator of algal growth). During scoping of this project, several comments were received that indicated some landowners drink unfiltered water from the lake.

The earliest known water sample in Lindbergh Lake was a 1975 measurement of water clarity, which recorded a Secchi disc was visible at 33 feet (Knudson 1994). The deeper the disc is visible, the greater the water clarity. Since that period, there have been three water quality studies in the lake.

When PCTC announced their 1990 harvest plans in the Herrick Run basin, Lindbergh Lake landowners hired a consultant for pre- and post-study water quality analysis. One sample period was collected in 1989 (pre-project), and then three post-project sample periods were collected from 1991 to 1993. This study found decreased Secchi disc and increased total phosphorus (indicators of deteriorating water quality) in 1991, and then return to pre-project levels in 1992 and 1993. There was no change in dissolved oxygen or nitrate nitrogen during that period (Knudson 1994). The report concluded that Lindbergh Lake “has exceptionally good water quality. Some degradation to this (lake’s) water quality was detected during the 1991 sampling episode but the lake appeared to largely recover from this disturbance in 1992 and 1993” (Knudson 1994). Unfortunately the study could not calculate natural variation in the lake over time. There is no statistical inference on whether the PCTC harvest had significant or insignificant impact.

The University of Montana provided a water quality characterization in 1996 and 1997 (Ellis et al. 1998). This study found similar Secchi disc depths and dissolved oxygen from previous studies. However, the 1996 to 1997 characterization found even less total phosphorus and nitrate nitrogen than the 1989 to 1994 study (e.g., superior water quality). This report also recorded chlorophyll *a* concentrations for the first time. The authors note different study techniques from Knudson (Knudson 1994) and do not claim any change over time (Ellis et al. 1998).

Volunteers have monitored Secchi disc depth, dissolved oxygen, total phosphorus and chlorophyll *a* concentrations intermittently from 1997 to 2012 (most recent year available). Secchi disc, total phosphorus and chlorophyll *a* concentrations had not changed from previous studies. Dissolved oxygen, however, was substantially lower in 2006 than any other year ever sampled for unknown reasons (Whitefish Lake Institute 2012). Volunteer monitoring has confirmed that Lindbergh Lake remains oligotrophic.

### SEDIMENTATION

Sedimentation into streams can adversely impact fish habitat, as described in the Beaver Creek analysis area discussion, and can also impact water quality of a lake. Nutrients are bound to sediments and, thus, as sedimentation increases, it releases more nutrients into the lake which then reduces water quality.

A 1998 habitat inventory of 1.5 miles of the inlet river found extremely low amounts of fine sediments (Project File Exhibit M-13). The $D_{50}$ of substrate was cobble-sized rocks (120 to 200°millimeters diameter [4.7 to 7.8 inches]), which indicates large materials in such a powerful stream. The University of Montana's water quality study found the inlet river has very low total suspended solids, even during peak flows (Ellis et al. 1998). This also indicates the inlet river has very little sedimentation input to the lake. Because the inlet river lies within the Mission Mountains Wilderness, the sedimentation status is considered natural.

Data collected by Ellis et al. (1998), Knudsen (1994) and local volunteers (Whitefish Lake Institute 2012) indicate that water quality of Lindbergh Lake has not been impacted by sedimentation from land management. Therefore, it is concluded that private residential development has thus far not impacted the lake. Fire suppression of the 2008 Lindbergh Lake Fire (at the inlet) also apparently had no impact. Past timber management in the Herrick Run drainage may have had a short-term impact, but it is uncertain if this was significant compared to natural variation. The recent Glacier Loon Project completed decommissioning of several forest roads in the Herrick Run watershed (the remaining actions have not yet been completed). During the road decommissioning work, several culverts on intermittent channels were removed. Although this was modeled to generate a very small amount of sedimentation it would be too small to detect in the lake (Project File U-8).

## AQUATIC SPECIES

Lindbergh Lake is a popular recreational fishery and averages about 960 fishing days per year (MFWP 2015). The primary fishery is non-native Kokanee salmon (*Oncorhynchus nerka*), which are regularly stocked, plus also a fishery for rainbow trout and cutthroat trout.

Lindbergh Lake contains a bull trout population that is traditionally considered "disjunct" or separate from other bull trout populations (Montana Bull Trout Scientific Group 1996; USDI 2014c). Recreational harvest of bull trout is prohibited. Both Lindbergh Lake and the inlet Swan River are designated as critical habitat for bull trout, illustrated on Figure 46  The fish spawn in a certain low-gradient patch just 150 meters (492 feet) long in the inlet river. Juvenile bull trout appear to get swept into the lake when just a few months old as evidenced from a 2011 sample that failed to capture any juvenile fish in the river. Immature fish mature slowly in Lindbergh Lake while foraging on smaller prey species. Mature fish subsequently return to spawn in the location they originated from when they are around 6 to 7 years old. Redd counts have been conducted intermittently since 1994. Redds have ranged from 26 to 7 and exhibit no upward or downward trend, as shown on Figure 47.

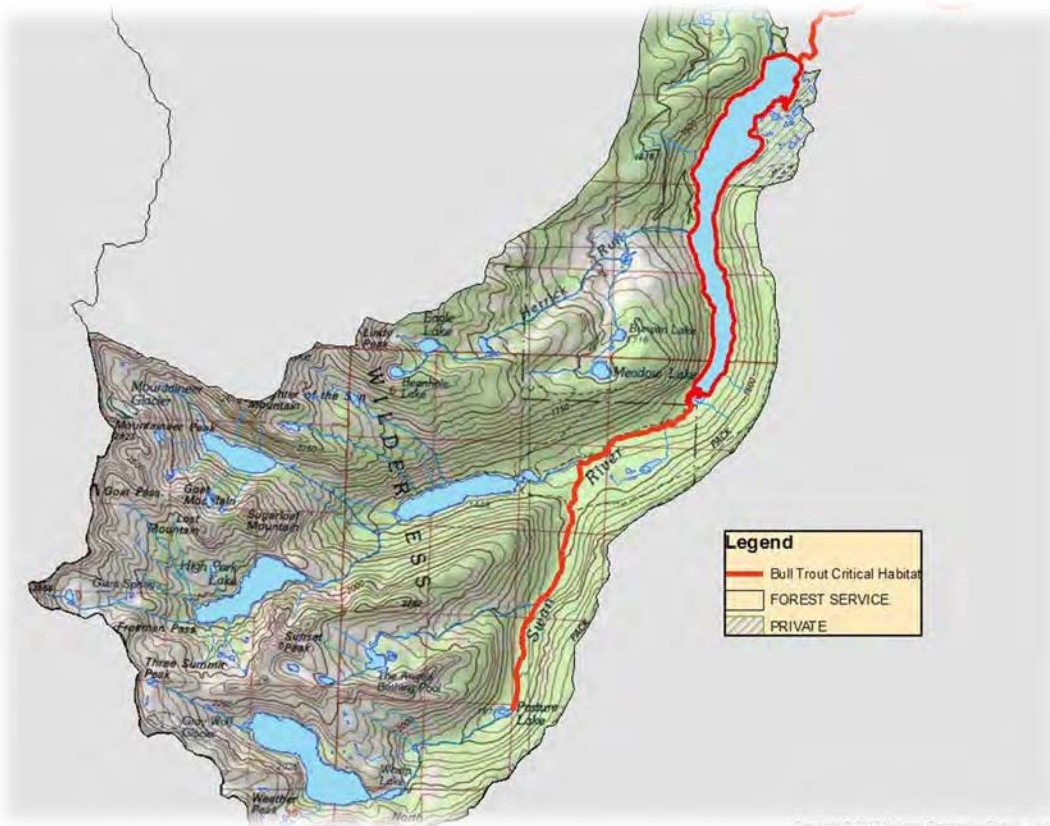


FIGURE 46. MAP OF LINDBERGH LAKE WATERSHED AND LOCATION OF BULL TROUT CRITICAL HABITAT.

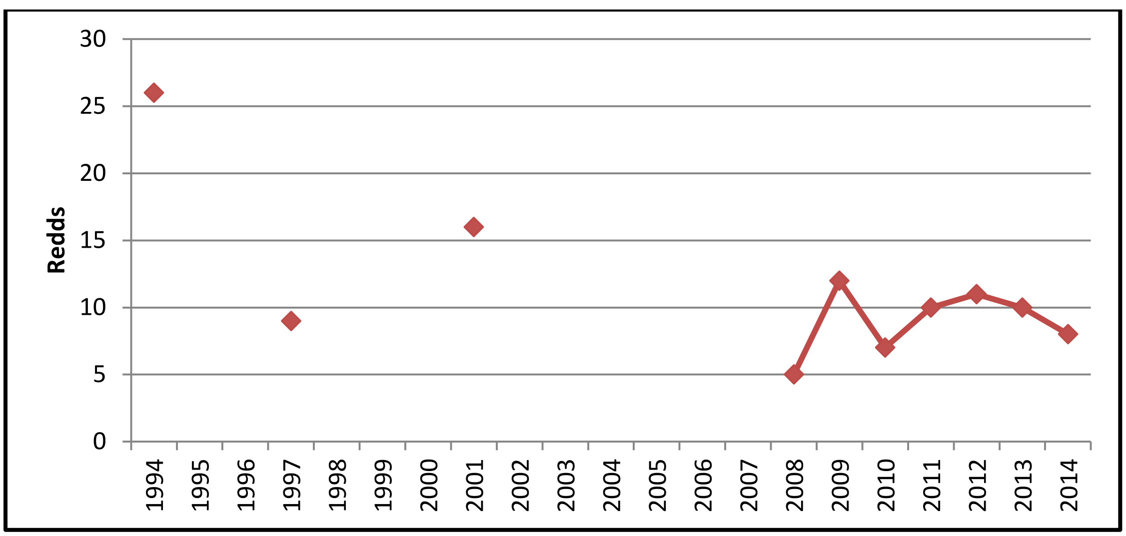


FIGURE 47. BULL TROUT REDDS IN INLET RIVER TO LINDBERGH LAKE.

The traditional concept that the outlet river is a thermal barrier to bull trout migration has been challenged by two discoveries. A 2011 genetic assignment of Swan Lake bull trout could not fully explain some of the redds, suggesting that some bull trout from Lindbergh Lake (or Holland Lake) may be moving downstream and spawning elsewhere (DeHaan et al. 2011). This may help explain how a perceived large bull trout population in Lindbergh Lake has been maintained by such a low number of redds. The other challenge is the new invasion of non-native lake trout

(*Salvelinus namaycush*) into Lindbergh Lake. Lake trout apparently migrated into Lindbergh Lake without any difficulty from a thermal barrier.

The invasion of lake trout poses a serious threat to the persistence of bull trout in Lindbergh Lake. Bull trout numbers in many lakes have sharply declined after successful colonization by lake trout. A study in Swan Lake found that juvenile lake trout compete with juvenile bull trout for *Mysis diluviana* (a non-native freshwater shrimp), and then adults compete for prey fish, particularly focusing on Kokanee salmon (Guy et al. 2011). Lindbergh Lake does not have *Mysis diluviana,* so juvenile survival may be low and population growth would be slow. The lake, however, does have Kokanee salmon. Researchers from USGS and the USFWS have identified several locations in Lindbergh Lake with suitable lake trout spawning habitat. This analysis assumes that the lake trout population would slowly and steadily increase to the detriment of bull trout.

Cutthroat trout, of unknown genetic purity, are also found in Lindbergh Lake. The population is stocked nearly annually, but may also have some wild recruitment from upstream. There are cutthroat trout in the upper Swan River, Crystal Lake, Gray Wolf Lake and High Park Lake. The population dynamics of cutthroat trout in this analysis area are unstudied, and there is uncertainty if each lake is independent or if fish move freely enough as one large population. The cutthroat trout found in the Swan River between Crystal Lake and Gray Wolf Lake are 99.8 percent genetically pure with very slight introgression with rainbow trout. Rainbow trout alleles (any of the alternative forms of a gene or other homologous DNA sequence) likely came from past stocking of rainbow trout in Crystal Lake and Lindbergh Lake. This population is one of the 22 cutthroat trout populations in the Swan Valley with conservation value.

Other species found in the Lindbergh Lake analysis area consist of Northern pikeminnow (*Ptychocheilus oregonensis*), largescale suckers (*Catostomus macrocheilus*), finescale suckers, mountain whitefish (*Prosopium williamsoni*), pygmy whitefish (*Prosopium coulterii*), and brook trout.

## ALTERNATIVE 1 - NO ACTION ALTERNATIVE DIRECT AND INDIRECT EFFECTS

### HYDROLOGIC PROCESSES

This alternative has no activity and no direct effect to hydrologic processes. As an indirect consequence of No Action, the watershed may experience a large wildfire, just as it has experienced periodically for many centuries. A large wildfire may result in increased peak flows into Lindbergh Lake for a few years until vegetation returns. This indirect effect is normal for hydrologic processes.

### WATER QUALITY

This alternative has no activity and no direct impact to water quality. However, this alternative does have an indirect effect due to increased risk of a wildfire. The Lindbergh Lake watershed has experienced many wildfires in the past, and this alternative does not mean that any future wildfire would be more severe than normal. Wildfires can result in short-term changes to water quality. A study conducted during a 1988 wildfire in a tributary of the North Fork Flathead River found a substantial spike in phosphorus and ammonium (a formulation of nitrogen) due to ash fall and input of charred timber. This disappeared within a few days and then another spike was observed the following spring as water moved across exposed ash and char (Spencer et al. 1990). The consequence of increased nutrients in Lindbergh Lake leads to increased algal productivity and reduced water quality. This change would be detectable with current volunteer monitoring protocols for chlorophyll a concentrations and total phosphorus, and may also be detectable with the Secchi disc. However, since Lindbergh Lake replenishes its water volume roughly every 5 to 6 months, this change would only be temporary and would return to baseline condition after 5 to 6 months. Lindbergh Lake has likely experienced nutrient inputs from fires before; and yet over the long term, water quality has remained excellent.

### AQUATIC SPECIES

The No Action Alternative has no direct or indirect effect to aquatic species composition. Any indirect effect from wildfire would still retain natural hydrologic processes and water quality and thereby not affect fish habitat or aquatic species.

## ALTERNATIVE 1 - NO ACTION ALTERNATIVE CUMULATIVE EFFECTS

### HYDROLOGIC PROCESSES

As described earlier, the inlet river dominates Lindbergh Lake's water budget. The inlet river is within designated wilderness and there has been no past, present or reasonably foreseeable actions that have impacted the river or its role with Lindbergh Lake hydrologic processes. Past land management around the lake, including private land clearing and prior PCTC timber harvest, had no measurable impact to hydrologic processes. Equivalent Clearcut Analysis modeling computed that these activities only increased the water yield to the lake by 0.9 percent (Project File U-8). The 2-year study conducted by Ellis et al. (1998) found 21 percent natural variance and, therefore, the 0.9 percent increase is within variance and has not impacted the lake. The only reasonably foreseeable activity in the analysis area is the Glacier Loon Project, which includes approximately 325 acres of commercial and pre-commercial vegetation management. This project is modeled to increase water yield by 1.1 percent and thus still not detectable to the lake's hydrologic process (Project File U-8). There are no cumulative effects to Lindbergh Lake's hydrologic processes.

### WATER QUALITY

In consideration of cumulative effects, past and present actions that could have impacted water quality in Lindbergh Lake include private land development and installation of septic systems, past timber harvest by PCTC and decommissioning of several roads in the Herrick Run drainage. However, as described earlier, water quality monitoring of the lake has not found an adverse impact and Lindbergh Lake has good water quality and very low sedimentation rate.

There are no reasonably foreseeable activities that could directly impact water quality. No new residential subdivision on the lake is proposed. As septic systems age, they can negatively impact the lake's water quality, but it is also possible that homeowners would adequately maintain or replace their systems. This analysis does not speculate on the maintenance of private septic systems. The remaining work yet to be completed with the Glacier Loon Project (including about 325 acres of vegetation management, temporary roads, and replacement of a culvert that blocks fish passage) are not anticipated to have any impact on water quality in Lindbergh Lake (Project File U-8). Without any reasonably foreseeable changes, long-term water quality should remain excellent.

### AQUATIC SPECIES

In consideration of cumulative effects, the past actions that introduced fish species had a profound impact (both intentional stocking of rainbow trout and brook trout as well as illegal introduction of lake trout). There are no reasonably foreseeable actions that would change aquatic species. It is likely that the lake trout population would slowly grow and exert increasing pressure on the bull trout population. There are no proposals to slow or halt lake trout expansion. Bull trout numbers would decline within the analysis timeframe.

Cutthroat trout would remain numerous, especially because of frequent stocking, but would decline in genetic purity. Rainbow trout are present in the analysis area. There is no barrier to block rainbow trout or hybridized cutthroat x rainbow trout from moving into the upper Swan River and spawning with cutthroat trout, resulting in further hybridization. Brook trout are present in the analysis area, primarily in the first few miles of the inlet river. There is nothing to stop them from moving upstream into the upper Swan River except for the long reaches of high gradient. Brook trout can negotiate the high gradient, but are slow to successfully colonize it. It is uncertain if they would colonize and displace the cutthroat trout of the upper Swan River within the analysis timeframe.

## ALTERNATIVES 2 AND 3 – ACTION ALTERNATIVES DIRECT AND INDIRECT EFFECTS

In consideration of Aquatic Resources, Alternatives 2 and 3 have the exact same impact to the Lindbergh Lake analysis area. Both alternatives include the same prescribed fire in the wilderness, the same temporary road construction, the same road decommissioning and same placement of roads into ISS. They have similar vegetation management proposals, but Alternative 3 defers Unit 83 (24-acre commercial thin) and Unit 237 (10-acre improvement cut). The additional or removal of these two units does not change the effects to hydrologic processes, water quality, or aquatic species. . As described below, the proposed timber harvest has no potential for erosion and, thus, has no impact to aquatic resources.

### HYDROLOGIC PROCESSES

Neither Alternative 2 nor Alternative 3 would have any adverse impact to hydrologic processes. The proposed prescribed burns in the Mission Mountains Wilderness consist of 4 percent of the entire watershed. The burn is intended to primarily burn the understory and unlikely to result in stand replacement of the entire area. This means that any hydrologic response in the inlet river would be fairly minor and mimic a small, natural disturbance. The inlet river naturally has a wide range of variance, and the burn would have no noticeable direct or indirect effect.

The total vegetation harvest ranges from 116 to 149 acres of commercial and non-commercial harvest (varies by alternative). These represent just 0.5 percent of the watershed. The combination of the prescribed burns and the vegetation treatments is only 4.5 percent of the watershed. Equivalent Clearcut Analysis modeling was not completed for such a small amount of activity, but even if all of the harvest units and prescribed burns were modeled as clearcuts, this would mean the alternatives would increase water yield by 4.5 percent over baseline. This level of disturbance is well below the observed natural variability of 21 percent and, therefore, has no impact to hydrologic processes.

### WATER QUALITY

Alternative 2 and 3 have one activity with potential impact to water quality and that is the 1,104-acre prescribed burn in the Mission Mountains Wilderness (Units 308 and 309). This burn consists of 4 percent of the watershed. The prescribed burn would be ignited during the fall and some ash may settle in Lindbergh Lake while the area is actively burning. If the ash fall is large enough, it may result in a short-term spike in phosphorus and nitrogen in Lindbergh Lake. Algae, however, would not respond because the lake is too cool in the fall to promote growth; and then the lake freezes over, halting all algae. The water volume with this ash fall would cycle out before algae can take advantage of the nutrients next spring.

The following spring, some surface runoff is possible in the burn area, even though there are no mapped streams. Small rivulets are expected due to the lack of vegetation after the fire and very steep slopes (60 to 80 percent average gradient). These rivulets would pick up sediments and nutrients and may transport them to either Crystal Lake or the inlet river. Any deposition into Crystal Lake would settle there, but 688 acres of the prescribed burn may lead to deposition into the inlet river. In order to estimate deposition into the river, the Forest Hydrologist used GIS analysis to profile the mountainside and potential rivulets. Then, he incorporated the potential erosion rates for the current unburned mountainside at various precipitation scenarios with a model called Disturbed WEPP (Project File Exhibit M-14). Normally the mountainside does not erode; but with flood events greater than 15-year return intervals, sediment delivery to the river is possible. The erosion rate was then calculated for a low-intensity burn. Although the riparian area beside the inlet river is not included in planned ignition, some spot fires may burn in the riparian area. In order to err on the side of caution, the analysis looked at the potential effects should the entire riparian area were to burn. Results indicate that a low-severity prescribed burn would contribute no additional sediment during normal runoff years, but some sedimentation is possible with 6-year flood events or greater. When averaging the sediment input from multiple flood event scenarios (ranging from 1.5-year to 30-year flood events), the model indicates 13,180 pounds of sediment could reach the inlet river. This is a worst-case scenario. There is between 47 to 97 percent probability that spring runoff would be mild enough to result in no erosion (Project File Exhibit M-14). It is also possible that the riparian area would not be burned as was the case with a similar prescribed burn project in the Piper Creek watershed, implemented in 2014, and no fire reached the riparian area.

To put this in perspective, normal sediment transport of the river is computed from measurements of total suspended solids recorded by Ellis et al. (1998). During the spring runoffs in 1996 and 1997, the inlet river transported an average of 1.46 mg/l during runoff periods greater than 300 cfs. By computing an average daily discharge, the total suspended solids transported during the entire runoff is estimated at about 196,154 pounds (Project File Exhibit M-15). Consequently, the worst-case scenario of the prescribed burns is a pulse of 7 percent increase over normal load. A pulse of 7 percent increase is not extraordinary. The Disturbed WEPP model notes that a natural 15-year flood event, without any fire, would generate a pulse of 17 percent increase over baseline (Project File Exhibit M-14).

The first spring after the fire, the river would transport any sediment generated by the fire to Lindbergh Lake. Nutrients are bound to sediment, so any sediment input into the lake could increase nutrients. A one-time, worst-case scenario pulse of 7 percent more sediment may be detectable for those monitoring total phosphorus or nitrogen in the lake. It is unlikely to be large enough to a response in algae growth. Without a response by algae, the water quality metrics of Secchi disc depth, chlorophyll *a* concentration and dissolved oxygen would be unchanged. People who drink unfiltered water from the lake would not detect any foul odor or taste. After 5 or 6 months, the water volume in the lake would cycle out and subsequent water quality sampling would not be able to detect anything different from previous conditions. No further sediment or nutrient input would be anticipated after the first spring runoff, since new vegetation in the burn area would quickly capitalize on new sunlight and exposed soils and capture nutrients. Lindbergh Lake would continue to be oligotrophic and contain high water quality.

The small rivulets in 688 acres of the burn area are the only possible impact to water quality. The Design Criteria of the burn is to avoid lighting any of the riparian area beside the inlet river. The burn would be implemented with helicopters and requires no hand lines or machine lines to contain the fire. Both of these Design Criteria greatly minimize sedimentation into the river. It is recognized that some small spots may burn outside the ignition area within the Crystal Lake watershed or Herrick Run watershed or on the north side of the inlet. These spot fires are not anticipated to burn large areas and would not be sources of ash input or sediment. The spot fires would not impact stream shade, large woody debris, pools, or stream banks.

The action alternatives would have no other impact to water quality. Alternative 2 has a total of about 92 acres of commercial vegetation management within the watershed. This consists of 58 acres of commercial thinning (Unit 83 and a portion of Unit 102), 34 acres of improvement cut (portions of Units 235 and 237) and 0.2 acres of regeneration harvest (small sliver of Unit 84). The alternative also has 57 acres of pre-commercial thinning. The closest unit (Unit 83) is 300 feet from the lake shore. In response to public concern, these units were validated in that they had no surface water, no springs or seeps, and no means to erode into the lake. While commercial harvest would scarify the soil in localized areas, it would not result in sheet or rill erosion that leaves the unit. Without any physical means for sediment or nutrients to reach the lake, these units have no potential to impact water quality. Alternative 3 has almost the same units, but defers Units 83 and 237. Since these units had no impact, their addition or deletion would not change effects to water quality.

The alternatives have minor activity associated with roads within the Lindbergh Lake analysis area. National forest system roads #10737 and 10739 would have waterbars cut into the roads after harvest is complete and the roads placed into ISS. These roads are upland roads (no streams) and would have no impact to water quality. National forest system road #10740 is overgrown and would be passively decommissioned, thus it also has no impact to the lake. About 1 mile of temporary road A1 follows the ridge line between Lindbergh Lake analysis area and Beaver Creek analysis area. This historic road would be fully re-contoured when the project is complete, but it would have no positive or negative impact to water quality. The road has no stream crossings and no means for any sediment to reach the lake.

Alternatives 2 and 3 would not eliminate the potential for a large wildfire in the Lindbergh Lake watershed, but the prescribed burning that is proposed would make the fire less likely to leave the wilderness and burn the Lindbergh Lake shoreline. It may also allow fire managers to allow fire to play a natural role on the landscape. Since the majority of the watershed has the same fire potential as Alternative 1, the alternatives have equal potential for indirect effect on water quality due to wildfires. Any wildfire impact would be temporary since the lake replenishes its water volume about every 5 or 6 months.

## AQUATIC SPECIES

Alternatives 2 and 3 would have no impact to aquatic species. As described earlier, the alternatives are not anticipated to trigger increased algae growth in Lindbergh Lake. Water quality metrics of dissolved oxygen, water clarity (Secchi disc), and chlorophyll *a* concentration would be unchanged. The lake would remain oligotrophic and fully capable of supporting the existing aquatic species. Bull trout critical habitat in the lake would not be adversely impacted.

The habitat in the inlet river is also largely unaffected by the alternatives. The majority of the inlet river is a large channel with high gradient, thus high sheer stress (the force applied by flowing water parallel to the stream bed or bank). Dominate substrate are boulders and cobbles so any fine materials that could erode into the stream from the prescribed fire would be quickly swept into the lake. The best available information indicates that juvenile bull trout do not rear in the river and would be unaffected by any sediment transport.

Bull trout spawn only in one short patch (roughly 150 meters [0.1 miles] long) that has low gradients with smaller gravel substrates. Design Criteria has been developed that restricts noise from helicopters from disturbing bull trout in the spawning patch. This small spawning patch has less sheer stress and could allow fine sediments to settle on the stream surface. Bull trout are sensitive to fine sediments (less than 1 mm [0.04 inch) diameter) deposition on spawning gravels. Fine sediments that cover eggs reduce oxygen exchange and, thereby, reduce egg survival (Bowerman et al. 2014).

The bull trout spawning patch is located upstream of most of the 688 acres of prescribed fire that is parallel to the inlet river. Fine sediments cannot travel upstream. Therefore, only 167 acres of the prescribed burn has any potential to erode into bull trout spawning area. This is 24 percent of the area computed earlier for potential impacts to the river. So, the worst-case scenario of a 7 percent pulsed increase along the length of the river means just a 2 percent increase of sediment in the sensitive bull trout spawning patch. This potential worst-case scenario would not be detectable in fish habitat. Habitat monitoring in nine Swan River Valley streams in unmanaged, reference condition has found fine sediments have a variance of 23 percent from year to year. The MFWP's 26-year study of a key bull trout stream in an unmanaged watershed (Elk Creek) has a 10.5 percent variance (Project File Exhibit M-16). Thus, both datasets indicate that a worst-case scenario of a 2 percent increase of fine sediment falls within natural stream variance over time. This would be an undetectable change and would not impair bull trout spawning success. Bull trout critical habitat in the stream would not be adversely impacted.

# ALTERNATIVES 2 AND 3 – ACTION ALTERNATIVES CUMULATIVE EFFECTS

## HYDROLOGIC PROCESSES

As described with the No Action Alternative, past actions such as land management and residential development have increased water yield by only 1.1 percent over baseline and, therefore, the hydrologic processes are within natural condition. The implementation of either Alternative 2 or 3 would result in vegetation removal (either by prescribed fire or harvest) in 4.5 percent of the watershed. Although these actions are not clearcuts, if they were modeled as such, the cumulative ECA of the watershed would be 5.6 percent over baseline. This is well below observed natural variance of 21 percent. There are reasonably foreseeable actions that would affect the lake's water budget. The hydrologic processes of Lindbergh Lake would remain in natural condition.

## WATER QUALITY

As was described earlier in the existing conditions section, water quality monitoring conducted in Lindbergh Lake (1994, 1998, and 2012) not detected effects to water quality from land management and residential development occurring in the watershed. There are no reasonably foreseeable actions that would impact water quality

The worst-case scenario modeling of Alternatives 2 and 3 are a pulse of 7 percent more sediment entering the lake. This scenario assumes the riparian area along the inlet river burns and also that there is a flood event the first spring following the prescribed burn. A 7 percent increase of sediment is not extraordinary and less than what normally occurs in a 15-year flood event (Project File M-14). This pulse of sediment is not large enough to trigger algae growth and Lindbergh Lake would continue to have high water quality. Given how the water volume in the lake cycles out after 5 or 6 months, this project would not contribute to any cumulative effect to water quality.

## AQUATIC SPECIES

In consideration of cumulative effects, it is noted that past legal and illegal introductions of non-native fish have resulted in a profound effect on native species. As described earlier, bull trout numbers in Lindbergh Lake are anticipated to decline due to the expansion of non-native lake trout. There are no reasonably foreseeable actions to halt the expansion of lake trout in order to conserve bull trout in Lindbergh Lake and the activities proposed in Alternatives 2 and 3 will not contribute to this cumulative effect. The alternatives would have no effect to Lindbergh Lake itself and an undetectable effect to the spawning area. The amount of sediment that could reach the spawning area, even in a worst-case scenario, is too small to distinguish from natural variance. Bull trout critical habitat would not be adversely affected. Bull trout are anticipated to decline in numbers due to non-native species invasion, and the implementation of Alternative 2 or 3 will not contribute to this decline.

Cutthroat trout have also been negatively impacted by introduction of brook trout and rainbow trout in the analysis area. There are no reasonably foreseeable actions that would affect fish distribution. The District Fisheries Biologist estimates that the genetic purity of the cutthroat trout would decline during the analysis timeframe from 99.8 percent to approximately 95 percent pure due to hybridization with rainbow trout. Brook trout may also move into the upper Swan River although it is uncertain if they would be able to successfully colonize it. These fish would still be one of the 22 populations in the Swan River valley with conservation value, albeit at a lower value. Spawning and rearing habitat is located in the upper Swan River, not the inlet river. No activity is proposed in the upper Swan River and Alternatives 2 and 3 do not contribute to any cumulative effect.

# SWAN RIVER VALLEY

## EXISTING CONDITION

### HYDROLOGIC PROCESSES

The Swan River Valley has largely natural hydrologic processes. There are no dams or reservoirs in the watershed. There are very few water diversions on tributaries (none on the main river) and in-stream flows appear to be in natural condition. The high elevations on both the east side and west side of the valley are predominately un-roaded and unmanaged. These high elevation areas gather the most precipitation and govern the stream flows below, so their natural condition has benefited hydrologic processes.

The Swan River has remained unconfined and permitted to move across the valley floor. Woody debris is abundant and multiple log jams make navigation on the river challenging. A review of aerial photographs of the river from 1934 to 1985 found no evidence that land management has resulted in increased river erosion or channel instability (Grant et al. 1989). A 2001 assessment by the DEQ found the river to have very little bank erosion and no evidence of anthropogenic degradation of stream banks (Montana Department of Environmental Quality 2004). The river is not listed as impaired on the 303(d) list by DEQ. A 2012 nation-wide assessment of watershed conditions, known as the Watershed Condition Framework, found 20 out of the 23 sub-watersheds were “functioning appropriately.” Three sub-watersheds were considered functioning at risk, namely Beaver Creek, Cold Creek, and Jim Creek; none were listed as impaired.

#### WATER QUALITY

Swan Lake is the downstream terminus of the Swan River Valley analysis area and thus water quality of the lake reflects the overall, cumulative condition of the analysis area. Swan Lake is classified by DEQ as an A-1 water body, meaning it is suitable to drink, culinary uses, bathing and recreation, and propagation of salmonids. However, the DEQ classifies Swan Lake as “threatened” (a lesser risk than impaired). The lake is considered threatened because of excessive particulate organic carbon (nutrient) and low dissolved oxygen levels on the lake bottom. The source of this condition is uncertain. It may be a natural state due to the large wetland adjacent to the southern shore or it may be from anthropogenic causes or both. If it is anthropogenic, the sources are either timber harvest and associated roads or private land development (including septic systems and riparian clearing) (Montana Department of Environmental Quality 2004). Two particular tributaries, Jim Creek and Goat Creek, are classified as “impaired” from elevated sediment levels and habitat degradation

In 2004, the DEQ prepared a Total Maximum Daily Load (TMDL) report that outlines conservation requirements and recommendations on recovery of Swan Lake, Jim Creek and Goat Creek. The TMDL for Swan Lake is no further increase of nutrients. Water quality monitoring must not have a deteriorating trend. The TMDL report recommended a 40 percent reduction of erosion from forest roads, protection of stream banks, minimizing impacts of timber harvest, and maintenance of private septic systems. Since 2004, a collaborative group has focused on reducing erosion from the existing road network in Cold Creek, Beaver Creek, and Elk Creek watersheds. A 2011 inventory of the road network found that the original problems have been largely resolved, and the TMDL is achieved (Atkins 2012). Furthermore, water quality monitoring on the lake has not found a deteriorating trend (Koopal 2012).

#### AQUATIC SPECIES

The Swan River Valley has many aquatic species. Bull trout and westslope cutthroat trout are considered MIS in that they best represent the health of all other aquatic species. Bull trout are protected by ESA and critical habitat is designated along the length of the Swan River, from Lindbergh Lake to Swan Lake.

The bull trout of the Swan River Valley consist of one core population (USDI 2014c). Bull trout spawn in 12 tributary streams distributed along the length of the Swan River Valley. The juvenile fish rear in the tributaries for 2 or 3 years and then migrate to Swan Lake to mature. Until recently bull trout had maintained a strong, stable population in the Swan River Valley (Montana Bull Trout Scientific Group 1996). A limited recreational fishery in Swan Lake was permitted until 2012. However, redd count monitoring in the 12 tributary streams has observed a downward trend. This decline is uniform in all tributaries. Thus, the apparent cause is the new establishment of non-native lake trout in Swan Lake. It is unlikely the cause is habitat loss in any stream since all spawning tributaries are trending equally. Suppression of lake trout began in 2009. From 2011 to 2014 (most recent data available) bull trout redds counts have stabilized, suggesting the project has prevented further bull trout losses.

Cutthroat trout were once very widespread and occupied almost every tributary. The population may have consisted of multiple resident populations in tributaries plus, perhaps, some migratory fluvial fish that reared in the Swan River. They were not present in high-elevation mountain lakes. In recent years, the distribution of cutthroat trout in tributaries has sharply declined. This is likely due to a combination of impacts from non-native rainbow trout, non-native brook trout, habitat loss, culvert barriers, and recreational harvest. In 2011 to 2012, a collaborative group inventoried tributaries that were suspected to have the greatest potential of harboring genetically pure cutthroat trout. This group found 22 remnant populations of sufficient size and genetic purity to have conservation value (Swan Native Fish Committee 2014). These were largely in headwater streams, and they represent approximately 20 percent of the historic range (USDA Forest Service et al. 2010). Meanwhile high mountain lakes, which were previously fishless, have been periodically stocked with cutthroat trout, so the total distribution of cutthroat trout has shifted from low elevations to high elevations.

## ALTERNATIVE 1 -NO ACTION ALTERNATIVE DIRECT AND INDIRECT EFFECTS

### HYDROLOGIC PROCESSES

This alternative has no activity and, therefore, no impact to hydrologic processes of the Swan River Valley. The increased likelihood of wildfire in the Beaver Creek and Lindbergh Lake watersheds would have no consequence to the overall natural condition of the Swan River.

### WATER QUALITY

There are no direct or indirect effects to water quality with Alternative 1.

### AQUATIC SPECIES

Alternative 1 has no direct or indirect impact to aquatic species distribution in the Swan River Valley.

## ALTERNATIVE 1 -NO ACTION ALTERNATIVE CUMULATIVE EFFECTS

### HYDROLOGIC PROCESSES

Past and present actions have maintained natural hydrologic processes in the Swan River Valley. There are no reasonably foreseeable actions, such as new dams or mines or bank stabilization that would degrade the river valley. The reasonably foreseeable Chilly James Project would likely recover two watersheds (Jim Creek and Cold Creek) to functioning appropriately with the

Watershed Condition Framework. Beaver Creek would be the only remaining watershed in the Swan River Valley considered functioning at risk.

### WATER QUALITY

Water quality of the Swan Lake and Swan River would either remain stable or improve during the analysis timeframe. The Swan Lake TMDL seeks a 40 percent reduction of erosion from forest roads, protection of stream banks, minimizing impacts of timber harvest and maintenance of private septic systems. The reduction of forest road erosion has already been achieved. Recently completed timber harvest projects including Sixmile, Hemlock Elk, Summit Salvage, and multiple projects by TNC have retained riparian buffers and reduced road erosion. The reasonably foreseeable projects of Glacier Loon, Cold Jim, Chilly James (Flathead National Forest), and Cilly Cliffs (Swan River State Forest), all incorporate further reductions of road erosion and retain riparian buffers. All of these projects minimize timber impacts and protect stream banks. It is unknown what maintenance would take place on private septic systems. Thus, it is reasonable to assume there would be no deteriorating trend of dissolved oxygen and nutrient enrichment in Swan Lake (TMDL conservation requirement).

### AQUATIC SPECIES

The cumulative effect of past, present and foreseeable activities has resulted in good habitat conditions, but a poor prognosis for native aquatic species due to non-native species. The Swan River Valley bull trout population would continue to be stable for a few years and then decline. It is reasonably foreseeable that lake trout suppression on Swan Lake would continue until 2016. After that, no further action is reasonably foreseeable. Beginning in 2017, lake trout numbers are anticipated to dramatically increase, and this would correspond to reduced survival of juvenile bull trout rearing in Swan Lake. Initially this change would be undetected since mature bull trout are not impacted by lake trout and redd counts reflect the number of mature, spawning fish. Eventually the older bull trout would die and with less juvenile recruitment, redd counts would resume a downward trend around 2020 or 2021. Bull trout are not likely to completely disappear in the analysis timeframe. Nearby Flathead Lake once supported a migratory population like Swan Lake. The domination of lake trout in Flathead Lake resulted in a very sharp decline of bull trout redds, but low numbers are still present. The future of Swan Lake bull trout would be similar. Climate change may also add stress to the bull trout population. Bean et al. (Bean et al. 2015) modeled potential impacts to Flathead River bull trout and found vulnerability in reduced fry survival from winter flows scouring the stream bed (not water temperature). No model is available yet for Swan River Valley bull trout, but climate change would likely further stress bull trout.

Cutthroat trout would also decline in distribution, abundance, and genetic purity throughout the Swan River Valley. While some of the 22 remnant populations are likely to persist because they are upstream of barriers, others would gradually disappear. Two of the 22 populations are in the project area and are anticipated to decline or have reduced genetic purity (Sunset Creek and upper Swan River). It is uncertain exactly how many of the 22 populations would persist. Hybridization with non-native rainbow trout or Yellowstone cutthroat trout (which were stocked in many headwater lakes) would continue to spread in streams without barriers. Brook trout would continue to exert competitive pressure in streams without barriers, but may also struggle with climate change induced winter flows (Wenger et al. 2011). Cutthroat trout refuges in headwater streams may contract due to climate change (Wenger et al. 2011) although no model is yet available for the Swan Valley. Mountain lakes, however, should continue to support cutthroat trout.

## ALTERNATIVES 2 AND 3 – ACTION ALTERNATIVES

## DIRECT AND INDIRECT EFFECTS

A very limited amount of activity is proposed near the Swan River itself and is not within the other analysis areas of Beaver Creek, wetlands, or Lindbergh Lake. In consideration of Aquatic

Resources, Alternatives 2 and 3 have similar impact. Both alternatives include approximately 24 acres of commercial thinning (Units 36 and 34) and 1 acre of pre-commercial thinning (Unit 201).

### HYDROLOGIC PROCESSES

The 24 acres of commercial harvest and 1 acre of pre-commercial harvest would have no impact to hydrologic processes of the Swan River Valley. The vegetation management is far too small to affect water yield in this 428,000-acre watershed.

### WATER QUALITY

The 24 acres of commercial harvest and 1 acre of pre-commercial harvest would have no impact to water quality. These activities are 300 feet from the Swan River, and they do not involve any new, temporary roads. There would not be any potential for erosion to reach the Swan River.

### AQUATIC SPECIES

Because the 24 acres of commercial harvest and 1 acre of pre-commercial harvest would have no potential impact to habitat, there would be no direct or indirect effects to aquatic species.

## ALTERNATIVES 2 AND 3 – ACTION ALTERNATIVES CUMULATIVE EFFECTS

### HYDROLOGIC PROCESSES

In consideration of the 25 acres of vegetation management in this analysis area, as well as effects from the Beaver Creek analysis area, the wetlands analysis area and the Lindbergh Lake analysis area, it is concluded that Alternatives 2 and 3 would have no cumulative effect to the Swan River Valley hydrologic processes. As described for each analysis area, the alternatives would not alter hydrologic processes for any analysis area. Past and present activities have maintained natural characteristics. There are no reasonably foreseeable actions that would modify it. The Swan River Valley would continue to have natural hydrologic processes.

### WATER QUALITY

Alternatives 2 and 3 would have no direct impact to water quality in the Swan River analysis area. There are no downstream cumulative effects from the other analysis areas. As described earlier, the alternatives may have short-term impacts to a few wetlands, but otherwise is beneficial to water quality. The alternatives would conserve water quality in Lindbergh Lake. Alternative 2 would have minor effects to water quality in Beaver Creek, whereas Alternative 3 has a slight benefit. Both alternatives include enough restoration activities (fuel reduction, road decommissioning) to restore the watershed to functioning appropriately in the Watershed Condition Framework. The reasonably foreseeable Chilly James Project would likewise restore two watersheds. Thus, upon completion of these projects, all watersheds within the Swan River Valley would be rated functioning appropriately in the Watershed Condition Framework.

Water quality of the Swan Lake and Swan River would either remain stable or improve with either alternative. The Swan Lake TMDL goals are the reduction of erosion from forest roads, protection of stream banks, minimizing impacts of timber harvest, and maintenance of private septic systems. Although Alternatives 2 or 3 do nothing with private septic systems, they would help achieve the other goals. The reasonably foreseeable projects of Glacier Loon, Cold Jim, Chilly James (Flathead National Forest), and Cilly Cliffs (Swan River State Forest) likewise would achieve those goals. So, it is reasonable to conclude there would be no deteriorating trend of dissolved oxygen and nutrient enrichment in Swan Lake with either Alternative 2 or 3.

### AQUATIC SPECIES

Within the Swan River analysis area, Alternatives 2 and 3 have no direct or indirect effect to aquatic species. However, in consideration of cumulative effects, the alternatives do help reduce the impact of past introductions of non-native species. Both Alternative 2 and 3 would have a beneficial impact to aquatic species in the Cur Pond and Willow Creek Beaver Complex wetlands, in that they would block invasion of non-native fish. The alternatives also would establish a barrier to conserve the remnant cutthroat trout of Sunset Creek, although they vary in effectiveness. Alternative 2 would be more likely to sustain this small population than Alternative 3. In terms of the cumulative effect to cutthroat trout of the Swan River Valley, both alternatives would help conserve 1 of the 22 remnant populations of conservation value. This would be beneficial to slow the anticipated decline. The reasonably foreseeable climate change, expansion of hybrids and brook trout would continue to stress cutthroat trout, and some remnant populations would disappear. Cutthroat trout would not disappear altogether in the Swan River Valley. Some remnant populations are already secure above barriers, mountain lakes would continue to support fish, and these alternatives would help secure Sunset Creek.

Alternative 2 and 3 would have no cumulative effect to bull trout. The 25 acres of vegetation management in the analysis area has no impact. There are no bull trout in the wetlands or in Beaver Creek. Bull trout spawning habitat in the inlet river to Lindbergh Lake would not be degraded by the prescribed burn. Rearing habitat in Lindbergh Lake would be conserved. However, the anticipated expansion of lake trout in Lindbergh Lake and Swan Lake, along with stress from climate change, remains a concern. Bull trout numbers would be likely to decline in the analysis timeframe.

## BULL TROUT CRITICAL HABITAT

Bull trout critical habitat exists in the Lindbergh Lake and Swan River analysis areas. Alternative 2 or 3 could have a small potential affect to this habitat due to the prescribed burn (Units 308 and 309). . The following table describes the Primary Constituent Elements (PCEs) and the project impact.

**TABLE 64. REVIEW OF PCES AND POTENTIAL IMPACTS FROM THE BEAVER CREEK PROJECT.**

| PCE Number and Description | Beaver Creek Project Effects |
|---|---|
| Permanent water having low levels of contaminants such that normal reproduction, growth and survival are not inhibited. | No impact |
| Water temperatures ranging from 2 to 15C with adequate thermal refugia available for temperatures at the upper end of this range. | No impact |
| Complex stream channels with features such as wood debris, side channels, pools, and undercut banks to provide a variety of depths, velocities and instream structures. | No impact |
| Substrates of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-year and juvenile survival. A minimal amount of fine substrate less than 0.63mm in diameter and minimal substrate embeddedness are characteristics of these conditions. | Under a worst-case scenario, a very small amount of sediment could settle in a spawning area. The amount of sediment is too small to measure or detect and thus it would not reduce egg, fry or young-of-year survival. |
| A natural hydrograph, including peak, high, low and base flows within historic ranges or, if regulated, a hydrograph that demonstrates the ability to support bull trout populations. | No impact |
| Springs, seeps, groundwater sources, and subsurface water connectivity to contribute to water quality and quantity. | No impact |
| Migratory corridors with minimal physical, biological, or chemical barriers between spawning, rearing, overwintering, and foraging habitats, including intermittent or seasonal barriers induced by high water temperatures or low flows. | No impact |
| An abundant food base including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish | No impact |

| TABLE 64. REVIEW OF PCES AND POTENTIAL IMPACTS FROM THE BEAVER CREEK PROJECT. | |
|---|---|
| **PCE Number and Description** | **Beaver Creek Project Effects** |
| Few or no predatory, interbreeding, or competitive nonnative species present. | No impact |

# EFFECTS OF A FOREST PLAN AMENDMENT TO ASSIGN MANAGEMENT AREAS TO ACQUIRED LANDS

The Beaver Creek Project includes a Forest Plan Amendment to assign interim management areas (MAs) to approximately 5,457 acres of former Plum Creek Timber Company (PCTC) lands acquired by the U.S. Forest Service to be managed as part of the Flathead National Forest. These interim management areas will be in effect on acquired lands until the ongoing Forest Plan Revision effort is completed, anticipated in 2 years.

Alternative 1- No Action Alternative proposes not to assign management areas to acquired lands although forest-wide standards and guidelines will continue to apply to all NFS lands on the Flathead National Forest.

Alternative 2 proposes to assign 55 acres of acquired lands to MA 2, 8 acres of acquired lands to MA 5, 2,312 acres to MA 11C, 320 acres to MA12, 2,033 acres to MA15, 712 acres to MA 15C, and 17 acres to MA 17. These proposed MA assignments were made in consideration of the characteristics of the acquired parcel and the management direction on surrounding lands. Table11 describes the management emphasis for each of these MAs, but lands assigned to MA5, MA11C, MA15, MA15C, and MA17 are considered suitable for timber production, while MA 2 and MA 12 are considered unsuitable for timber production although management activities may occur to benefit other resources.

Alternative 3 proposes different management area assignments to reflect public concern about the scenic integrity of lands on the east side of Lindbergh Lake. To accomplish this, Alternative 3 assigns MA5 instead of MA15 on approximately 502 acres of acquired land on the east side of Lindbergh Lake to maintain or enhance the scenic quality of these lands when viewed from Lindbergh Lake. Although MA5 will allow for timber harvest to occur on these lands, it will emphasize the maintenance of a natural appearing landscape where management activities are not evident.

The effects of the Forest Plan Amendment to the aquatics resource within analysis area under Alternative 1 – No Action Alternative are minor because the Forest Plan standards and guidelines apply to all lands managed by the Flathead National Forest even if management areas are not assigned. The effects of the Forest Plan Amendment under Alternative 2 and 3 are also minor in scale because although they allow for timber management to occur on some lands they will maintain consistency with the forest-wide standards and guidelines that are in place to conserve aquatic resources over time and will allow for aquatic restoration activities to occur. These MA assignments are consistent with the existing condition of these lands and the management direction assigned to adjacent lands and will not preclude future MA assignment under the Flathead Forest Plan Revision effort.

The cumulative effects of this forest plan amendment are very limited due to the geographic scope and expected duration of the amendment. At the Flathead National Forest scale, this amendment is only addressing management area direction on less than 1 percent of the NFS acreage on the Flathead National Forest. Additionally, the duration of this amendment is expected to be short-term since forest plan revision is ongoing with a decision expected in 2017. When the revision effort is completed, new management areas will be assigned across the entire Flathead National Forest, including the Beaver Creek project area, and will supersede any of the interim management areas proposed in this amendment. Reasonably foreseeable activities identified on the lands associated with the amendment is very limited as identified in Table 17 in Chapter 3 of this EA. If future land management activities occur on these lands they will be subject to forest-wide direction found in the Flathead National Forest Land and Resource Management Plan, federal and state laws, and other Forest Service regulations, as they are now, and will be guided by the proposed management area direction. Future land management activities such as timber harvest, road work, changes to public access etc. would be subject to site-specific NEPA analysis in the future.

# REGULATORY FRAMEWORK

Management and protection of water resources on NFS lands is regulated by the Federal Water Pollution Control Act (Clean Water Act), the Streamside Management Zone Law, Federal Executive Orders, Forest Plan direction, and Forest Service Policy.

Section 313 of the Clean Water Act requires that Federal agencies comply with all substantive and procedural requirements related to water quality. Under Section 303 of the Clean Water Act, states have the primary responsibility to develop and implement water quality programs, which include developing water quality standards and BMPs. State water quality standards are based on the water quality necessary to protect beneficial uses.

Environmental Protection Agency policy requires each state to implement an anti-degradation policy. Under this policy, water quality must be maintained to fully support existing beneficial uses. Existing water quality that is higher than the established standards must be maintained at the existing level unless a change in water quality is justifiable due to social and/or economic reasons (CFR Vol. 48, No. 217, 131.12, November 8, 1983; Montana Water Quality Act, Section 75-5.) This project fully maintains the existing water quality in Beaver Creek, Lindbergh Lake, and Swan River Valley.

Federal agency compliance with pollution control is addressed through Section 313 of the Clean Water Act, Executive Order 12580 (January 23, 1987), National Nonpoint Source Policy (December 12, 1984), USDA Nonpoint Source Water Quality Policy (December 5, 1986) and the Environmental Protection Agency in their guidance "Nonpoint Source Controls and Water Quality Standards" (August 19, 1987). In order to comply with State and local nonpoint pollution controls, the Forest Service implements BMPs to control non-point source pollution. Best Management Practices are the primary mechanism to achieve water quality standards (Environmental Protection Agency 1987). In an MOU with the State of Montana, the Forest Service has agreed to follow BMPs during timber harvest and road construction activities. This project would utilize all applicable BMPs during project design and implementation as described in Best Management Practices for Forestry in Montana, 1997. The use of BMPs has proven to be an effective tool in limiting non-point source pollution from forest harvesting activities. The Forestry Practices Program coordinated by DNRC leads a biennial audit of the application and effectiveness of BMPs on selected high risk sites. The most recent BMP audit on file found that 97 percent of locations audited were effective in protecting water quality. The effectiveness statistics are found in the 2010 Forestry Best Management Practices Field Review results (Ziesak 2012).

The purpose of the Montana SMZ is to protect the quality and quantity of forest waters and to conserve the integrity of Montana streamside zones. The law prohibits clearcutting, burning, equipment operation, road construction, slash disposal, or use of toxic material within at least 50 feet of any stream, lake, or other body of water and the project complies with the law.

Wetlands and floodplains are protected under Executive Orders 11990 and 11988, respectively. All wetlands and riparian zones have delineated RHCAs and SMZs around them. This project meets SMZ law and a site-specific analysis demonstrates how the project achieves Forest Plan direction for RHCAs.

All action alternatives comply with directions and goals set forth in the Forest Plan, including Amendment #3 and the INFISH Amendment. The Forest Plan prohibits “unacceptable fish losses” from land management actions, and this is not anticipated with Alternative 2 or 3. The Forest Plan also seeks to maintain long-term water quality to meet or exceed state water quality standards and this project complies with that direction.

In 1990, the Forest adopted Amendment #3, which added more trout stream standards. The amendment required various protections for certain listed bull trout streams, none of which are in the project area. The amendment has several requirements for cutthroat trout streams, which are applicable to this project. The amendment prescribes:

1 Recruitment of at least 40 trees per 1,000 linear feet of stream, which is easily achieved in all alternatives, even those with RHCA activity because all trees within 50 feet are left unharvested;

2 The amendment requires stream canopy shading to prevent water temperatures from exceeding 17°C [62.6°F]. Although lower Beaver Creek naturally has temperatures exceeding 17°C, the very minor loss of shade by Units 4108 and 4110 and the free-standing fish barrier would not elevate water temperature;

3 The amendment requires that before any significant ground disturbance in areas that are critical to cutthroat trout will have sediment sources identified and rehabilitated. Sediment sources were evaluated in the 2012 road inventory, and this project would rehabilitate all found sources with road BMPs.

4 The amendment also seeks “opportunities for recovery of westslope cutthroat trout populations in streams having non-native trout” but does not mandate every project do so.

In 1995 the Forest Service adopted INFISH with the goal of recovering native fish populations. Various riparian goals are identified and activities must not retard goals or Riparian Management Objectives. Activities in RHCAs require site specific analysis to review compliance with INFISH (Project File Exhibit M-17).

Bull trout are listed as a threatened species under the ESA. A BA is required for significant federal actions that may impact bull trout. The BA was prepared for proposed activities and submitted to the USFWS for consultation (Project File Exhibit M-2).

The Regional Forester has identified two aquatic species that are sensitive species and requires a BE for each action alternative. The two species are westslope cutthroat trout and western pearlshell mussel. The BE is available in the Project File (Exhibit M-3).

# THREATENED AND ENDANGERED WILDLIFE SPECIES

## INTRODUCTION

The threatened and endangered wildlife species (TES) and critical habitat that may be found in the Beaver Creek Project Area, as well as throughout the Upper Swan Valley are listed below in Table 65.

Life history information on these species can be found in the Flathead National Forest Evaluation and Compliance with NFMA Requirements to Provide for Diversity of Animal Communities (USDA 2015b). The gray wolf was delisted in 2012; effects analysis for the gray wolf can be found in the Sensitive Wildlife Species Section of this EA. The North American wolverine was recently proposed as a threatened species.

**TABLE 65. THREATENED, ENDANGERED, AND PROPOSED SPECIES KNOWN OR SUSPECTED TO OCCUR WITHIN THE INFLUENCE AREA OF THE PROPOSED ACTION.**

| SPECIES | STATUS | OCCURRENCE |
|---|---|---|
| Canada Lynx (Lynx canadensis) | Threatened | Resident |
| Canada Lynx Critical Habitat | Critical Habitat | Resident |
| Grizzly Bear (Ursus arctos) | Threatened | Resident |
| Wolverine (Gulo gulo luscus) | Proposed | Resident |

# CANADA LYNX

## ANALYSIS AREA

### SPATIAL BOUNDS

In accordance with the Lynx Conservation Assessment and Strategy (USDA et al. 2000), 109 Lynx Analysis Units (LAUs) were identified and mapped on Flathead National Forest lands. The proposed Beaver Creek Project is located within portions of the Lower and Upper Beaver LAUs (Project File Exhibit H-6). These units approximate the size of an area used by an individual lynx and encompass both lynx habitat and areas classified as non-habitat. The Lower and Upper Beaver LAUs (42,878 acres combined) are the geographic area used to analyze direct, indirect, and cumulative effects for Canada lynx (USDA 2007d).

### TEMPORAL BOUNDS

The length of time for the proposed activities associated with the Beaver Creek Project is approximately 5 years. This is based on the probable contract length for the proposed project, and the timeframes for related activities. The temporal scale of the effects analysis extends 100 years into the future, enough time for dense forest conditions and mature multistory stands to develop and trees to die and/or fall over and create denning habitat. Temporal bounds for specific activities are discussed below.

## DATA SOURCES, METHODS, AND ASSUMPTIONS USED

Data used included aerial photography, National Agricultural Imagery Program (NAIP) images, stand exams, VMAP data, research literature, and GIS and dataset information for features, such as general forest attributes, slope, aspect, habitat type, forest type, elevation, and mapped lynx habitat based on the Flathead National Forest Model. In addition, site-specific information on habitat characteristics was collected from on-site visits of proposed treatment areas.

# AFFECTED ENVIRONMENT

## HABITAT

Foraging habitat for lynx includes dense sapling-size stands (e.g., stand initiation) that would likely support snowshoe hare (USDA 1999a) and multistory forest stands that include dense patches of trees or shrubs or overstory trees with limbs that touch the ground. Squires et al. (Squires et al. 2010) found that during winter, lynx preferentially foraged in mature, multi-layer forests with Engelmann spruce and subalpine fir in the overstory and midstory. Forests used during winter were composed of larger diameter trees with higher horizontal cover, more abundant snowshoe hares, and deeper snow. During summer, lynx broadened their resource use to select younger forests with high horizontal cover, abundant total shrubs, abundant small-diameter trees, and dense saplings, especially spruce and fir saplings (Squires et al. 2010).

Canada lynx modeled habitat is widespread across the Forest Service's Region 1 and the Flathead National Forest (USDA 2007b). A Regional multi-scale lynx habitat assessment by (Hillis, Jacobs, et al. 2003) derived estimates of the proportions of foraging and unsuitable habitat at the forest scale and compared them to forage and unsuitable habitat estimates at larger scales. At the Region 1 scale, foraging habitat is only present on 5.4 percent of lynx habitat, below the historic average. However, the assessment only analyzed stand initiation habitat and did not include estimates for multistory forage. However, the fires of 1988, 2000, 2001, 2003, and 2007 have provided a substantial "pulse" of unsuitable habitat that will provide foraging habitat after 20 years post-burn depending on the burn conditions. (Hillis, Jacobs, et al. 2003) results suggested that denning habitat was not limiting throughout the region.

Lynx have evolved with forest disturbance (USDA et al. 2000). Stand-replacing fire has been a dominant influence historically in the northern Rocky Mountains. The dominant regime in lynx habitat in pre-settlement times was long-interval (40 to 200 years), high-severity, stand-replacing fire in continuous forests of lodgepole pine, spruce, and subalpine fir, often with smaller acreages subjected to non-lethal, low-severity fires in the intervals between stand-replacing fires (USDA et al. 2000). Dense regenerating vegetation as stand initiation from disturbance or as an understory in stands provides horizontal cover for snowshoe hare. The amount and density of horizontal cover strongly influences snowshoe hare abundance (Mills et al. 2005). Depending on the prescription type, vegetation management may mimic natural disturbance and can reduce stand density and encourage understory growth (Fuller et al. 2010).

Snowshoe hares are the primary prey of lynx, comprising 35 to 97 percent of the diet throughout the range of the lynx (Apps 2000; Burdett 2008; Hanson et al. 2008; Maletzke et al. 2008; Mowat et al. 2000; Shenk 2009; Squires andRuggiero 2007). Lynx habitat selection largely reflects that of hares, both seasonally, as well as through the hare population cycle (McCann et al. 2011; Mowat et al. 2003; Squires andRuggiero 2007).

Squires and Ruggiero (Squires andRuggiero 2007) found that lynx in western Montana prey almost exclusively on snowshoe hares during the winter; good hare habitat equates to good foraging habitat for lynx. Foraging habitat for lynx includes dense sapling-size stands (e.g., stand initiation) that would likely support snowshoe hare (USDA 1999a) and multistory forest stands that include dense patches of trees or shrubs or overstory trees with limbs that touch the ground or the snow surface. Red squirrels are an alternate prey species; however, in northwestern Montana red squirrels were only 2 percent of the biomass of the winter diet (Squires andRuggiero 2007).

The highest quality winter lynx habitat is mature, multi-layer forests with Engelmann spruce and subalpine fir in the overstory and midstory (Squires et al. (Squires et al. 2010)The importance of multistory forests is further supported by Berg (2010) and Berg et al. (2012), which documented the highest hare densities in multistory forests in Wyoming. In northwest Montana, forests used during winter were composed of larger diameter trees with higher horizontal cover, more abundant snowshoe hares, and deeper snow Squires et al. (2010). During the winter, lynx selected an elevation band between 1,260 to 2,355 meters (4,134 to 7,726 feet) (Squires et al. 2010). During summer, lynx broadened their resource use to select younger forests with high horizontal cover, abundant total shrubs, abundant small-diameter trees, and dense saplings, especially spruce and fir saplings (Squires et al. 2010). Squires et al. (2010) recommended that, "Given that lynx in Montana exhibit seasonal differences in resource selection, we encourage managers to maintain habitat mosaics. Because winter habitat may be most limiting for lynx, these mosaics should include abundant multistory, mature spruce–fir forests with high horizontal cover that are spatially well-distributed" (Squires et al. 2010). This science is consistent with management direction in the Northern Rockies Lynx Management Direction (NRLMD). The NRLMD incorporated management direction into land management plans for the conservation and recovery of Canada lynx (USDA 2007b). The NRLMD sets standards, objectives and guidelines for lynx habitat including early stand initiation, stand initiation, and multistory forage (i.e., Veg S1 - Veg S6). The NRLMD is discussed in more detail under the Regulatory Consistency Section. The mosaic of forest openings and lynx forage throughout the project LAUs were considered in regard to habitat distribution and lynx travel when designing the proposed project.

Composition of a landscape between forest stands that support snowshoe hares and adjacent less suitable stands has been studied to examine influence on snowshoe hare densities, lynx foraging, and movement. Lewis et al. (Lewis et al. 2011) found stand density and moist stand habitats as the best predictors of high hare densities. Lewis et al. (2011) also detected a negative correlation for snowshoe hare density within 300 meters (984 feet) of open stand types. However, snowshoe hare and lynx are a disturbance dependent species where a mosaic of stand conditions persists into the future. Fuller and Harrison (Fuller et al. 2010) examined lynx foraging strategies and found high forage selection for clear-cuts with high stem density and tall regenerating trees. Lynx traversed through stands with low understory density less than randomly expected (Fuller et al. 2010). Squires et al. (Squires et al. 2013) found that lynx selected high densities of vegetative cover when traversing landscapes. Squires et al. (2013) points out that vegetative density can decrease as forests age.

Kosterman (2014) examined reproductive success of five simplified forest structure types within female home ranges. Kosterman (2014) found that 50 percent mature forest and approximately 10 – 15 percent young regenerating forest appeared to be the optimal combination of structure types. However, Kosterman's (2014) work did not included a detailed examination of forest density for stand initiation or multistory lynx foraging conditions (Squires personal communication 2015 – Project File Exhibit H-6). Instead, the analysis classified general forest types from satellite imagery and VMAP. Kosterman's coarse classifications cannot be directly compared to the project area analysis. Further, the habitat analysis included in this report represents a more detailed and accurate classification of lynx habitat as it includes representation of types of lynx foraging habitats, not just simplified forest structure classes and is consistent with the best available science (Project File Exhibit H-6).

At the population level, Squires et al. (Squires et al. 2013) suggests that degree of infrastructure (highway traffic volume, urbanization) most impacts landscape connectivity for lynx movement. Information from Squires et al. (Squires et al. 2013) suggests that while forest fragmentation between patches of lynx habitat can increase resistance to lynx movement, lack of genetic isolation within the population indicates good landscape connectivity through the Northern Region (Schwartz et al. 2002). Squires et al. (Squires et al. 2013) identified a large-scale potential corridor for lynx connectivity from Canada to the Northern Rockies that extended from the Whitefish Range down the western front of the Swan Mountains to Seeley Lake. None of the proposed activities would occur on the western front of the Swan Mountains. The Beaver Creek Project considered Squires et al. (Squires et al. 2013) and structured treatments to maintain lynx foraging and travel habitats in a mosaic pattern across the project LAUs suitable for lynx travel. The NRLMD speaks to making habitats permeable for lynx and maintaining travel and foraging habitats. Developed corridors, such as highways or urbanization that most impact connectivity for lynx, are not a part of the Beaver Creek Project. Furthermore, Montana State Highway 83 bisects the Swan Valley, but it does not appear to impede movement, since radio-collared lynx have been documented to cross this highway (Squires et al. 2000).

Denning habitat includes older forest stands where larger amounts of down woody material would be expected to occur (USDA 1999a; USDA et al. 2000). In a study in northwestern Montana (Squires, Ruggiero, et al. 2006), it was found that lynx denned in pre-existing sheltered spaces created by downed logs (62 percent), root-wads from wind-thrown trees (19 percent), boulder fields (10 percent), slash piles (6 percent), and live trees (4 percent). Squires et al. (2008) found that female dens were primarily located in spruce-fir stands with abundant coarse woody debris and high horizontal cover; however, denning did occur in stands with coarse woody debris, but insufficient cover for snowshoe hares. In this study, 80 percent of dens were in mature forest stands and 13 percent in mid-seral regenerating stands; young regenerating stands and thinned stands were seldom used for denning. Lynx denning habitat did not appear to be limiting in northwestern Montana (Squires et al. 2008).

Lands within the LAUs have been delineated into lynx habitat and non-lynx habitat. This delineation is based on both elevation and snow-depth, and on-site characteristics; non-habitat (includes dry forest habitat types, areas with less than 24 to 30 inches of snow, high elevation habitat types on specific sites, and other unusable areas such as permanent water, rock, and human development. The majority of the area with the Beaver Creek Project LAUs is lynx habitat.

Current science and studies, Ecology and Conservation of Lynx in the United States (USDA 1999a), the NRLMD, and local field validation were used to determine lynx habitat across the Flathead National Forest. Distinct LAUs were established, and the Forest developed a mapping protocol to designate lynx and non-lynx habitat within the different LAUs. A combination of snow depth and forest habitat criteria was used as the basis to model lynx versus non-lynx habitat. The snow depth below which lynx use is expected to decline on the Flathead National Forest has been defined as less than 24 to 30 inches of snow. At this snow depth and below, there is usually increased use by mountain lions and coyotes (USDA 1999a). The subsequent increase in competition for prey and the increase in potential predation on lynx results in the decreased use of these areas by lynx.

The Swan Valley includes the vegetative types and elevation ranges necessary for Canada lynx, and lynx are known to have been residents in the Swan Valley in the past. The Beaver Creek Project Area includes many diverse forest types, including subalpine fir, Engelmann spruce, whitebark and western white pine, and a small component of cedar hemlock forest. Forage opportunities for lynx would have been dependent on vegetative patterns across the landscape at the time (e.g., snowshoe hare habitat).

The following table (Table 66) summarizes the current situation for potential Canada lynx habitat in the project LAUs (Lower and Upper Beaver LAUs) based on the Flathead lynx habitat model and project area validation. The LAUs have been broken up into habitat and non-habitat. Baseline lynx habitat was modeled for LAUs using size class, canopy cover, and habitat type from the Northern Region Vegetation Mapping Project (VMAP). Stand information was updated based on field review to create the most accurate representation of existing stand conditions within the project area. For an in-depth description of the model query elements, the habitat classifications, and the modeling process steps of the Flathead lynx model refer to the Project File Exhibit H-6.

**TABLE 66. EXISTING CONDITION OF LYNX HABITAT IN THE LOWER AND UPPER BEAVER LAUS.**

| LAU Name | LAU Total Acres | Total Lynx Habitat Acres | Stand Initiation[1] (provides winter forage) Acres[1] | Stand Initiation[1] (provides winter forage) Percent of Lynx Habitat | Early stand Initiation[2] (provides summer forage only) Acres | Early stand Initiation[2] (provides summer forage only) Percent of Lynx Habitat | Multistory (Forage[3]) Acres | Multistory (Forage[3]) Percent of Lynx Habitat | Other[4] (stem exclusion, multistory non-feeding) Acres | Other[4] (stem exclusion, multistory non-feeding) Percent of Lynx habitat |
|---|---|---|---|---|---|---|---|---|---|---|
| Lower Beaver | 22,418 | 19,454 | 1,902 | 10% | 1,915 | 10% | 6,769 | 35% | 8,868 | 45% |
| Upper Beaver | 20,451 | 9,147 | 740 | 8% | 1,175 | 13% | 5,641 | 61% | 1,592 | 17% |

[1]Stand initiation structural stage that currently provides winter snowshoe hare habitat.
[2]Stand initiation structural stage where the trees have not grown tall enough to protrude above the snow in winter.
[3]Multistory structural stage with many age classes and vegetation layers that provide snowshoe hare habitat. This stage may contain denning habitat.
[4]Other – Stem Exclusion Structural Stage – Closed canopy with understory limited; Multistory structural stage with many age classes and vegetation layers that do not provide snowshoe hare habitat. This stage may contain denning habitat.

The difference between “LAU Total Acres” and “Total Lynx Habitat Acres” in Table 67 is the acreage of areas that are not lynx habitat due to water, rocky areas, dry forest types or low elevation (snow depth factor). “Total Lynx Habitat Acres” are suitable vegetative areas within an LAU that may provide forage, denning, or hiding cover for lynx based on snow depth and potential natural vegetation. “Early stand initiation” acres are areas that do not currently provide winter lynx forage such as sapling stands that are not tall enough to extend above the snow or dense enough to provide suitable horizontal cover for snowshoe hare. “Stand initiation” structural stage acres and “Multistory” structural stage acres currently provide winter snowshoe hare habitat and are considered to be lynx foraging habitat. “Stem Exclusion” includes mature forest stands not providing snowshoe hare habitat. Some of these stands may contain larger amounts of down woody material to support lynx denning. These acres could also function as habitat for lynx hiding cover to travel between foraging stands. Old, mature forest stands (including designated old growth) were included as potential denning habitat. Ongoing research suggests that lynx also commonly use second growth stands as denning habitat if there is a down woody component (e.g. stumps, root wads, blowdown).

## POPULATION

Lynx are expected to occur over much of the Flathead National Forest, with over 1.7 million acres (73 percent of the forest) modeled as lynx habitat (USDA 2015b). Lynx populations appear to occur at naturally low densities, probably because of limited habitat and limited availability of their primary prey, snowshoe hares. The USFWS (USDI Fish and Wildlife Service 2000) concluded when listing the species that a resident population of lynx is distributed throughout its historic range in Montana. Numerous historic and current lynx records exist in western Montana; winter snow-track surveys and ongoing telemetry studies indicate a number of lynx in Montana, as well. There are numerous reports of lynx sightings or their tracks across the Flathead National Forest, including those of lynx adults with kittens (USDA 2015b). Although lynx populations are difficult to monitor without the aid of large-scale telemetry or hair-snare programs, efforts such as carnivore snow-track surveys, lynx hair-snare sampling, and the compilation of incidental sightings continue across the forest. Canada lynx are assumed to occur within the Lower Beaver and Upper Beaver LAUs; there have been confirmed lynx detections in the Lower and Upper Beaver LAUs. Winter track transects have detected suspected lynx tracks, and hair or scat was found to confirm species through genetic analysis. Winter track transects have been documented to be an effective way of detecting lynx within an area (Squires et al. 2012). Carnivore surveys (2000 to

2015) in the Swan Valley have detected lynx within of the project LAUs (SWCC monitoring Team 2014). Sunset ridge in the higher elevations at the south end of the project area, receives the most lynx use based on project monitoring and lynx detections are less common in the winter months at the northern end of the project area in the lower elevations.

The Seeley area is located approximately 20 miles south of the 2 project LAUs. For the Seeley area, a letter to Missoula Count Rural Initiatives stated,

> "preliminary analysis of population viability suggested that lynx in the Seeley area may be declining, so concerns for maintaining available habitat does have a scientific bases" (Squires 2009).

Lynx vital rates, such as adult and kitten survival, can drive population trend. These rates can be influenced by prey density, predation, and other mortality from trapping and shooting (Squires et al. 2010; Squires, Ruggiero, et al. 2006).The preliminary analysis in Squires (Squires 2009) was based on empirical data, but adult survival, not habitat was determined to be the driving factor behind the indication of population decline. No relationship was determined between adult survival and habitat in the modeling exercise (USDA 2013c). Population trajectory for lynx in another area (the Yaak) was also calculated as part of the evaluation used in Squires (2009). Population trend in this area, where the NRLMD is also applied, was found to have an increasing population trend. Among the differences between the Yaak and Seeley areas is the amount of non-Federal land. The Yaak is almost entirely Federal land (NFS land), while the Seeley area has a substantial amount of interspersed non-Federal land, that generally does not support lynx (USDA 2013c). The USFWS determined (USDA 2013c) that Squires' 2009 letter, along with other information made available since 2007 (USDA 2013c), is consistent with information considered for the NRLMD's 2007 BO.

# ENVIRONMENTAL CONSEQUENCES

## ALTERNATIVE 1 - NO ACTION
## DIRECT, INDIRECT, AND CUMULATIVE EFFECTS

Under the No Action Alternative, there would be no vegetation treatments or associated activities proposed. There would be no direct effects to Canada lynx as a result of implementing this alternative; there would be no loss of forage habitat or hiding cover, no decrease in security, and no displacement from the management activities proposed in the project LAUs. Stands that only provide summer forage for lynx now, because they are too short to protrude above the snow in winter, would be expected to continue to grow, becoming good winter hare habitat (i.e. stand initiation hare habitat). Red squirrel habitat (alternate prey for lynx) would be maintained in old growth and other mature cone-bearing forest stands across the project LAUs.

Forest vegetation would continue to grow. Stand initiation stands would grow into stem exclusion habitat, while other stands recruit a dense understory of spruce/fir creating multistory foraging habitat conditions. Indirectly, not implementing the proposed vegetative treatments could increase the risk of a wildfire burning more intensely in the project area in the future, which could result in changes in available forage, cover, and denning habitat for lynx. Fires have historically produced both positive and negative effects for lynx; loss of hiding cover and existing foraging habitat across large areas on the negative side. On the positive side, forage habitat would be potentially increased in 15 to 20 years once forests have imitated enough to provide stand initiation snowshoe hare habitat.

Established human activities would continue, including road maintenance, firewood cutting, trapping, and development on private lands. Alternative 1 would not contribute negative cumulative effects to Canada lynx in the Swan Valley.

# ALTERNATIVE 2
# DIRECT AND INDIRECT EFFECTS

## LYNX FORAGE

The NRLMD provides standards and guidelines for management and conservation of lynx habitat. The NRLMD (USDA 2007c) allows for reduction of lynx foraging habitat within the WUI and includes exception acres for treatment outside the WUI for the purposes of whitebark pine or western white pine restoration.

The Beaver Creek Project used the Seeley-Swan WUI. The NRLMD and Seeley-Swan WUI are further discussed in the Regulatory Consistency Section below. Table 67 displays the approximate acre changes in available foraging habitat by LAU for Alternative 2. Interplant acres are not included in Table 67. Project File Exhibit H-6 displays how acres of treatment are counted based on prescription, if treatment occurred.

**TABLE 67. ALTERNATIVE 2 CHANGES TO LYNX HABITAT WITHIN AFFECTED LAUS.**

| LAU Name | Total Acres | Total Lynx Habitat Acres Acres | Stand Initiation[1] (Provides Winter Forage) Acres | Stand Initiation[1] (Provides Winter Forage) Percent of Lynx Habitat | Early Stand Initiation[2] (Provides Summer Forage Only) Acres | Early Stand Initiation[2] (Provides Summer Forage Only) Percent of Lynx Habitat | Multistory (Forage)[3] Acres | Multistory (Forage)[3] Percent of Lynx Habitat | Other[4] (Stem Exclusion; Multistory Non-Feeding) Acres | Other[4] (Stem Exclusion; Multistory Non-Feeding) Percent of Lynx Habitat |
|---|---|---|---|---|---|---|---|---|---|---|
| Lower Beaver (Existing) | 22,418 | 19,454 | 1,902 | 10% | 1,915 | 10% | 6,769 | 35% | 8,868 | 45% |
| Lower Beaver Alt. 2 | 22,418 | 19,454 | 1,541 | 8% | 3,238 | 17% | 6,540 | 33% | 8,135 | 42% |
| Upper Beaver (Existing) | 20,451 | 9,147 | 740 | 8% | 1,175 | 13% | 5,641 | 61% | 1,592 | 17% |
| Upper Beaver Alt. 2 | 20,451 | 9,147 | 740 | 8% | 1,421 | 16% | 5,641 | 61% | 1,346 | 15% |

[1]Stand initiation structural stage that currently provides winter snowshoe hare habitat
[2]Stand initiation structural stage where the trees have not grown tall enough to protrude above the snow in winter
[3]Multistory structural stage with many age classes and vegetation layers that provide snowshoe hare habitat. This stage may contain denning habitat.
[4]Other – Stem Exclusion Structural Stage – Closed canopy with understory limited; Multistory structural stage with many age classes and vegetation layers that do not provide snowshoe hare habitat This stage may contain denning habitat.

Effects to lynx foraging habitat were analyzed based on harvest and burn prescriptions. Treatment in lynx winter foraging habitat within the WUI (Table 67: stand initiation; multistory) would not permanently remove this habitat, but alter composition of vertical and horizontal cover thereby altering the structural stage of the stand. Changes in stand characteristics would be dependent on the prescribed treatment for each stand. Treatments in non-lynx habitat would remain non-lynx habitat (Project File Exhibit H-6).

The analysis was conservative regarding effects of proposed activities to lynx foraging habitat. For instance, all burning was assumed to create Early Stand Initiation habitat (temporarily unsuitable) even though fire would likely burn at light or moderate intensity and leave a mosaic of mature forest that may be classified as stem exclusion in the wilderness or pockets of understory that would continue to be lynx foraging habitat in the WUI. Likewise, daylighting or group selection treatments would retain lynx foraging habitat within the stand, but for this analysis, the entire stand was assumed to no longer provide foraging habitat.

Regeneration treatments would remove stand overstory and recruit young saplings within the stand area. Existing lynx foraging acres that would receive regeneration treatments would retain some young and mature trees, but not function as lynx foraging habitat. For this reason, stands with proposed regeneration harvest were classified as “early stand initiation” habitat for post treatment acres. Intermediate treatments would reduce stand density within lynx foraging habitat, but would retain overstory cover. These treatment acres would be temporarily converted to “stem exclusion stands” habitat until sufficient horizontal cover returns to provide snowshoe hare habitat. Pre-commercial thinning would also reduce stand density. These treatment acres would either be added to “early stand initiation,” or “stem exclusion” acres depending on the stand and treatment type. The estimated composition of lynx habitat (existing and treated) in the affected LAUs is shown in Table 68 for each respective LAU for Alternative 2. Treatments would not result in permanent stand changes. A list of stands by unit, treatment type, and pre/post lynx habitat stage is located in Project File Exhibit H-6. Forest regeneration and succession would occur in treated stands over time. Table 69 depicts affected acres of lynx habitat in Alternative 3 acres by lynx habitat stage.

**TABLE 68. ALTERNATIVE 2 - ACRES OF EXISTING LYNX STRUCTURAL STAGE AFFECTED BY TREATMENTS.**

| LAU NAME | NON-HABITAT | STAND INITIATION[1] ACRES | EARLY STAND INITIATION HARE HABITAT[2] | MULTISTORY HARE HABITAT[3] ACRES | OTHER[4] (STEM EXCLUSION; MULTISTORY NON-FEEDING) |
|---|---|---|---|---|---|
| Lower Beaver | 203 | 361 | 824 | 229 | 2,300 |
| Upper Beaver | 790 | 0 | 34 | 0 | 246 |

[1]Stand initiation structural stage that currently provides winter snowshoe hare habitat
[2]Stand initiation structural stage where the trees have not grown tall/ dense enough to protrude above the snow in winter
[3]Multistory structural stage with many age classes and vegetation layers that provide snowshoe hare habitat. This stage may contain denning habitat.
[4]Other – Stem Exclusion Structural Stage – Closed canopy with understory limited; Multistory structural stage with many age classes and vegetation layers that do not provide snowshoe hare habitat. This stage may contain denning habitat.

Proposed regeneration, intermediate, and pre-commercial treatments would decrease lynx forage within both LAUs. Treatments would convert lynx foraging and denning habitat into non-foraging forest stages. For the Lower Beaver LAU, the proposed activity would reduce stand initiation foraging habitat by 2 percent and multistory foraging habitat by 2 percent. In the Upper Beaver LAU, no lynx foraging habitat would be treated under Alternative 2.

The reduction in lynx forage resulting from the implementation of proposed activities would not be permanent; natural regeneration and planted seedlings would grow back and provide snowshoe hare habitat. Squires (Squires et al. 2010) found that in Montana, hares are not using regenerated stands until approximately 20 or more years after logging or fire. The time it takes for regenerated stands to grow into stand initiation lynx foraging habitat is dependent on aspect, elevation and habitat type in addition to other factors such as fire severity, precipitation etc. Design Criteria would retain some existing horizontal cover (10 percent of understory trees) within intermediate treatment stands. This criterion would improve return interval of horizontal cover in commercial thinning treatment areas.

Interplant treatments would occur in primarily areas of low tree density. Interplant treatments would increase the return interval of forest vegetation to function as future travel cover in the between patches of foraging habitat and may ultimately become lynx foraging habitat over time.

The project would treat lynx foraging habitat in the WUI for fuels reduction. Alternative 2 also proposes to daylight whitebark pine or western white pine in 11 acres (Unit 269) of stand initiation habitat outside of the WUI for restoration of whitebark pine in accordance with the NRLMD

(USDA 2007b). Outside of these 11 acres, no other lynx foraging habitat would be removed outside of the WUI through project activities. While the analysis above assumes the acres (all the acres in 269) would no longer function as lynx habitat, design criteria would retain 80 percent of the lynx foraging habitat in the stand (See Design Criteria). For more information, see Regulatory Consistency Section below.

## Denning Habitat

Lynx den sites are predominately found in mature boreal forest stands that have a large amount of cover and abundant, coarse, woody debris, such as downed trees and root wads (Squires et al. 2008). Den sites have also been associated with moister forest stands containing denser understory cover (Squires, Ruggiero, et al. 2006).

Based on the characteristics of lynx denning habitat described above, multistory forage and some stem exclusion stands (non-feeding) from Table 69 were estimated to be denning habitat. Denning habitat is not limited and widespread throughout the project area. For denning, this analysis considered all late seral and old growth stands that were either multistory forage or stem exclusion stands in the project area. These stands have high levels of snags and coarse woody debris based on field visits and common stand exams. Other denning habitat exists out of these stands; however, these qualifications likely represent the highest quality denning conditions. The proposed project activities would decrease snag and coarse woody debris across 871 acres (260 acres in the Upper Beaver LAU; 611 acres in the Lower Beaver LAU. This reduction would be approximately 8 percent of the denning conditions in the Lower Beaver LAU and 3 percent of the Upper Beaver LAU (Table 69). Wilderness burning would likely increase denning habitat over time (see Snag and Down Woody Debris Associated Species Section).

**Table 69. Alternative 2 Effects to High Quality Denning Conditions in the Upper and Lower Beaver LAUs.**

| LAU | Estimated High Quality Denning Habitat (Acres) | Estimated Reduction (Acres) |
|---|---|---|
| Lower Beaver | 7,502 | 611 (8%) |
| Upper Beaver | 7,979 | 260 (3%) |

Squires et al. (2008) believed that few lynx populations are limited by a lack of immediate den sites given their large home ranges and low den site fidelity. Due to the abundant cover and large amounts of down woody debris, some old growth forest types contain characteristics indicative of denning habitat. There would be no treatment to old growth forest stands under Alternative 2. Design Criteria in treatment areas would retain 10 tons of down woody debris per acre where available and snags would be retained in each treatment area for future recruitment of lynx denning structures. Given the Design Criteria, Forest Plan direction and information that denning habitat is widespread, the short-term reduction of denning habitat is likely to have little impact on lynx in the project LAUs.

## Early Stand Initiation/Stem Exclusion/Non-Habitat

Stem exclusion (listed above as “other”) habitat includes open stands with intermittent canopy, relatively closed overstory canopy, and limited understory vegetation. These stands do not contain snowshoe hare habitat (lynx forage) due to lack of horizontal cover, but can serve as hiding cover for lynx to travel through. Proposed treatments would treat 2,300 acres of stem exclusion non-feeding habitat within the Lower Beaver LAU and 246 acres within the Upper Beaver LAU. The project would also treat 824 acres of early stand initiation habitat in the Lower Beaver LAU and 34 acres in the Upper Beaver LAU.

Stem exclusion habitat structure is generally not progressing towards hare habitat. Although there would be a loss of hiding cover over the short term (10 years), there is also an opportunity through harvest prescriptions to move the stands towards conditions that provide future forage and/or denning habitat for Canada lynx. Intermediate cutting may open up the stands and encourage an increase in horizontal cover (understory regeneration); remaining trees in the stand would have improved growing conditions and would increase in size. Many of the stands where intermediate harvest is proposed would have the potential to become multistory forage and/or denning habitat once the overstory canopy closes and shade-tolerant trees regenerate in the understory. Design criteria would maintain patches of spruce and fir in the understory where available and would promote potential creation of future multistory foraging habitat over approximately 1,103 acres in the project LAUs. Cone bearing mature forest (red squirrel habitat) would remain well distributed after project activities.

Some of the stands where regeneration treatment is prescribed have a high percentage of lodgepole pine trees that have either already been attacked by mountain pine beetle or are very susceptible to attack (See Vegetation Section of this EA). The proposed regeneration of these stands within the project LAUs would remove most of the existing overstory structure. The stands would be expected to return to a lynx foraging seedling/sapling structure (stand initiation) within approximately 20 years. It should be noted that if the future sapling stands are pre-commercially thinned, there would not likely be an increase in quality forage for lynx.

In the regeneration treatment units, there would be little or no hiding cover remaining following treatment; lynx movement patterns could change in their travel across the project LAUs. Intermediate treatments that retain ≥40 percent canopy cover are judged to maintain lynx travel habitat. Several Design Criteria would be in place to reduce the loss of hiding cover; regeneration units would be laid out so that no point in the unit is more than 600 feet from cover, visual screening would be retained adjacent to open roads, and commercial thin units would retain 10 percent of understory vegetation distributed throughout the each unit.

Early stand initiation acres (Table 69) includes young stands that either do not protrude sufficiently above the snow or do not have a sufficient density of horizontal cover to provide winter snowshoe hare habitat, but may be used by snowshoe hare during the summer. Treatments such as pre-commercial thinning would reduce existing tree density in early stand initiation stands. This reduction may result in a change in lynx movement patterns throughout the project LAUs. Beaver Creek Project's Alternative 2 would treat 823 acres of early stand initiation in the Lower Beaver LAU and 0 acres in the Upper Beaver LAU. Pre-commercial thin treatments of early stand initiation habitat would increase spacing between trees and may decrease the potential of these stands to regenerate into future dense stand initiation snowshoe hare habitat. However, pre-commercial thin treatments may release trees from competition and result in faster growing trees with full crowns and place the trees on a more expedient trajectory towards a mature canopied forest, which lynx are known to move through.

Alternative 2 proposed activities would also affect approximately 203 acres of non-habitat in the Lower Beaver LAU and 790 acres of non-habitat in the Upper Beaver LAU. These acres would remain non-habitat after treatment (Project File Exhibit H-6). Lynx travel would still be possible across areas of non-habitat within the project LAUs. Project activities would maintain a mosaic of stand conditions that provide for lynx travel throughout the project LAUs.

## HABITAT SECURITY

The best information suggests that forest roads do not affect lynx (USDI 2007a). USDA (1999a) found that lynx do not avoid roads, except at high traffic volumes (Apps 2000). Effects of highways with high speeds and high traffic volumes are not the same as the effects of forest roads. With regard to forest roads, such as those that occur in the Beaver Creek Project LAUs, a recent analysis on the Okanogan National Forest in Washington showed lynx neither preferred nor avoided forest roads, and the existing road density does not appear to affect lynx habitat selection (McKelvey et al. 1999). In Montana, forest roads with low vehicular or snowmobile traffic had little effect on lynx resource selection patterns (USDA 2013b). Squires concluded that lynx did not avoid the subset of roads that were open to wheeled vehicle travel during the denning season or at any other time (Squires et al. 2010).

Given that lynx have been documented to be tolerant of motorized and human activity, the potential for displacement from project activities including log hauling, temporary road building, storage, decommissioning activities, or helicopter fire ignition is small. Road management in place for grizzly bear (Amendment 19 and the SVGBCA) would also benefit Canada lynx by providing more acres of habitat secure for lynx in all seasons. In addition, standard contractual requirements used in all contracts provide for modification or termination of the contract to avoid impacts and protect threatened and endangered species. This would allow for modification of the project should an unforeseen issue(s) be identified during operations.

Adult mortality for Canada lynx (Squires et al. 2010); includes starvation in winter and early spring, predation by lions during non-snow periods, and human conflict (e.g., accidental trapping or malicious shooting). Given the small relative reduction to foraging habitat and that the Beaver Creek Project would not increase public motorized access in the project LAUs, the project is not expected increase the probability of lynx mortality.

### WINTER LOGGING

Alternative 2 proposes activities that could occur during the summer or winter depending on inactive/active grizzly bear subunit guidelines (see grizzly bear section). Project activities could displace lynx. Lynx have shown tolerance to human activity (USDA 2013b; USDA et al. 2000). Little to no effects of displacement are expected considering lynx tolerance to motorized activity and distribution of available lynx foraging habitat in the project LAUs. Further, project activities would occur in only a portion of the winter lynx foraging habitat within the project LAUs leaving the remaining foraging habitat free from potential disturbance. Lynx forage across a broader variety of habitats in the summer months relative to the winter and potential displacement effects would have even less effect relative to winter activity (Squires et al. 2010). There is no existing evidence that snow compaction from winter logging causes competition with other predators, exerting a population level threat to lynx (USDA 2007b). Kolbe et al. (Kolbe et al. 2007) provides evidence for northwest Montana that the overall influence of snowmobile trails in the Seeley Lake area appeared to be minimal.

## ALTERNATIVE 3 – ACTION ALTERNATIVE DIRECT AND INDIRECT EFFECTS

### LYNX FORAGE

The NRLMD provides standards and guidelines for management and conservation of lynx habitat. The NRLMD (USDA 2007) allows for reduction of lynx foraging habitat within the WUI and includes exception acres for treatment outside the WUI for the purposes of whitebark pine or western white pine restoration.

The Beaver Creek Project used the Seeley-Swan WUI. The NRLMD and Seeley-Swan WUI are further discussed in the Regulatory Consistency Section below. Table 75 displays the approximate acre changes in available foraging habitat by LAU for Alternative 3. Interplant acres are not included in Table 70. Project File Exhibit H-6 displays how acres of treatment are counted based on prescription, if treatment occurred.

**TABLE 70. ALTERNATIVE 3 CHANGES TO LYNX HABITAT WITHIN AFFECTED LAUs.**

| LAU Name | Total Acres | Total Lynx Habitat Acres | Stand Initiation[1] (provides winter forage) Acres | Stand Initiation[1] (provides winter forage) Percent of Lynx Habitat | Early Stand Initiation[2] (provides summer forage only) Acres | Early Stand Initiation[2] (provides summer forage only) Percent of Lynx Habitat | Multistory[3] (forage) Acres | Multistory[3] (forage) Percent of Lynx Habitat | Other[4] (stem exclusion; multistory non-feeding) Acres | Other[4] (stem exclusion; multistory non-feeding) Percent of Lynx Habitat |
|---|---|---|---|---|---|---|---|---|---|---|
| Lower Beaver - Existing | 22,418 | 19,454 | 1,902 | 10% | 1,915 | 10% | 6,769 | 35% | 8,868 | 45% |
| Lower Beaver – Alt 3. | 22,418 | 19,454 | 1,755 | 9% | 2,443 | 12% | 6,620 | 34% | 8,635 | 44% |
| Upper Beaver – Existing | 20,451 | 9,147 | 740 | 8% | 1,175 | 13% | 5,641 | 61% | 1,592 | 17% |
| Upper Beaver_ Alt. 3 | 20,451 | 9,147 | 740 | 8% | 1,421 | 16% | 5,641 | 61% | 1,838 | 20% |

[1]Stand initiation structural stage that currently provides winter snowshoe hare habitat
[2]Stand initiation structural stage where the trees have not grown tall enough to protrude above the snow in winter.
[3]Multistory structural stage with many age classes and vegetation layers that provide snowshoe hare habitat. This stage may contain denning habitat.
[4]Other – Stem Exclusion Structural Stage – Closed canopy with understory limited; Multistory structural stage with many age classes and vegetation layers that do not provide snowshoe hare habitat. This stage may contain denning habitat.

See the discussion above in Alternative 2 for how effects to forest vegetation and lynx foraging habitat would vary between prescriptions and assumptions that were used in the analysis.

**TABLE 71. ALTERNATIVE 3 ACRES OF EXISTING LYNX STRUCTURAL STAGE AFFECTED BY TREATMENTS.**

| LAU Name | Non-Habitat | Stand Initiation[1] Acres | Early Stand Initiation Hare Habitat[2] | Multistory Hare Habitat[3] Acres | Other[4] (Stem exclusion; multistory non-feeding) |
|---|---|---|---|---|---|
| Lower Beaver | 190 | 147 | 850 | 149 | 1,507 |
| Upper Beaver | 756 | 0 | 0 | 0 | 246 |

[1]Stand initiation structural stage that currently provides winter snowshoe hare habitat
[2]Stand initiation structural stage where the trees have not grown tall enough to protrude above the snow in winter
[3]Multistory structural stage with many age classes and vegetation layers that provide snowshoe hare habitat. This stage may contain denning habitat.
[4]Other – Stem Exclusion Structural Stage – Closed canopy with understory limited; Multistory structural stage with many age classes and vegetation layers that do not provide snowshoe hare habitat. This stage may contain denning habitat.

Proposed regeneration, intermediate, and pre-commercial treatments would decrease lynx forage within both LAUs. Treatments would convert lynx foraging and denning habitat into non-foraging forest stages. For the Lower Beaver LAU, the proposed activity would reduce stand initiation foraging habitat by 1 percent and multistory foraging habitat by 1 percent. In the Upper Beaver LAU, no lynx foraging habitat would be treated under Alternative 3.

The reduction in lynx forage resulting from the implementation of proposed activities would not be permanent; natural regeneration and planted seedlings would grow back and provide snowshoe hare habitat. Squires (USDA 2010) found that in Montana, hares are not using regenerated stands until approximately 20 years after logging or fire. Design Criteria would retain some existing horizontal cover (10 percent of understory trees) within intermediate treatment stands. This criterion would improve return interval of horizontal cover in commercial thinning treatment areas.

Interplant treatments would occur in primarily areas of low tree density. Interplant treatments would increase return interval of forest vegetation to function as future travel cover in the between patches of foraging habitat and may ultimately become lynx foraging habitat over time.

The project would treat lynx foraging habitat in the WUI for fuels reduction. Alternative 3 also proposes to daylight whitebark pine in 11 acres (unit 269) of stand initiation habitat outside of the WUI for restoration of whitebark or western white pine in accordance with the NRLMD (USDA 2007b). Outside of these 11 acres, no other lynx foraging habitat would be removed outside of the WUI through project activities. While the analysis above assumes that all the acres in 269 would no longer function as lynx, design criteria would retain 80 percent of the lynx foraging habitat in the stand (See Design Criteria). For more information, see Regulatory Consistency Section below.

## DENNING HABITAT

Lynx den sites are predominately found in mature boreal forest stands that have a large amount of cover and abundant, coarse, woody debris, such as downed trees and root wads (Squires et al. 2008). Den sites have also been associated with moister forest stands containing denser understory cover (Squires, Ruggiero, et al. 2006).

Based on the characteristics of lynx denning habitat described above, multistory forage and some stem exclusion stands (non-feeding) from Table 68 were estimated to be denning habitat. Denning habitat is not limited and is widespread throughout the project area. For denning, this analysis considered all late seral and old growth stands that were either multi-story forage or stem exclusion stands in the project area. These stands have high levels of snags and coarse woody debris based on field visits and common stand exams. Other denning habitat exists out of these stands; however, these qualifications likely represent the highest quality denning conditions. The proposed project activities would decrease snag and coarse woody debris across 797 acres (260 acres in the Upper Beaver LAU and 537 acres in the Lower Beaver LAU). Prescribed burning in the Mission Mountains Wilderness would likely increase denning habitat over time (see Snag and Down Woody Debris Associated Species Section of this EA).

**TABLE 72. ALTERNATIVE 3 EFFECTS TO HIGH QUALITY DENNING CONDITIONS IN THE UPPER AND LOWER BEAVER LAUS.**

| LAU | ESTIMATED HIGH QUALITY DENNING HABITAT (ACRES) | ESTIMATED REDUCTION (ACRES) |
|---|---|---|
| Lower Beaver | 7,502 | 537 (7%) |
| Upper Beaver | 7,979 | 260 (3%) |

Squires et al. (2008) believed that few lynx populations are limited by a lack of immediate den sites given their large home ranges and low den site fidelity. Due to the abundant cover and large amounts of down woody debris, some old growth forest types contain characteristics indicative of denning habitat. There would be no treatment to old growth forest stands under Alternative 3. Design Criteria in treatment areas would retain 10 tons of down woody debris per acre where available and snags would be retained in each treatment area for future recruitment of lynx denning structures. Given the Design Criteria, Forest Plan direction and information that denning habitat is widespread, the short-term reduction of denning habitat is likely to have little impact on lynx in the project LAUs.

## EARLY STAND INITIATION/STEM EXCLUSION/OTHER HABITAT

Stem exclusion (listed above as “other”) habitat includes open stands with intermittent canopy, relatively closed overstory canopy and limited understory vegetation. These stands do not contain snowshoe hare habitat (lynx forage) due to lack of horizontal cover, but can serve as hiding cover for lynx to travel through. Proposed treatments would treat 1,507 acres of stem exclusion non-feeding habitat within the Lower Beaver LAU and 246 acres within the Upper Beaver LAU. The project would also treat 850 acres of early stand initiation habitat in the Lower Beaver LAU and 34 acres in the Upper Beaver LAU.

Stem exclusion habitat structure is generally not progressing towards hare habitat. Although there would be a loss of hiding cover over the short term (10 years), there is also an opportunity through harvest prescriptions to move the stands towards conditions that provide future forage and/or denning habitat for Canada lynx. Intermediate cutting may open up the stands and encourage an increase in horizontal cover (understory regeneration); remaining trees in the stand would have improved growing conditions and would increase in size. Many of the stands where intermediate harvest is proposed would have the potential to become multistory forage and/or denning habitat once the overstory canopy closes and shade-tolerant trees regenerate in the understory. Design criteria would maintain patches of spruce and fir in the understory where available and would promote potential creation of future multistory foraging habitat over approximately 1,043 acres in the project LAUs.  Cone bearing mature forest (red squirrel habitat) would remain well distributed after project activities.

Some of the stands where regeneration treatment is prescribed have a high percentage of lodgepole pine trees that have either already been attacked by mountain pine beetle or are very susceptible to attack (See Vegetation Section of this EA). The proposed regeneration of these stands within the project LAUs would remove most of the existing overstory structure. The stands would be expected to return to a lynx foraging seedling/sapling structure within approximately 20 years. It should be noted that if the future sapling stands are pre-commercially thinned, there would not likely be an increase in quality forage for lynx.

In the regeneration treatment units, there would be little or no hiding cover remaining following treatment; lynx movement patterns could change in their travel across the project LAUs. Intermediate treatments that retain ≥40 percent canopy cover are judged to maintain lynx travel habitat.  Several Design Criteria would be in place to reduce the loss of hiding cover; regeneration units would be laid out so that no point in the unit is more than 600 feet from cover, visual screening would be retained adjacent to open roads, and commercial thin units would retain 10 percent of understory vegetation distributed throughout the each unit.

Early stand initiation acres (Table 70) includes young stands that either do not protrude sufficiently above the snow or do not have a sufficient density of horizontal cover to provide winter snowshoe hare habitat, but may be used by snowshoe hare during the summer. Treatments such as pre-commercial thinning would reduce existing tree density in early stand initiation stands. This reduction may result in a change in lynx movement patterns throughout the project LAUs. Pre-commercial thin treatments of early stand initiation habitat would increase spacing between trees and may decrease the potential of these stands to regenerate into future dense stand initiation snowshoe hare habitat. However, pre-commercial thin treatments may release trees from competition and result in faster growing trees with full crowns and place the trees on a more expedient trajectory towards a mature canopied forest which lynx are known to move through.

Alternative 3 proposed activities would also affect approximately190 acres of non-habitat in the Lower Beaver LAU and 790 acres of non-habitat in the Upper Beaver LAU.  These acres would remain non-habitat after treatment (Project File Exhibit H-6). Lynx travel would still be possible across areas of non-habitat within the project LAUs. Project activities would maintain a mosaic of stand conditions that provide for lynx travel throughout the project LAUs.

### Habitat Security

The best information suggests that forest roads do not affect lynx (USDI 2007a). USDA et al. (2000) found that lynx do not avoid roads, except at high traffic volumes (Apps 2000). Effects of highways with high speeds and high traffic volumes are not the same as the effects of forest roads. With regard to forest roads, such as those that occur in the Beaver Creek Project LAUs a recent analysis on the Okanogan NF in Washington showed lynx neither preferred nor avoided forest roads, and the existing road density does not appear to affect lynx habitat selection (McKelvey et al. 1999; USDI Fish and Wildlife Service 2000). In Montana, forest roads with low vehicular or snowmobile traffic had little effect on lynx resource selection patterns (USDA 2013b). Squires concluded that lynx did not avoid the subset of roads that were open to wheeled vehicle travel during the denning season or at any other time (Squires et al. 2010).

Given that lynx have been documented to be tolerant of motorized and human activity the potential for displacement from project activities. Road management in place for grizzly bear (Amendment 19 and the SVGBCA) would also benefit Canada lynx by providing more acres of habitat secure for lynx in all seasons. In addition, standard contractual requirements used in all contracts provide for modification or termination of the contract to avoid impacts and protect threatened and endangered species. This would allow for modification of the project should an unforeseen issue(s) be identified during operations.

Adult mortality for Canada lynx (Squires et al. 2010); includes starvation in winter and early spring, predation by lions during non-snow periods, and human conflict (e.g., accidental trapping or malicious shooting). Given the small relative reduction to foraging habitat and that the Beaver Creek Project would not increase public motorized access in the project LAUs, the project is not expected to increase the probability of lynx mortality.

### Winter Logging

Alternative 3 proposes activities that could occur during the summer or winter depending on inactive/active grizzly bear subunit guidelines (see grizzly bear section). Project activities could displace lynx. Lynx have shown tolerance to human activity (USDA 2013b; USDA et al. 2000). Little to no effects of displacement are expected considering lynx tolerance to motorized activity and distribution of available lynx foraging habitat in the project LAUs. Further, project activities would occur in only a portion of the winter lynx foraging habitat within the project LAUs leaving the remaining foraging habitat free from potential disturbance. Lynx forage across a broader variety of habitats in the summer months relative to the winter and potential displacement effects would have even less effect relative to winter activity (Squires et al. 2010). There is no existing evidence that snow compaction from winter logging causes competition with other predators, exerting a population level threat to lynx (USDA 2007b). Kolbe et al. (Kolbe et al. 2007) provides evidence for northwest Montana that the overall influence of snowmobile trails in the Seeley Lake area appeared to be minimal.

## Alternatives 2 and 3 – Action Alternatives Cumulative Effects

There is a history of timber management and road building on all ownership lands in the Beaver Creek Project LAUs; it is anticipated that timber management activities would continue into the future. Other on-going activities include hunting, trapping, firewood cutting, recreational activities, existing special use permits, road maintenance activities, noxious weed treatments, and residential development and land conversion on private lands. Timber management and road building, along with conversion of private lands in the area, have an effect on the availability of forage and denning habitat for Canada lynx. In addition, the combination of each of the activities described above could affect the ability of Canada lynx to move across the landscape securely. Landscapes in which hare habitat is more contiguous, or where good patches of hare habitat are surrounded by other patches of similar habitat quality, support more snowshoe hare (lynx forage) than landscapes that are more fragmented or include dry habitats that are poorer quality (USDA et al. 2000).

Squires et al. (Squires et al. 2013) characterized major highways and permanent development as the major barrier to connectivity between to lynx populations. The Beaver Creek Project does not propose any improvement to the highway adjacent to the project area or urbanization on private land. Future highway improvement or development on private land in the Lower Beaver LAU may occur. Land acquisitions by the Forest Service and conservation easements have helped provide habitat and reduce the potential of development on private lands.

Effects of past harvest on private land to lynx habitat were characterized using stand attributes in recent VMAP data, NAIP imagery, and field verification. These data sources were used to characterize the area within the two LAUs including NFS, private, and Legacy Lands. Private land within the Lower Beaver LAU exists in the low elevations of the LAU. The composition of lynx habitat on these private lands was incorporated into the habitat baseline in Table 68 and Table 70 above. Distribution of canopy cover is adequate to facilitate lynx movement throughout the private lands within the Lower Beaver LAUs.

In June 2008, announcements were made regarding the 320,000-acre Montana Legacy Project between the TPL, TNC, and PCTC. The Farm Bill included a Qualified Conservation Forestry Bond provision that allowed Federal bonds to be sold to finance the purchase of qualified lands adjacent to NFS lands. The land deal included all of PCTC's remaining holdings in the Swan Valley, about 67,000 acres checkered throughout the 230,000-acre watershed; approximately 47,000 of acres have been acquired by the Flathead National Forest. This benefits wildlife, including Canada lynx; the land acquisition in the Swan Valley, including the project LAUs, will minimize the negative effects of human and related activities from the development of private lands, and insure that a larger portion of lynx habitat in the Swan Valley will be managed under NRLMD guidelines in the future.

Legacy Lands were previously managed as industrial forest lands and contain little mature timber, large down woody debris, or large trees. A wood fiber agreement was created as part of the Montana Legacy Project. Through this agreement, TNC retains the timber rights to donated Legacy Lands until 2018. Within the Lower Beaver LAU, there has been harvest activity by TNC that has reduced cover, reduced lynx foraging habitat, and contributed to early stand initiation (temporarily unsuitable) conditions. A map of TNC harvest activities is located in the Project File (Exhibit H-6). The effects to lynx habitat of the TNC projects in the Lower Beaver LAU are represented in the habitat baseline above.

The Glacier Loon Project is a Forest Service fuels reduction and forest health project that is partially located within the Lower Beaver and Upper Beaver LAUs. The Glacier Loon Project would reduce lynx foraging stand initiation habitat by an additional 8 acres in the Lower Beaver LAU. The project also includes harvest treatments across an additional 213 acres of non-foraging habitat in Lower Beaver and would also treat 25 acres of non-foraging habitat in the Upper Beaver LAU. Lynx foraging habitat would remain well distributed through the project LAUs with consideration of the Glacier Loon cumulative effects.

The Cold Jim Project is a Forest Service fuels reduction and forest health project that is located outside of the Lower Beaver or Upper Beaver LAUs. The Chilly James project is a watershed restoration project to improve fish habitat and overlaps spatially with the Cold Jim project. This analysis considered the potential cumulative effects of the Glacier Loon, Cold Jim, Chilly James. and Beaver Creek projects when considered cumulatively. Lynx foraging habitat would remain well distributed throughout the LAUs affected by these projects.

Trapping has been identified as a mortality source for Canada lynx. Currently, trapping for Canada lynx is not allowed; however, incidental trapping mortality may occur. Closed roads used for proposed treatments would be closed to public wheeled use by the public during and after proposed activities are completed within the project LAUs. Roads would continue to be open for over-the-snow vehicles. Access is not expected to increase for trapping. A mosaic of forest stand conditions and successional stages would continue to exist post-project, capable of supporting a viable population of lynx in the Swan/Seeley Valley.

### DETERMINATION

The Canada Lynx is listed as a "Threatened" species under the ESA. A BA was prepared and submitted to the USFWS.

## EFFECTS OF A FOREST PLAN AMENDMENT TO ASSIGN MANAGEMENT AREAS TO ACQUIRED LANDS

The Beaver Creek Project includes a Forest Plan Amendment to assign interim management areas (MAs) to approximately 5,457 acres of former Plum Creek Timber Company (PCTC) lands acquired by the U.S. Forest Service to be managed as part of the Flathead National Forest. These interim management areas will be in effect on acquired lands until the ongoing Forest Plan Revision effort is completed, anticipated in 2 years.

The effects of the Forest Plan Amendment to the Canada lynx within the analysis area under Alternative 1 – No Action Alternative are minor because the Forest Plan standards for Canada lynx habitat apply to all lands managed by the Flathead National Forest even if management areas are not assigned. The effects of the Forest Plan Amendment under Alternative 2 and 3 are also minor in scale because although they allow for timber management to occur on some lands they will maintain consistency with the forest-wide standards and guidelines for Canada lynx. Canada lynx habitat standards are applied across the Flathead National Forest where lynx habitat has been identified and is not guided by management area direction. These MA assignments are consistent with the existing condition of these lands and the management direction assigned to adjacent lands and will not preclude future MA assignment under the Flathead Forest Plan Revision effort.

## REGULATORY FRAMEWORK AND CONSISTENCY

The Canada lynx was classified as Threatened in Montana on March 24, 2000, and is currently protected under the ESA. Threatened status affords a species and its habitat special protection from adverse effects resulting from federally authorized or funded projects.

The LCAS was developed in 2000 to guide lynx conservation and management. The LCAS established mapping of LAUs and analysis for effects to lynx at the LAU scale. The NRLMD directs the continued use of LAUs for effects analysis.

In March 2007, the ROD for the NRLMD incorporated goals, objectives, standards, and guidelines into existing plans of all National Forests in the Northern Rockies Lynx Planning Area, including the Flathead National Forest. The NRLMD allows a limited range of fuel or timber management projects that can be conducted within the WUI and limited pre-commercial thinning for other resource benefits, under exceptions or exemptions from amendment standards VEG S1, S2, S5, and S6. Within the NRLMD, the WUI definition is the "area adjacent to an at-risk community that is identified in the community wildfire protection plan" (HFRA § 101). Seeley Swan Community Wildfire Protection Plan (2013) represents the community fire plan used to define the boundaries of the WUI used in the analysis of the Beaver Creek Project.

To minimize the impact of this incidental take, terms and conditions in the Incidental Take Statement limited the number of acres per Forest that could be treated in ways that adversely affect lynx habitat. These acres were allocated to each Forest subject to the NRLMD ROD. The USFWS analyzed the effects of such projects on lynx in their first-tier BO and provided an

Incidental Take Statement for these activities. Forest allocations of activity acres approved in the BO for the 2007 decision are reported annually to the USFWS.

The USFWS issued a BO on the effects of amending Forest Plans of 18 National Forests with the NRLMD. The USFWS determined in its BO (USDI 2007a) that the NRLMD would substantially reduce or eliminate adverse effects to lynx from NFS land management activities. In the first-tier BO, the USFWS analyzed the effects of timber management/fuel reduction projects and provided an Incidental Take Statement for those activities based on explicit estimates on the number of acres that would be impacted under the exceptions and exemptions that were provided by the Forest Service (e.g., acres of probable treatment in existing WUI at the time of analysis). These acres were allocated to each Forest subject to the NRLMD ROD. In the BO on the NRLMD, the USFWS anticipated fuels reduction treatment of 103,800 acres of lynx habitat within WUIs on the Flathead National Forest and 1,460 acres of pre-commercial thinning of snowshoe hare habitat for vegetation management for other resource benefits (under the exemptions and exceptions to standards VEG S1, S2, S5 and S6). Proposed commercial and noncommercial treatments in lynx habitat in the project LAUs would be conducted under exceptions to Standards VEG S1, S2, S5, and S6 (for treatments in the WUI) and would utilize exemption acres outside the WUI for restoration of whitebark pine and western white pine.

The ROD for the NRLMD (USDA 2007b) incorporated goals, objectives, standards, and guidelines into existing plans of all National Forests in the Northern Rockies Lynx Planning Area, including the Flathead National Forest, where the Beaver Creek Project is proposed. In their BO on implementation of the NLRMD (USDI 2007a), the USFWS determined that the NRLMD would result in application of management direction on nearly 12.2 million acres of occupied lynx habitat, including all lynx habitat delineated in the recovery outline, and would substantially reduce or eliminate adverse effects to lynx from NFS land management activities. The project is consistent with NRLMD direction, as displayed in Table 73 below.

The ROD for the NRLMD incorporated goals, objectives, standards, and guidelines into existing plans of all National Forests in the Northern Rockies Lynx Planning Area, including the Flathead National Forest, where the Beaver Creek Project is proposed. The USFWS issued a BO on the effects of amending Forest Plans of 18 National Forests with the NRLMD. The BO was identified as the first-tier of a tiered consultation framework, with the review of subsequent projects that could affect lynx as being the second-tier of consultation. Second-tier BOs would be issued as appropriate, where proposed actions would result in adverse effects to lynx that were not fully analyzed in the first-tier biological opinion.

In the first-tier BO, the USFWS analyzed the effects of timber management/fuel reduction projects and provided an Incidental Take Statement for those activities based on explicit estimates on the number of acres that would be impacted under the exceptions and exemptions that were provided by the Forest Service (e.g., acres of probable treatment in existing WUI at the time of analysis). These acres were allocated to each Forest subject to the NRLMD ROD. In the BO on the NRLMD, the USFWS anticipated fuels reduction treatment of 103,800 acres of lynx habitat within WUIs on the Flathead National Forest and 1,460 acres of pre-commercial thinning of snowshoe hare habitat for vegetation management for other resource benefits (under the exemptions and exceptions to standards VEG S1, S2, S5 and S6).

Proposed commercial and noncommercial treatments in lynx habitat in the Beaver Creek Project LAUs would be conducted under exceptions to Standards VEG S5 and VEG S6 (for treatments in the WUI). Under Alternative 2, 590 acres of existing lynx forage, both sapling and multistory structures, would be negatively affected, primarily through the removal of the horizontal structure. In Alternative 3, 296 acres of lynx forage would be negatively affected. Theses acreages under each of the action alternatives would occur within the WUI, using the exceptions described above in the NRLMD (e.g., anticipated reduction of 103,800 acres). The negative effects to lynx habitat described in this analysis were included as those anticipated and analyzed in the 2007 BO on the NRLMD (USDI 2007a).

NRLMD Veg S5 applies to pre-commercial thinning projects outside the WUI to stand initiation habitat for daylight thinning of rust-resistant white pine where 80 percent of the winter snowshoe hare is retained and to restore whitebark pine. The NRLMD defines pre-commercial thinning as: "mechanically removing trees to reduce stocking and concentrate growth on the remaining trees, and not resulting in immediate financial return." The prescriptions in the Beaver Creek Project are consistent with this definition (Project File Exhibit H-6). The proposed treatments under Alternatives 2 and 3 would not exceed the allotted Flathead Forest 1,460 exemption acres. The negative effects to lynx habitat for effects to lynx habitat inside the WUI and outside the WUI, described in this analysis, were included as those anticipated and analyzed in the 2007 BO on the NRLMD (USDI 2007a).

The USFWS determined in its BO (USDI 2007a) that the NRLMD would result in application of management direction on nearly 12.2 million acres of occupied lynx habitat, including all lynx habitat delineated in the recovery outline, and would substantially reduce or eliminate adverse effects to lynx from Forest Service land management activities. The standards for lynx in the NRLMD are intended to ensure that the appropriate mosaic of habitat is provided for lynx conservation on Federal lands. The Beaver Creek Project is consistent with NRLMD direction.

**TABLE 73. NORTHERN ROCKIES LYNX MANAGEMENT DIRECTION STANDARD AND GUIDELINE COMPLIANCE.**

| Standards and Guidelines | | Project Compliance |
|---|---|---|
| **ALL MANAGEMENT PRACTICES AND ACTIVITIES (ALL):** The following standards and guidelines apply to all management projects in lynx habitat within LAU's in occupied habitat. | | |
| **Objective ALL O1** | Maintain or restore lynx habitat connectivity in and between LAUs, and in linkage areas. | Some connections between habitat patches would be affected, but no major ridgeline or riparian connections would be affected. A mosaic of stands would still exist as travel corridors and numerous sapling stands would contribute to connectivity for lynx. There would be no negative impacts on any lynx linkage area. |
| **Standard ALL S1** | New or expanded permanent development and vegetation management projects must maintain habitat connectivity in an LAU and/or linkage area. | A mosaic of stand conditions would remain after project implementation. Habitat would continue to be distributed in a way to provide connectivity through the project LAUs. No new permanent development is proposed. |
| **Guideline ALL G1** | Methods to avoid or reduce effects on lynx should be used when constructing or reconstructing highways or forest highways across federal land. Methods could include fencing, underpasses, or overpasses. | Not applicable to this project. |
| **Standard LAU S1** | Changes in LAU boundaries shall be based on site-specific habitat information and after review by the Forest Service Regional Office. | Not applicable to this project. |
| **VEGETATION MANAGEMENT ACTIVITIES AND PRACTICES (VEG):** The following standards and guidelines apply to vegetation management projects in lynx habitat within LAU's in occupied habitat. | | |
| **OBJECTIVE VEG O1** | Manage vegetation to mimic or approximate natural succession and disturbance processes while maintaining habitat components necessary for the conservation of lynx. | Natural succession and disturbance processes would be approximated and habitat components would be maintained. |
| **OBJECTIVE VEG O2** | Provide a mosaic of habitat conditions through time that support dense horizontal cover, and high densities of snowshoe hare. Provide winter snowshoe hare habitat in both the stand initiation structural stage and in mature, multistory conifer vegetation. | The mosaic would be provided over time, including areas of dense horizontal cover. |

**TABLE 73. NORTHERN ROCKIES LYNX MANAGEMENT DIRECTION STANDARD AND GUIDELINE COMPLIANCE.**

| Standards and Guidelines | | Project Compliance |
|---|---|---|
| **OBJECTIVE VEG O3** | Conduct fire use activities to restore ecological processes and maintain or improve lynx habitat. | Stands within the project area have been influenced by regular fire intervals over the past century. Broadcast and wilderness prescribed burning would be consistent with restoration of ecological processes. No lynx habitat would be removed through burning. Burning may recruit high density of saplings in some areas over time. |
| **OBJECTIVE VEG O4** | Focus vegetation management in areas that have potential to improve winter snowshoe hare habitat but presently have poorly developed understories that lack dense horizontal cover. | The majority of acres in both alternatives are focused on stem exclusion habitat. Regeneration harvest may recruit future stand initiation habitat. |
| **STANDARD VEG S1** | **Where and to what this applies:** Standard VEG S1 applies to all vegetation management projects that regenerate forests, except for fuel treatment projects within the wildland urban interface (WUI) as defined by HFRA, subject to the following limitation:<br><br>Fuel treatment projects within the WUI that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 may occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest). For fuel treatment projects within the WUI see guideline VEG G10.<br><br>**The Standard:** Unless a broad scale assessment has been completed that substantiates different historic levels of stand initiation structural stages, limit disturbance in each LAU as follows: If more than 30 percent of the lynx habitat in an LAU is currently in a stand initiation structural stage that does not yet provide winter snowshoe hare habitat (early stand initiation), no additional habitat may be regenerated by vegetation management projects. | Less than 30% of each LAU is currently in a stand initiation structural stage that does not yet provide winter snowshoe hare habitat and the proposed project would not cause this standard to be exceeded in any LAU. Considering effects of Beaver Creek Project and Cumulative Effects, Alternative 2 would result in 14% of the Lower Beaver LAU and 16% in the Upper Beaver LAU. Alternative 3 would result in 12% in the Lower Beaver LAU and 16% in the Upper Beaver LAU. |
| **STANDARD VEG S2** | **Where and to what this applies:** Standard VEG S2 applies to all timber management projects that regenerate forests, except for fuel treatment. Projects within the WUI as defined by HFRA17, subject to the following limitation:<br><br>Fuel treatment projects within the WUI that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 shall occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest).<br><br>For fuel treatment projects within the WUI see guideline VEG G10.<br>The standard: Timber management projects shall not regenerate more than 15 percent of lynx habitat on NFS lands within an LAU in a 10-year period. | The proposed project would not cause there to be regeneration treatment on more than 15% of lynx habitat on NFS lands within any LAU in a ten-year period. Alterative 2 combined with cumulative effects would result in 10% of lynx habitat regenerated in the Lower Beaver LAU and 3% of the Upper Beaver regenerated. Alternative 3 combined with cumulative effects would result in 6% of the Lower Beaver LAU regenerated and 3% of the Upper Beaver LAU regenerated. |

**TABLE 73. NORTHERN ROCKIES LYNX MANAGEMENT DIRECTION STANDARD AND GUIDELINE COMPLIANCE.**

| STANDARDS AND GUIDELINES | | PROJECT COMPLIANCE |
|---|---|---|
| **STANDARD VEG S5** | **Where and to what this applies**: Standard VEG S5 applies to all pre-commercial thinning projects, except for fuel treatment projects that use pre-commercial thinning as a tool within the wildland urban interface (WUI) as defined by HFRA, subject to the following limitation:<br><br>Fuel treatment projects within the WUI that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 may occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest). For fuel treatment projects within the WUI see guideline VEG G10.<br><br>**The Standard:** Pre-commercial thinning projects that reduce snowshoe hare habitat may occur from the stand initiation structural stage until the stands no longer provide winter snowshoe hare habitat only:<br><br>Within 200 feet of administrative sites, dwellings, or outbuildings;<br>For research studies or genetic tree tests evaluating genetically improved reforestation stock;<br>Based on new information that is peer reviewed and accepted by the regional level of the Forest Service, and state level of FWS, where a written determination states:<br>that a project is not likely to adversely affect lynx; or<br>that a project is likely to have short term adverse effects on lynx or its habitat, but would result in long-term benefits to lynx and its habitat;<br>For conifer removal in aspen, or daylight thinning around individual aspen trees, where aspen is in decline;<br>For daylight thinning of planted rust-resistant white pine where 80% of the winter snowshoe hare habitat is retained;<br>To restore whitebark pine<br>Exceptions 2 through 6 shall only be utilized in LAUs where Standard VEG S1 is met. | The Beaver Creek project proposes commercial and pre-commercial harvest as a fuels reduction tool in the WUI. The project would also use daylighting to treat stand initiation structural stage stands outside the WUI to restore whitebark pine or western white pine. In western white pine stands, 80% of the foraging habitat would be retained. |

**TABLE 73. NORTHERN ROCKIES LYNX MANAGEMENT DIRECTION STANDARD AND GUIDELINE COMPLIANCE.**

| | STANDARDS AND GUIDELINES | PROJECT COMPLIANCE |
|---|---|---|
| **STANDARD VEG S6** | **Where and to what this applies:** Standard VEG S6 applies to all vegetation management projects except for fuel treatment projects within the wildland urban interface (WUI) as defined by HFRA, subject to the following limitation:<br><br>Fuel treatment projects within the WUI that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 may occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest).<br><br>For fuel treatment projects within the WUI see guideline VEG G10.<br><br>**The Standard:** Vegetation management projects that reduce snowshoe hare habitat in multistory mature or late successional forests may occur only:<br><br>Within 200 feet of administrative sites, dwellings, outbuildings, recreation sites, and special use permit improvements, including infrastructure within permitted ski area boundaries; or<br><br>For research studies or genetic tree tests evaluating genetically improved reforestation stock; or<br><br>For incidental removal during salvage harvest (e.g. removal due to location of skid trails).<br><br>(NOTE: Timber harvest is allowed in areas that have potential to improve winter snowshoe hare habitat but presently have poorly developed understories that lack dense horizontal cover [e.g. uneven age management systems could be used to create openings where there is little understory so that new forage can grow]). | The Project proposes vegetation management in snowshoe hare habitat in multistory mature forest only within the WUI as a fuel reduction tool. |
| **GUIDELINE VEG G1** | Vegetation management projects should be planned to recruit a high density of conifers, hardwoods, and shrubs where such habitat is scarce or not available. Priority for treatment should be given to stem-exclusion, closed-canopy structural stage stands to enhance habitat conditions for lynx or their prey (e.g. mesic, monotypic lodgepole stands). Winter snowshoe hare habitat should be near denning habitat. | This guideline has been incorporated into the proposed project because activities in stem exclusion habitat, including tree harvest, planting, and prescribed burning, would promote a high density of conifers, hardwoods, and shrubs to provide feeding habitat for lynx, in close juxtaposition to potential denning habitat. |
| **GUIDELINE VEG G4** | Prescribed fire activities should not create permanent travel routes that facilitate snow compaction. Constructing permanent firebreaks on ridges or saddles should be avoided. | This guideline has been incorporated into the proposed project. Prescribed fire would not create travel routes and no permanent fire breaks would be constructed. |
| **GUIDELINE VEG G5** | Habitat for alternate prey species, primarily red squirrel, should be provided in each LAU. | Habitat for alternate prey species is present in mature and old forests in each LAU. No treatment is proposed in old growth forest. |
| **GUIDELINE VEG G10** | Fuel treatment projects within the WUI as defined by HFRA should be designed considering Standards VEG S1, S2, S5, and S6 to promote lynx conservation. | Intermediate harvest treatments would encourage structural diversity. Regeneration of MPB affected stands would provide stand initiation hare habitat within approximately 20 years. |

| TABLE 73. NORTHERN ROCKIES LYNX MANAGEMENT DIRECTION STANDARD AND GUIDELINE COMPLIANCE. | | |
|---|---|---|
| STANDARDS AND GUIDELINES | | PROJECT COMPLIANCE |
| GUIDELINE VEG G11 | Denning habitat should be distributed in each LAU in the form of pockets of large amounts of large woody debris, either down logs or root wads, or large piles of small wind thrown trees ("jack-strawed" piles). If denning habitat appears to be lacking in the LAU, then projects should be designed to retain some coarse woody debris, piles, or residual trees to provide denning habitat in the future. | There are no proposed activities in old growth forest, which has a high potential to provide quality denning habitat. There are other mature stands that provide denning habitat in the Beaver Creek area that would not be treated. Design Criteria include retention of down woody material in treated units.<br><br>Denning is not estimated to be lacking within the LAU. |
| OBJECTIVE GRAZ 01 | Manage livestock grazing to be compatible with improving or maintaining lynx habitat. | Not Applicable to this project. The project does not propose any grazing. Existing grazing in the project area is managed to be compatible with lynx habitat maintenance. Dense single-story or multistory stands providing lynx foraging opportunities are distributed throughout each project LAU. Existing grazing is not known to affect recruitment of dense stands of saplings for future lynx foraging habitat in the Lower Beaver LAU. |
| GUIDELINE GRAZ 01 | In fire-and harvest-created openings, livestock grazing should be managed so impacts do not prevent shrubs and trees from regenerating. | Based on the few animals grazed across a large permit area. Grazing in the project area would not prevent shrubs and trees from regenerating in fire and harvest-created openings. |
| GUIDELINE GRAZ 02 | In aspen stands, livestock grazing should be managed to contribute to the long-term health and sustainability of aspen. | The project does not propose any management in aspen stands. The project does propose to plant aspen stands which may benefit snowshoe hare densities in the future. |
| GUIDELINE GRAZ 03 | In riparian areas and willow carrs, livestock grazing should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes. | Not Applicable to this project. The project does not propose any grazing. Ongoing grazing in the project LAUs is managed to prevent overuse of meadows, riparian areas and moist sites to maintain a preponderance of mid to late seral conditions in riparian areas. |
| GUIDELINE GRAZ 04 | In shrub-steppe habitats, livestock grazing should be managed in the elevation ranges of forested lynx habitat in LAUs, to contribute to maintaining or achieving a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes. | Not Applicable to this project. The project area does not contain shrub-steppe habitats. |
| GUIDELINE HU O1 | Maintain the lynx's natural competitive advantage over other predators in deep snow by discouraging the expansion of snow-compacting activities in lynx habitat. | Cross-country over-snow travel is already allowed on all USFS land throughout this relatively accessible landscape so there would be no expansion of snow-compacting activity. |
| GUIDELINE HU O2 | Manage recreational activities to maintain lynx habitat and connectivity. | Existing recreational activities are focused along trails and forest roads. These activities are not known to affect lynx connectivity or habitat (Squires et al. 2006; USDA 2000). |
| GUIDELINE HU O3 | Concentrate activities in existing developed areas, rather than developing new areas in lynx habitat. | No new recreation sites would be developed. |
| GUIDELINE HU O4 | Provide for lynx habitat needs and connectivity when developing new or expanding existing developed recreation sites or ski areas. | Not Applicable to this project. |

**TABLE 73. NORTHERN ROCKIES LYNX MANAGEMENT DIRECTION STANDARD AND GUIDELINE COMPLIANCE.**

| STANDARDS AND GUIDELINES | | PROJECT COMPLIANCE |
|---|---|---|
| **GUIDELINE HU O5** | Manage human activities, such as special uses, mineral and oil and gas exploration and development, and placement of utility transmission corridors, to reduce impacts on lynx and lynx habitat. | Not Applicable to this project. |
| **GUIDELINE HU O6** | Reduce adverse highway effects on lynx by working cooperatively with other agencies to provide for lynx movement and habitat connectivity, and to reduce the potential of lynx mortality. | Not Applicable to this project. |
| **GUIDELINE HU G1** | When developing or expanding ski areas, provisions should be made for adequately sized inter-trail islands that include coarse woody debris, so winter snowshoe hare habitat is maintained. | Not Applicable to this project. |
| **GUIDELINE HU G2** | When developing or expanding ski areas, lynx foraging habitat should be provided consistent with the ski area's operational needs, especially where lynx habitat occurs as narrow bands of coniferous forest across mountain slopes. | Not Applicable to this project. |
| **GUIDELINE HU G3** | Recreation developments and operations should be planned in ways that both provide for lynx movement and maintain the effectiveness of lynx habitat. | Not Applicable to this project. |
| **GUIDELINE HU G4** | For mineral and energy development sites and facilities, remote monitoring should be encouraged to reduce snow compaction. | Not Applicable to this project. |
| **GUIDELINE HU G5** | For mineral and energy development sites and facilities that are closed, a reclamation plan that restores 40 lynx habitat should be developed. | Not Applicable to this project. |
| **GUIDELINE HU G6** | Methods to avoid or reduce effects on lynx should be used in lynx habitat when upgrading unpaved roads to maintenance levels 4 or 5, if the result would be increased traffic speeds and volumes, or a foreseeable contribution to increases inhuman activity or development. | Not Applicable to this project. |
| **GUIDELINE HU G7** | New permanent roads should not be built on ridge-tops and saddles, or in areas identified as important for lynx habitat connectivity. New permanent roads and trails should be situated away from forested stringers. | The project proposes to realign road segments to create a shorter overall road system. Realignment would not occur on ridgetops, saddles or areas important for lynx connectivity. Lynx have not been found to avoid forest roads. |
| **GUIDELINE HU G8** | Cutting brush along low-speed, low-traffic-volume roads should be done to the minimum level necessary to provide for public safety. | Funding constraints limit this to the minimum necessary for safety. |
| **GUIDELINE HU G9** | On new roads built for projects, public motorized use should be restricted. Effective closures should be provided in road designs. When the project is over, these roads should be reclaimed or decommissioned, if not needed for other management objectives. | Public motorized use will not be permitted on restricted roads. All temporary roads will be rehabilitated. The project proposes to realign road segments to create a shorter overall road system. Roads that are realigned would remain closed to the public before, during and after project activities. |
| **GUIDELINE HU G10** | When developing or expanding ski areas and trails, consider locating access roads and lift termini to maintain and provide lynx security habitat, if it has been identified as a need. | Not Applicable to this project. |

**TABLE 73. NORTHERN ROCKIES LYNX MANAGEMENT DIRECTION STANDARD AND GUIDELINE COMPLIANCE.**

| STANDARDS AND GUIDELINES | | PROJECT COMPLIANCE |
|---|---|---|
| **GUIDELINE HU G11** | Designated over-the-snow routes or designated play areas should not expand outside baseline areas of consistent snow compaction, unless designation serves to consolidate use and improve lynx habitat. This may be calculated on an LAU basis, or on a combination of immediately adjacent LAUs. This does not apply inside permitted ski area boundaries, to winter logging, to rerouting trails for public safety, to accessing private inholdings, or to access regulated by Guideline HU G12. Use the same analysis boundaries for all actions subject to this guideline. | Not Applicable to this project. |
| **GUIDELINE HU G12** | Winter access for non-recreation special uses and mineral and energy exploration and development, should be limited to designated routes or designated over-the snow routes. | Not Applicable to this project. |
| **OBJECTIVE LINK O1** | In areas of intermingled land ownership, work with landowners to pursue conservation easements, habitat conservation plans, land exchanges, or other solutions to reduce the potential of adverse impacts on lynx and lynx habitat. | Land and Water Conservation Funds (LWCF) and the Montana Legacy Project have acquired Plum Creek Timber Company lands in the project area for public ownership. |
| **STANDARD LINK S1** | When highway or forest highway construction or reconstruction is proposed in linkage areas, identify potential highway crossings. | No highway construction or reconstruction is proposed. |
| **GUIDELINE LINK G1** | NFS lands should be retained in public ownership. | No NFS lands sales or exchanges are proposed. |
| **GUIDELINE LINK G2** | Livestock grazing in shrub-steppe habitats should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes. | Not Applicable to this project. |

# CANADA LYNX CRITICAL HABITAT

## ANALYSIS AREA

### SPATIAL BOUNDS

In accordance with the LCAS (USDA et al. 2000), 109 LAUs were identified and mapped on the Flathead National Forest. These areas approximate the size of a female's home range and contain year-round habitat components (USDA et al. 2000). The LAUs are the geographic area used to analyze direct, indirect, and cumulative effects for Canada lynx. The proposed project is located across two LAUs – Lower and Upper Beaver. In determining impacts to lynx critical habitat, this analysis considered all designated lynx critical habitat in the two LAUs.

### TEMPORAL BOUNDS

The length of time for the activities associated with the proposed fuels reduction and forest health treatments is approximately 5 years. This is based on the probable contract length for the proposed project, and the timeframes for related activities. The temporal scale of the effects analysis extends 100 years into the future, enough time for dense forest conditions and mature multistory stands to develop and trees to die and/or fall over and create denning habitat. Temporal bounds for specific activities are discussed below.

# DATA SOURCES, METHODS, AND ASSUMPTIONS USED

Data used included aerial photography, stand exams, VMAP data, field surveys of downed logs, old growth surveys, project area field visits to verify lynx habitat classification, research literature, and GIS and dataset information for features such as general forest attributes, slope, aspect, habitat type, forest type, elevation, and mapped lynx habitat.

## HABITAT

The conservation role of lynx Critical Habitat is to support viable core area lynx populations (USDI Fish and Wildlife Service 2009). In 2008, Critical Habitat was proposed for Canada Lynx. A Final Rule for Revised Designation of Critical Habitat for the Contiguous United States Distinct Population Segment of the Canada Lynx was effective on March 27, 2009. The designation of Critical Habitat for lynx was based on the best assessment of areas: (1) determined to be occupied at the time of listing; (2) that contained the physical and biological features in the appropriate spatial arrangement and quantity essential for the conservation of the species; and (3) that may require special management considerations or protection.

On September 12, 2014, the USFWS revised Critical Habitat in the contiguous United States. Northwest Montana is in Critical Habitat Unit 3: Northern Rocky Mountains. This unit includes most of northwest Montana, as well as a small portion of northeastern Idaho, and encompasses approximately 9,783 square miles (approximately 6,261,095 acres). The Unit 3 area is essential to the conservation of lynx because it appears to support the highest density of lynx populations in the Northern Rocky Mountain region of the lynx's range. It also likely acts as a source for lynx and provides connectivity to other portions of the lynx's range in the Rocky Mountains (USDI Fish and Wildlife Service 2009, 2014).

As of the 2014 revision, on the Flathead National Forest, there are approximately 2,273,340 acres of designated Critical Habitat for lynx. The majority (approximately 99 percent) of the project's 2 LAUs representing the spatial bounds of this analysis are designated as Canada lynx Critical Habitat. All of the proposed activities are located in Critical Habitat (Project File Exhibit H-6).

By definition, Critical Habitat for Canada lynx contains the physical and biological features essential to conservation of the lynx, and is comprised of "primary constituent elements" (PCEs) in an appropriate quantity and spatial arrangement (USDI Fish and Wildlife Service 2008). Based on the current knowledge of the life history, biology, and ecology of the lynx, the PCE and its four components for lynx Critical Habitat are:

1) Boreal forest landscapes supporting a mosaic of differing successional forest stages and containing:

    a) *Presence of snowshoe hares and their preferred habitat conditions*, which include dense understories of young trees, shrubs or overhanging boughs that protrude above the snow, and mature multistoried stands with conifer boughs touching the snow surface (PCE 1a);

    b) *Winter snow conditions* that are generally deep and fluffy for extended periods of time (PCE 1b);

c) *Sites for denning* that have abundant coarse woody debris, such as downed trees and root wads (PCE 1c); and

d) *Matrix habitat* (e.g., hardwood forest, dry forest, non-forest, or other habitat types that do not support snowshoe hares) *that occurs between patches of boreal forest* in close juxtaposition (at the scale of a lynx home range) such that lynx are likely to travel through such habitat while accessing patches of boreal forest within a home range (PCE 1d).

Table 74 summarizes the estimated distribution of stand conditions that provide PCEs within lynx Critical Habitat across the 2 LAUs in the project area. Table 75 summarizes the estimated denning habitat (PCE1c) within the 2 project LAUs. The estimated PCE1c is likely an underestimate. Only late-seral stands that had high amounts of coarse woody debris were included in this estimate. Other PCE1c conditions exist within the project area in the form of root wads, slash piles, blow down etc.; however, the estimated PCE1c is likely the best quality denning habitat available.

**TABLE 74. ESTIMATED EXISTING STAND CONDITIONS THAT CONTRIBUTE TO PCE1A AND PCE1D WITHIN CANADA LYNX CRITICAL HABITAT.**

| LAU Name | LAU Total Acres | Total Critical Habitat Acres | PCE1a - Stand Initiation currently hare habitat1 (% of LAU Critical Habitat) | PCE1a -Multistory currently hare habitat2 Acres (% of LAU Critical Habitat) | PCE1d Matrix3 |
|---|---|---|---|---|---|
| Lower Beaver | 22,418 | 22,073 | 1,902 | 6,769 | 2,599 |
| Upper Beaver | 20,451 | 20,451 | 740 | 5,641 | 11,304 |
| Total | 42,869 | 40,524 | 2,642 | 12,410 | 13,903 |

[1]Stand initiation structural stage with dense young trees, shrubs or overhanging boughs that protrude above the snow.
[2]Multistory structural stage with many age classes, vegetation layers, a dense understory of young trees and conifer boughs touching the snow surface that provides snowshoe hare habitat, which may also provide denning habitat.
[3]Matrix: hardwood forest, dry forest, non-forest, or other habitat types that do not support snowshoe hares.

Squires et al. (2008) found that female dens were primarily located in spruce-fir stands with abundant coarse woody debris and high horizontal cover; however denning did occur in stands with coarse woody debris but insufficient cover for snowshoe hares. Table 75 summarizes the estimated denning habitat in designated critical habitat within the project LAUs. This habitat includes some multistory hare habitat and some stem exclusion habitat with high amounts of down woody debris.

**TABLE 75. ESTIMATED STAND CONDITIONS THAT CONTRIBUTE TO PCE1C WITHIN CANADA LYNX CRITICAL HABITAT.**

| LAU Name | LAU Total Acres | Total Critical Habitat Acres | PCE1c Denning Habitat[1] Acres |
|---|---|---|---|
| Lower Beaver | 22,418 | 22,073 | 7,502 |
| Upper Beaver | 20,451 | 20,451 | 7,979 |
| Total | 42,869 | 40,524 | 15,481 |

[1]Sites for denning that have abundant coarse woody debris, such as downed trees and root wads. Stands that include these features include both multistory forage and stem exclusion stands with high amounts of coarse woody debris.

## ALTERNATIVE 1 - NO ACTION
## DIRECT, INDIRECT, AND CUMULATIVE EFFECTS

Under the No Action Alternative, there would be no vegetation treatments or associated activities proposed. There would be no direct effects to Canada Lynx Critical Habitat as a result of implementing this alternative; there would be no reduction of PCE1a or PCE1c from the management activities proposed in the project LAUs. Stands that may only provide summer forage for lynx now (early stand initiation), because they are too short to protrude above the snow in winter, would be expected to continue to grow, becoming good winter hare habitat (PCE1a). Red squirrel habitat (alternate prey for lynx) would be maintained in old growth and other mature forest stands across the project LAUs.

Indirectly, not implementing the proposed vegetative treatments could increase the risk of a wildfire burning more intensely in the project area in the future, which could result in changes in available PCE1a, PCE1c, and PCE1d. Fires have historically produced both positive and negative effects for lynx; loss of hiding cover and/or loss of PCE1a conditions would be a potential negative effect. On the positive side, PCE1a would be potentially increased as stands regenerate over time and stands regenerate from wildfire disturbance.

Established human activities would continue including road maintenance, firewood cutting, trapping, and development on private lands. Alternative 1 would not contribute negative cumulative effects to Canada lynx in the Swan Valley.

## ALTERNATIVES 2 AND 3 – ACTION ALTERNATIVES DIRECT AND INDIRECT EFFECTS

The Final Rule for Revised Designation of Critical Habitat (March 27, 2009) described three types of Federal actions that may affect Critical Habitat:

1) Actions that would reduce or remove understory vegetation within boreal forest stands on a scale proportionate to the large landscape used by lynx.
2) Actions that would cause permanent loss or conversion of the boreal forest on a scale proportionate to the large landscape used by lynx.
3) Actions that would increase traffic volume and speed on roads that divide lynx Critical Habitat, or, in matrix habitat, activities that change vegetation structure or condition in such a way as to create a barrier or impede lynx movement.

### CANADA LYNX CRITICAL HABITAT

All of the proposed units are located within designated Canada Lynx Critical Habitat.

For Canada Lynx Critical Habitat, quantification at the LAU scale of the vegetation management effects is displayed in Table 10.This analysis is separate from that applied to the lynx analysis as the focus is on impacts on the components of the PCE for Lynx Critical Habitat.

Within Lynx Critical Habitat in the Beaver Creek Project Area, there would be a decrease of approximately 2 percent stand initiation and 2 percent multistory PCE1a conditions under Alternative 2. Alternative 3 would result in a decrease of 1 percent stand initiation and 1 percent multistory PCE1a conditions. Table 76 and Table 77 display the amount of habitat providing PCE 1a that would be affected by the proposed activities.

**TABLE 76. ALTERNATIVE 2 -SUMMARY OF EFFECTS TO LYNX CRITICAL HABITAT.**

| LAU | ACRES TREATED IN LYNX FORAGE[1] (PCE 1A) | ACRES TREATED IN LYNX DENNING (PCE 1C) | ESI ACRES TREATED IN CRITICAL HABITAT | STEM EXCLUSION / ESI ACRES TREATED IN LYNX HABITAT | ACRES TREATED IN MATRIX HABITAT (PCE1D) |
|---|---|---|---|---|---|
| Lower Beaver | 590 | 611 | 787 | 3,124 | 203 |
| Upper Beaver | 0 | 260 | 0 | 279 | 790 |
| **Total** | **590** | **871** | **787** | **3,403** | **993** |

[1]Treatment of lynx forage would primarily occur in the WUI; 11 acres of stand initiation would be daylighted outside the WUI. Lynx forage here is defined as winter foraging habitat (stand initiation and multistory hare habitat).

**TABLE 77. ALTERNATIVE 3 - SUMMARY OF EFFECTS TO LYNX CRITICAL HABITAT.**

| LAU | ACRES TREATED IN LYNX FORAGE[1] (PCE 1A) | ACRES TREATED IN LYNX DENNING (PCE 1C) | ESI ACRES TREATED IN CRITICAL HABITAT | STEM EXCLUSION / ESI ACRES TREATED IN LYNX HABITAT | ACRES TREATED IN MATRIX HABITAT (PCE1D) |
|---|---|---|---|---|---|
| Lower Beaver | 296 | 537 | 850 | 2,358 | 190 |
| Upper Beaver | 0 | 260 | 0 | 280 | 790 |
| Total | 296 | 797 | **850** | 2,620 | 980 |

[1] Treatment of lynx forage would primarily occur in the WUI; 11 acres of stand initiation would be daylighted outside the WUI. Lynx forage here is defined as winter foraging habitat (stand initiation and multistory hare habitat).

Reduction in PCE1a would not be permanent. Natural regeneration and planted seedlings would grow back and provide snowshoe hare habitat. However, it should be noted that where regeneration harvest is proposed, PCE1a stand conditions would return in approximately 20 years.

PCE1c would be reduced by 871 acres in Alternative 2 and 797 acres in Alternative 3. As stated in Table 76, stand conditions with PCE1c attributes were considered for both multistory forage and stem exclusion habitats with high amounts of down woody debris. The reduction of PCE1c would be approximately 12 percent of the Lower Beaver LAU and 3 percent of Upper Beaver LAU in Alternative 2. Alternative 3 would reduce PCE1c by 7 percent in the Lower Beaver LAU and 3 percent in the Upper Beaver LAU. Project Design Criteria would retain 10 tons/acre of down woody debris where available in treatment units and retain large diameter snags under Forest Plan Amendment 21. These features would retain denning structures for lynx in treated stands. As treated stands regenerate, sufficient cover combined with lynx denning structures (fallen snags, root wads) would create denning habitat over time.

PCE 1b (deep fluffy snows) would not be affected by this proposal.

Alternative 2 proposes 993 acres of vegetation management and fire activities in matrix habitat. Alternative 3 proposes 980 acres of vegetation management and fire activities in matrix habitat. Lynx movement patterns may change as a result of treatment, but PCE 1d (matrix habitat) would continue to support the ability of lynx to travel within their home range.

The effects on Canada Lynx Critical Habitat would occur on a small portion of Critical Habitat Unit 3. The sum of Critical Habitat in the project LAUs comprises approximately 0.64 percent of Critical Habitat Unit 3. Table 78 displays effects to PCEs relative to Critical Habitat within the project LAUs, as well as relative to Critical Habitat in Unit 3 for the action alternatives.

**TABLE 78. EFFECTS OF ACTION ALTERNATIVES ON THE PRIMARY CONSTITUENT ELEMENTS FOR DESIGNATED LYNX CRITICAL HABITAT.**

| PRIMARY CONSTITUENT ELEMENT | | EFFECT WITHIN THE PROJECT LAUS |
|---|---|---|
| PCE1a | Presence of snowshoe hares and their preferred habitat conditions, which include dense understories of young trees, shrubs or overhanging boughs that protrude above the snow, and mature multistoried stands with conifer boughs touching the snow surface. | The approximately 296 - 590 acres of hare habitat that would be affected by vegetation management activities, is approximately 1 -2% of the available hare habitat (PCE1a) in the project LAUs and less than 0.0001% of the Critical Habitat Area in Unit 3. |
| PCE1b | Winter snow conditions that are generally deep and fluffy for extended periods of time. | The presence of deep fluffy snows would not be affected by this proposal. |
| PCE1c | Sites for denning that have abundant coarse woody debris, such as downed trees and root wads. | The approximately 797 - 811 acres of denning habitat that would be affected by vegetation management and fire activities is at most about 6% of the available denning habitat (PCE1c) in the 2 project LAUs. |
| PCE1d | Matrix habitat (e.g., hardwood forest, dry forest, non-forest, or other habitat types that do not support snowshoe hares) that occurs between patches of boreal forest in close juxtaposition (at the scale of a lynx home range) such that lynx are likely to travel through such habitat while accessing patches of boreal forest within a home range. | The proposal would not alter the ability of lynx to access habitat within or between home ranges. There would be no negative impacts on any lynx linkage area (Squires et al. 2013). |

There would be no permanent loss (such as paving or building construction) of habitat or conversion of the boreal forest as a result of proposed activities. The physical and biological features would not be altered to an extent that would appreciably reduce the conservation value of Critical Habitat for lynx and the PCEs would continue to function at the scale of the LAU and across Critical Habitat Unit 3.

The proposed use of existing roads and temporary roads would not create barriers to, or impede movements of lynx.

## ALTERNATIVES 2 AND 3 - ACTION ALTERNATIVES CUMULATIVE EFFECTS

There is a history of timber management and road building on all ownership lands in the project LAUs; it is anticipated that timber management activities would continue into the future. Other ongoing activities include hunting, trapping, firewood cutting, recreational activities, existing special use permits, road maintenance activities, noxious weed treatments, ongoing vegetation management project such as Glacier Loon and Cold Jim projects, watershed restoration projects such as Chilly James, and residential development and land conversion on private lands in the Swan Valley. Timber management and road building, along with conversion of private lands in the area, have an effect on the availability of forage and denning habitat for Canada lynx. In addition, the combination of each of the activities described above can affect the ability of Canada lynx to move across the landscape securely. Landscapes in which hare habitat is more contiguous, or where good patches of hare habitat are surrounded by other patches of similar habitat quality, support more snowshoe hare (lynx forage) than landscapes that are more fragmented or include matrix habitats that are poorer quality (Lewis et al. 2011; Squires et al. 2013; Squires et al. 2010; USDA et al. 2000).

Effects of past private land harvest on lynx habitat were characterized using stand attributes in recent VMAP data, NAIP imagery, and field verification. These data sources were used to characterize the area within the two LAUs including NFS, private, and Legacy Lands. Private land exists in the low elevations of the Lower Beaver LAU. The composition of lynx habitat on these private lands was incorporated into the habitat baseline. Distribution of canopy cover was judged to be adequate to facilitate lynx movement throughout the private lands.

In June 2008, announcements were made regarding the 320,000-acre Montana Legacy Project between the TPL, TNC, and PCTC. The Farm Bill included a Qualified Conservation Forestry Bond provision that allowed Federal bonds to be sold to finance the purchase of qualified lands adjacent to NFS lands. The land deal included all of PCTC's remaining holdings in the Swan Valley, about 67,000 acres checkered throughout the 230,000-acre watershed; approximately 47,000 of acres have been acquired by the Flathead National Forest. This benefits wildlife, including Canada lynx; the land acquisition in the Swan Valley, including the project LAUs would minimize the negative effects of human and related activities from the development of private lands, and insure that a larger portion of Lynx Critical Habitat in the Swan Valley would be managed under Forest Plan direction for habitat conservation into the future. The project minimizes risk of fragmentation of PCEs by obtaining large parcels for public land ownership.

A wood fiber agreement was created as part of the Montana Legacy Project. Through this agreement, TNC retains the timber rights to donated Legacy Lands until 2018. The Nature Conservancy's activities have occurred in the Lower and Upper Beaver LAUs and the effects of harvest were incorporated into the habitat baseline of this analysis. Legacy Lands were previously managed as industrial forest lands and contain little mature timber. Regenerating vegetation occurs in clumps with existing spaced out mature seed trees that were retained from past harvest. Travel cover and PCE1a exists as regenerating vegetation, remaining mature trees, and buffers surrounding riparian areas.

The Nature Conservancy's overstory removal activities selectively removed intermittent mature trees in old regeneration units. Commercial thinning reduced stand densities by removing merchantable trees. The harvest activities have reduced lynx foraging habitat and travel cover within the Lower Beaver LAU. Proposed changes to vegetation structure or condition in matrix habitat (PCE1d) would not create a barrier or impede lynx movement in the two project LAUs. Winter snow conditions (PCE1b) would not be affected under activities proposed in the project LAUs. The Forest Service is not aware of any other proposed activities by TNC at this time.

There would be local negative effects to snowshoe hare habitat (PCE 1a) and denning habitat (PCE1d) if future harvest by TNC on Montana Legacy Lands. However, at the landscape scale, considering the large amount of Critical Habitat in Unit 3 (Northern Rocky Mountains), sufficient densities of snowshoe hares would be produced to support lynx presence. Hodges (2000) recommended maintaining some minimum density of snowshoe hares across a broad landscape, e.g., >0.5 hare/hectare (0.2 hares/acre), to support a self-sustaining population of lynx. Griffin et al. (2004), and Mills et al. (2005) estimated density and relative abundance of snowshoe hares throughout Montana. Hare densities generally were low, ranging between 0.1 to 0.6 hares/hectare (0.24 to 1.48 hares/acre). In western Montana, Griffin and Mills (Griffin et al. 2004) found the highest snowshoe hare densities in regenerating forest stands with high sapling density and in uncut, mature multi-story stands with abundant saplings. Given that hares are a forest stand disturbance dependent species and the legacy of forest management across ownerships within the project LAUs that have maintained a mosaic of stands, hare densities would remain sufficient within remaining patches of hare habitat while regenerating forest structure would provide preferred hare habitat into the future. The PCEs would continue to be available within Canada Lynx Critical Habitat across the Flathead National Forest and proposed actions would not cause a permanent loss or conversion of the boreal forest on a scale proportionate to the large landscapes used by lynx.

## EFFECTS OF A FOREST PLAN AMENDMENT TO ASSIGN MANAGEMENT AREAS TO ACQUIRED LANDS

The Beaver Creek Project includes a Forest Plan Amendment to assign interim management areas (MAs) to approximately 5,457 acres of former PCTC lands acquired by the USDA Forest Service to be managed as part of the Flathead National Forest. These interim management areas will be in effect on acquired lands until the ongoing Forest Plan Revision effort is completed, anticipated in 2 years.

The effects of the Forest Plan Amendment to Canada lynx critical habitat within the analysis area under Alternative 1 – No Action Alternative are minor because the Forest Plan standards for Canada lynx critical habitat apply to all lands managed by the Flathead National Forest even if management areas are not assigned. The effects of the Forest Plan Amendment under Alternative 2 and 3 are also minor in scale because although they allow for timber management to occur on some lands they will maintain consistency with the forest-wide standards and guidelines for Canada lynx critical habitat. Canada lynx critical habitat standards are applied across the Flathead National Forest where critical lynx habitat has been identified and is not guided by management area direction. These MA assignments are consistent with the existing condition of these lands and the management direction assigned to adjacent lands and will not preclude future MA assignment under the Flathead Forest Plan Revision effort.

The cumulative effects of this forest plan amendment are very limited due to the geographic scope and expected duration of the amendment. At the Flathead National Forest scale, this amendment is only addressing management area direction on less than 1 percent of the NFS acreage on the Flathead National Forest. Additionally, the duration of this amendment is expected to be short-term since forest plan revision is ongoing with a decision expected in 2017. When the revision effort is completed, new management areas will be assigned across the entire Flathead National Forest, including the Beaver Creek project area, and will supersede any of the interim management areas proposed in this amendment. Reasonably foreseeable activities identified on the lands associated with the amendment is very limited as identified in Table 17 in Chapter 3 of this EA. If future land management activities occur on these lands they will be subject to forest-wide direction found in the Flathead National Forest Land and Resource Management Plan, federal and state laws, and other Forest Service regulations, as they are now, and will be guided by the proposed management area direction. Future land management activities such as timber harvest, road work, changes to public access etc. would be subject to site-specific NEPA analysis in the future.

## DETERMINATION

The Canada Lynx Critical Habitat was designated under the ESA. A BA was submitted to the USFWS.

# GRIZZLY BEAR

## INTRODUCTION

Grizzly bears have a large home range and use a wide variety of relatively undisturbed habitats that indicate relatively broad environmental limits (USDA 2015b). The high level of topographic and vegetative diversity allows grizzly bears to effectively use different habitats, leads to their omnivorous or generalist feeding habit, and an adaptable ability to eat a wide variety of plant and animal foods. Various articles on grizzly bear food habits and habitat use in the NCDE indicate bears use a diverse array of habitats, consume a variety of foods which can vary substantially by location and season. Mixed-shrub fields, seeps, grasslands, timbered side-hill parks, and burns are used for feeding and resting. A seasonal elevation gradient is often used, including low elevation riparian areas, avalanche chutes, and meadows in spring and fall, and higher elevation habitats, such as subalpine forests, alpine tundra, and boulder fields in summer, early fall and winter.

Grizzly bears have been shown to have a negative relationship with human development and activity. Roads and their associated motorized traffic are known to lessen the effectiveness and use of adjacent habitat, and expose bears that do travel on or near them to elevated risks from human-caused mortality (Kasworm et al. 1990; Mace et al. 1997; McLellan et al. 1989). Within the South Fork of the Flathead, Mace and Waller (Mace et al. 1997) showed substantive blocks of unroaded habitat as a component of adult female home ranges. Approximately 67.5 percent of composite home range for 8 female bears was greater than 0.3 miles (0.5 kilometer) from a road. The least amount of core area used in the South Fork Study was roughly 55 percent (USDA 1994a). In summary, vast areas of limited human access, moist, open-land habitats in combination with timbered areas are essential for optimum grizzly bear habitat.

# ANALYSIS AREA

## SPATIAL BOUNDS

The Beaver Creek Project is located in the NCDE. The NCDE has been divided into Bear Management Units (BMUs) Subunits. The BMU Subunits approximate the size of a female grizzly bear's home range. The project lies within the Beaver Creek (34,038 acre) and Buck Holland (35,886 acre) Grizzly Bear Subunits. These subunits were used to analyze direct, indirect, and cumulative effects to the grizzly bear. Conservation measures for the grizzly bear, including standards and guidelines, have been addressed at the subunit scale (e.g., Interagency Grizzly Bear Guidelines, Forest Plan Amendment 19, and the Swan Valley Grizzly Bear Conservation Agreement (SVGBCA)).

## TEMPORAL BOUNDS

The length of time for effects analysis is approximately 5 years. This is based on the probable contract length for the proposed project, the timeframes for related activities, and the reasonably foreseeable actions identified. The temporal scale of the effects analysis extends 100 years into the future. Temporal bounds for specific activities are discussed below.

# DATA SOURCES, METHODS, AND ASSUMPTIONS USED

Data used included aerial photography, NAIP images, stand exams, VMAP data, research literature, and GIS and dataset information for features, such as general forest attributes, slope, aspect, habitat type, forest type, elevation, and mapped security core and road density information. In addition, site-specific information on habitat characteristics was collected from on-site visits of proposed treatment areas.

# AFFECTED ENVIRONMENT

## HABITAT

Grizzly bears, one of the largest terrestrial mammals in North America, have a large home range and use a wide variety of relatively undisturbed habitats. The grizzly bear occupies less than 2 percent of its former range south of Canada (USDI 1993).

Grizzly bears have a large home range and use a wide variety of relatively undisturbed habitats that indicate relatively broad environmental limits (USDA 2015b). The high level of topographic and vegetative diversity allows grizzly bears to effectively use different habitats, leads to their omnivorous or generalist feeding habit, and an adaptable ability to eat a wide variety of plant and animal foods (Schwartz et al. 2003). Various articles on grizzly bear food habits and habitat use in the NCDE indicate bears use a diverse array of habitats, consume a variety of foods which can vary substantially by location and season. Mixed shrub fields, seeps, grasslands, timbered side-hill parks, and burns are used for feeding and resting. A seasonal elevation gradient is often used, including low elevation riparian areas, avalanche chutes, and meadows in spring and fall, and higher elevation habitats, such as subalpine forests, alpine tundra, and boulder fields in summer, early fall and winter.

The revised 1993 Recovery Plan for grizzly bear (Project File Exhibit H-129) delineated grizzly bear recovery zones in 6 mountainous ecosystems. The proposed Beaver Creek Project lies within the NCDE. National Forest System lands encompass 63 percent of the NCDE recovery zone. At 40 percent of the NCDE, the Flathead National Forest is the majority Federal manager of lands within the NCDE recovery zone (USDA 2015b).

Grizzly bears have been shown to have a negative relationship with human development and activity. High human activity levels may negatively affect grizzly bears by causing displacement from preferred habitats. Grizzly bears are highly dependent upon learned habitat; displacement into unknown territory may lead to sub-marginal nutrition, reduced reproduction, or greater exposure to adult predatory bears or human food sources, which can lead to human-caused mortality (Mace et al. 1997; USDA 2015b). Roads and their associated traffic are known to lessen the effectiveness and use of adjacent habitat, and expose bears that do travel on or near them to elevated risks from human-caused mortality (Kasworm et al. 1990; Mace et al. 1997; McLellan et al. 1989). Within the South Fork of the Flathead, Mace and Waller (Mace et al. 1997) showed substantive blocks of unroaded habitat as a component of adult female home ranges. Approximately 67.5 percent of composite home range for 8 female bears was greater than 0.3 miles (0.5 km) from a road. The least amount of core area used in the South Fork Study was roughly 55 percent (USDA 1994a).

Since the South Fork Study, recent advances in radio-tracking technology have improved how to monitor grizzly bear habitat use. Instead of VHF radio collars used to locate bears (which could only be located once daily), GPS radio collars can document grizzly bear locations throughout a 24-hour period (day/night) documenting movements and habitat use day and night. In Alberta, Roever et al. (Roever et al. 2010) documented bear selection for movements along or near low volume forest roads. Northrup et al. (Northrup et al. 2012) documented bear movement near open forest roads; however, bear use occurred during periods of low human activity. In British Columbia, Wielgus et al. (Wielgus et al. 2002) documented grizzly selection against open forest roads, but did not document any avoidance of restricted roads (forestry use only) by bears within the study. In the Swan Valley, Ruby (Ruby 2014) found that grizzly bears did not select against high or low densities of restricted roads at the valley scale. Based on grizzly tracks and remote camera detections, the district biologist has frequently observed grizzly bears using restricted (gated or bermed) roads for travel further suggesting no displacement is occurring due to the presence of restricted roads. Three decades of monitoring grizzly bear vital rates in the Flathead Valley of British Columbia and Montana, McLellan (2015) found that industrial activities (logging and gas exploration) did not have a clear negative effect on population trend. While highest bear densities were detected in the multiple use landscapes of the study area, bears likely avoided negative impacts of industrial activities by avoiding periods of human activities within the multiple use areas.

Recent human-caused mortality in Montana includes management control actions, defense of life, vehicle and train collisions, defense of property, mistaken identity by black bear or other big game hunters, poaching, and malicious killing. From 2000 through 2010, known grizzly bear mortality averaged about 21.45 bears per year. The greatest cause of mortality from 2000 through 2010 was from human-site conflict associated with food, garbage or stock (59 of the 236 deaths or 25 percent). Other major causes of mortality were from illegal or malicious activities (17 percent), trains and vehicles (20 percent), and self-defense (11 percent). Mortality occurs in all parts of the NCDE with most mortalities occurring on private lands (139/236 = 59 percent) and associated with human-site conflicts, which includes vehicle mortality. An increase in known human-caused or management-related mortality has been associated more with rural roaded areas, and primarily on private property adjacent to national forests (USDA 2015b).

There is the potential for displacing grizzly bears during implementation of proposed activities. Forest management has been found to displace grizzly bears (McLellan et al. 1989) and grizzly bears have been documented to use areas of dense cover for movement (Gibeau et al. 2002; Zager et al. 1983). In Alberta, Nielson et al. (Nielson et al. 2004) found grizzly bears selected clearcuts during fall periods due to the high diversity of foods present within (Nielson et al. 2004). Boulanger et al. (Boulanger et al. 2013) documented bears that used regenerating forest after harvesting, were most likely to see gains in their body condition; however, these gains were offset due to higher mortality risk in roaded environments. In summary, vast areas of no or low human activity to reduce mortality risk, and a mosaic of moist, open-land habitats in combination with timbered areas for cover are essential for optimum grizzly bear habitat.

The SVGBCA sets an active/inactive rotation schedule for bear subunits in the Upper Swan Valley (Project File Exhibit H-130). This rotation schedule designates select BMU subunits to be “active” during the “restricted period” or non-denning period (April 1 through November 15). Under the agreement, 4 subunits are active for 3 years leaving the other 7 subunits inactive for a minimum of 3 years. During the restricted period, the strategy for this rotation was to concentrate commercial activities as defined by the agreement within certain subunits while limiting activities in the remainder of the valley. Concentrating commercial activities in active subunits is designed to reduce overall displacement and disturbance to grizzly bears from human activities (USDI 1995). The SVGBCA also provides guidelines to maintain visual screening along open forest roads, maintain hiding cover throughout the subunit area, and prohibits contractors from carrying firearms. These guidelines diminish potential displacement effects to the bear and benefit grizzly bear security. Vegetative screening and hiding cover may diminish displacement effects due to noise and human activity on forest roads and could maintain some grizzly bear security by reducing visibility of bears from open roads (Archibald et al. 1987; McLellan et al. 1989).

Within an active subunit, unlimited commercial use may occur (major forest management activities, such as road construction and timber harvest) during the restricted period except within spring habitat from April 1 through June 15. This guideline limits disturbance to grizzly bears during the spring when natural foods may only be growing at low elevations as snowpack remains at higher elevations. Within an inactive subunit, salvage activities may occur during the restricted period, but only between June 16 and August 31, and cannot continue for periods of more than 2 consecutive weeks or for more than 30 days in aggregate. Post and pole collection is also allowed in inactive subunits if the activity is less than 2 weeks in duration. Limiting scope and timing of permissible inactive subunit activities is designed to reduce impacts of activities to bears (USDI 1997).

## POPULATION

The grizzly bear was listed as a threatened species under the ESA in the lower 48 states in 1975. The Grizzly Bear Recovery Plan was completed in 1982 and revised in 1993 (Project File Exhibit H-129).The 1993 revised Recovery Plan delineated grizzly bear recovery zones and detailed recovery objectives and strategies.

It appears that in the NCDE, grizzly bears are increasing their range and have a population beyond recovery plan levels (USDA 2002b, 2015b). The Grizzly Bear Recovery Plan (USDI 1993) identifies a minimum NCDE-wide grizzly bear population of 391 (211 bears outside Glacier National Park and 180 bears inside Glacier National Park). Grizzly bear population monitoring using a DNA sampling technique was carried out in 1998 and 2000 in approximately the northern one-third of the NCDE. The sample area included the North Fork of the Flathead River and Glacier National Park. Adjusted for lack of study area closure, the average number of grizzly bears in 1998 was 241. In 2000, the average number of grizzly bears was also 241 (Kendall et al. 2008).

Many cooperators, including the Flathead National Forest, were involved in the 2004 US Geological Survey (USGS) Northern Continental Divide Grizzly Bear Project, which was designed to derive a population estimate for grizzly bears in the entire Northern Continental Divide Grizzly Bear Ecosystem based on DNA sampling. On September 16, 2008, the population results of the 2004 study were released (USDI Geological Survey 2008). The NCDE grizzly bear population estimate was 765 animals, with the range estimated to be between 715 and 831 individuals.

An ongoing 6-year NCDE-wide population trend study conducted by the MFWP has recently estimated that the NCDE grizzly bear population increased at a rate of 3 percent per year between 2004 and 2010. Therefore, the total population size and the positive, increasing trend indicate that human-caused mortality in the ecosystem has been low enough (i.e., sustainable) to allow population growth (Mace et al. 2011). The population demographics indicate high survival for female bears (95 percent) within the ecosystem accredited in part to habitat security (Mace 2011; Mace et al. 2013). The Flathead National Forest represents 63 percent of the Northern Continental Divide Ecosystem. Both reproductive and survival rates in the NCDE are higher and the population growth rate is positive when compared to other grizzly bear populations further north in Alberta (Boulanger et al. 2014). Mace et al. (2011) attributed the high survival, reproduction and positive population growth in part to habitat security measures in the NCDE.

Current information suggests that the grizzly bear population in the NCDE and on the Flathead National Forest, is expanding its range outside of the recovery zone (Kendall et al. 2009; Mace et al. 2012). The USFWS has concluded that it is unlikely that the movement of grizzly bears from inside to outside the recovery zone is driven by displacement from roads, human development, or activity alone (Kendall et al. 2009). A Conservation Strategy is currently being developed to guide cooperative approach to maintain and monitor a recovered grizzly bear population in the NCDE.

The Beaver Creek Project is located on lands that have been designated as Management Situation 1 (MS-1) for grizzly bears. Management Situation 1 lands are identified as areas needed for the survival and recovery of the species (USDA 2001a). The Beaver Creek Project is located within the SVGBCA area. The proposed project is located within the Beaver Creek and Buck Holland Subunits. The situation for grizzly bears in the Swan Valley is summarized in Table 79.

**TABLE 79. GRIZZLY BEAR OCCURRENCE; DENNING, AND CONFLICT AND MORTALITY IN THE UPPER SWAN VALLEY.**

| GRIZZLY BEAR OCCURRENCE | DENNING | CONFLICT & MORTALITY |
|---|---|---|
| Grizzly bear are known to use lands in these units/subunits. There have been reliable visual sightings and information on radio-collared grizzlies. At least 4 grizzly bears were wearing radio collars in or adjacent to the Swan Valley in all or part of 2014. Based on MFWP and USFWS telemetry data, grizzly bears are known to move between the Swan and Mission Mountains, crossing State Highway 83. | There are no known den sites within the project area. The proposed treatments are not located in or near (1.2 miles [>2,000 meters]) to mapped grizzly bear denning habitat. | There was one known grizzly bear mortality in the Swan Valley in 2009, a management removal of a bear that was breaking in to cabins in the Cold Creek Area.<br>Three conflicts were reported for grizzly bears accessing human foods around residential homes in the Swan Valley in 2010. These conflicts resulted in one capture of a male grizzly; this bear was euthanized.<br>In 2011, there were 8 different occurrences of grizzly bear/human conflict with bears getting into human food. Most of these conflicts were attributed to a male grizzly bear that was later captured and euthanized. Grizzly bear mortalities in the Swan Valley continue to be human-caused deaths (e.g., management actions as a result of conflicts with humans or collision with automobiles).<br>In 2012-2014, there were no grizzly bear mortalities in the project subunits or in the upper Swan Valley or within the project subunits. |

# ENVIRONMENTAL CONSEQUENCES

## ALTERNATIVE 1 - NO ACTION
## DIRECT, INDIRECT, AND CUMULATIVE EFFECTS

Since there would be no vegetation treatments or associated activities proposed with this alternative, there would be no direct effects to grizzly bear as a result of implementing the No Action Alternative; there would be no loss of cover, no decrease in security, and no displacement from the management activities proposed in the Beaver Creek Project. Under the No Action Alternative, no road decommissioning would occur. Activity on private lands including development, timber harvest, road building would continue to occur. Activities on NFS lands, such as recreation, firewood cutting, road maintenance, would also continue.

The Nature Conservancy's harvest treatments have already occurred. The Nature Conservancy's activities have decreased hiding cover in the Beaver Creek and Buck Holland Subunits. Reduction of hiding cover and mature vegetation may result in an increase of shrubs and other forage species as more sunlight reaches the forest floor. Grizzly bear forage may increase in approximately 5 years.

Not implementing the proposed vegetative treatments could increase the risk of a wildfire burning more intensely in the project area, which could result in a change in available forage and cover for grizzly bear over the short and long term. Fires have historically produced both positive and negative effects for grizzly bears; loss of hiding cover would be a potential negative effect. On the positive side, forage habitat could be potentially increased. Under Alternative 1, potential wildlife may burn to a more intense and severe degree than under natural conditions. Larger, more severe wildfire may increase the interval for grizzly bear forage to return.

## ALTERNATIVES 2 AND 3 – ACTION ALTERNATIVES
## DIRECT AND INDIRECT EFFECTS

### DENNING HABITAT

Denning habitat has been characterized as steep (greater than 45 percent slope), relatively inaccessible slopes with northern and western aspects at or above 5,900 feet in elevation (Mace et al. 1997). Considering areas with slopes greater than 30 percent (selected as a conservative measurement) and above 5,900 feet, only the wilderness burning would occur in grizzly bear denning habitat. The proposed prescribed burning in the Mission Mountains Wilderness would occur but would not be implemented during the denning season (November 15 through April 1) and would not affect grizzly bear denning in either Alternative 2 or 3.

### HIDING COVER

Satellite imagery, stand data, and field visits were used to estimate hiding cover within the Beaver Creek and Buck Holland Subunit. Currently, approximately 61 percent of the Beaver Creek and 54.5 percent of the Buck Holland Subunits provide hiding cover for grizzly bears (Project File Exhibit H-9). Hiding cover was defined as trees of sufficient size and density to conceal an animal at approximately 200 feet. This percentage includes all NFS lands (e.g., Legacy Lands and wilderness) and private property. The proposed activities would decrease the amount of hiding cover in the Buck Holland and Beaver Creek Grizzly Bear Subunits.

Based on past monitoring of harvest and prescribed fire in the Swan Valley, it was assumed that regeneration harvest would not retain hiding cover after implementation. Intermediate, daylighting and pre-commercial treatments would retain hiding cover based on prescriptions. It was assumed that group selection would retain hiding cover throughout 80 percent of the stand area. Fire areas were assumed to retain 50 percent of the burn area in hiding cover based on mosaic pattern of past burning practices, burned snags providing visual obstruction, and light to moderate burning intensity. Please see Project File Exhibit H-9 for more information. Hiding cover would still be arranged to allow for grizzly bear travel throughout the project subunits. The project would continue to meet MA 11C direction within the project subunits.

Under Alternative 2, the project activities would decrease hiding cover by 130 acres (1 percent) in the Buck Holland Subunit and 1,769 acres (8 percent) of hiding cover in the Beaver Creek Subunit. Alternative 3 would decrease hiding cover by approximately 748 acres (3 percent) in the Beaver Creek Subunit and 130 acres (1 percent) in the Buck Holland Subunit. Alternative 2 proposes treatment in RHCA areas. Design Criteria would retain patching of hiding cover within RHCA areas and hiding cover closest to streams and wetlands where the majority of herbaceous bear foods are located within riparian zones.

Design Criteria for intermediate treatments would retain 10 percent of understory trees and hardwoods resulting in patches of hiding cover distributed in a mosaic throughout the treatment stands. The calculations do not consider the influence of topography on sighting distance, which overall likely decreases the ability of an observer to see a bear. Both Alternatives 2 and 3 proposed regeneration harvest greater than 40 acres in size. These alternatives were designed to meet forest plan hiding cover direction. Treatment units would be laid out in a manner that ensures that no point in the unit would be more than 600 feet from hiding cover. Design Criteria consistent with the SVGBCA for both alternatives would stipulate that vegetative screening be retained along open roads in the project area to mitigate potential effects to grizzly bear from loss of hiding cover.

Hiding cover could take approximately 20 years to recover, depending on stand conditions. Interplant treatments and proposed shrub planting would decrease the natural return interval of vegetation and likely increase hiding cover in these units in the next 10 years.

## FORAGING HABITAT

Grizzly bears are opportunistic feeders and will prey or scavenge on almost any available food. Plants with high crude protein content and animal matter are the most important food items. Habitats with abundant grasses, forbs, sedges, shrubs, and plant roots and bulbs are heavily used by grizzly bears (e.g., avalanche chutes, riparian areas, shrub lands). Mace and Waller (Mace et al. 1997), in their discussion of grizzly bear ecology in the Swan Mountains, describe how grizzly bears move to lower elevations after emerging from their dens to seek green vegetation and carrion. During mid-spring, bears move to median elevations in search of optimum forage. During early summer, the bears foraging elevation drop slightly as bears exploit early ripening huckleberries at lower elevations, and then follow the pattern of ripening or green up to higher elevations. The elevations at which bears will forage decline again as food resources at higher elevations become unavailable due to frost and snow.

Public comments have question whether or not the decline of whitebark pine or the potential project effects to whitebark pine may have a subsequent effect on food sources for grizzly bear. In looking at the diets of grizzly bears in the Northern Continental Divide Ecosystem (NCDE) Teisberg et. al (2015) found that whitebark pine nuts may been historically used by bears in the Mission Mountains, they currently appear to be a small part of grizzly bears diet, if at all (Mace and Jonkel 1986) due to the decline in whitebark pine due to blister rust. Therefore there are no anticipated effects to grizzly bears as a result of management activities that may affect whitebark pine. The effects to whitebark pine are discussed in the Threatened, Endangered, and Sensitive plants section of this EA.

The project subunits provide potential foraging habitat for grizzly bear throughout the spring, summer, and fall. Proposed treatments in both alternatives would decrease the amount of available forage temporarily due to ground disturbance in cutting units and the construction of temporary roads. The potential for a decrease in the amount of forage would be greatest in Alternative 2, due to the larger amount of acres treated and the amount of proposed temporary road construction. The decrease of forage would be temporary and would return in all treatment areas within 5 years. Forage has potential to increase on the forest floor after activities in all treatment areas; however this analysis conservatively considers only regenerative treatments and prescribed burns to increase forage production over time.

Project Design Criteria would provide timing restrictions would minimize disturbance in spring habitat during the spring period (April 1 to June 15). These Design Criteria would reduce the potential to displace bears foraging on spring foods located in the lower elevations (while snow may still cover the higher elevations) of the project area.

Riparian areas, including streams, lakes, small wetlands, and ponds or potholes, provide high quality grizzly bear forage. There are management guidelines and BMPs in place (e.g., INFISH) that mitigate effects to riparian habitat. Riparian Habitat Conservation Areas restrict activities within a designated distance from streams, lakes, and wetlands (see Fisheries Section of this EA for more information). The riparian guidelines in place for proposed treatments under each alternative would help protect important riparian habitats for grizzly bear. Alternative 2 would have a greater potential for displacing bears compared to Alternative 3, due to the greater treatment of acres and proposed treatment in RHCA areas.

In the long term, fire disturbance would likely restore vegetative diversity conditions and early seral food sources for grizzly bears. Post-fire disturbance plant succession time is related to fire intensity and severity (Bartuszevige et al. 2009). Waller (Waller 1992) documented a loss of food sources such as huckleberries for at least 15 years after fire disturbance, but sites within Northwestern Montana without fire disturbance for 60 years have been documented to be least productive for huckleberry production (Martin 1983).

Forage (grasses, shrubs, forbs) production of understory vegetation would occur in vegetative treatment areas as a greater amount of sunlight and moisture reach the forest floor. Over time, the openings and thinned areas would be expected to again produce quality forage for grizzly bears. In some areas forage production could increase over the long-term due to increased grass, forb, huckleberry and shrub production on the forest floor (Martin 1983; Nielson et al. 2004). Evaluating regeneration harvest and the low/moderate severity of burn activities (including wilderness prescribed fire), the proposed activities would increase grass and shrub abundance in these areas over approximately 2,412 acres in Alternative 2 and 2,040 acres in Alternative 3 within approximately 15 years. The south facing prescribed fire in the Mission Mountains Wilderness would likely benefit grizzly bear forage by increasing huckleberry production throughout the fire area.

## DISPLACEMENT

High human-activity levels could negatively affect grizzly bears by causing displacement from preferred habitats. Grizzly bears are highly dependent upon learned habitat; displacement into unknown territory may lead to sub-marginal nutrition, reduced reproduction, or greater exposure to adult predatory bears or human food sources, which can lead to human-caused mortality (Mace et al. 1997; USDA 2015b). The potential for displacing grizzly bears during implementation of proposed activities is greater in Alternative 2 than in Alternatives 3, due to the greater amount of units, temporary roads, and quantity of restricted roads needed for access. Displacement of bears may occur due to mechanical/motorized activity and crew activities. Potential displacement would be short-term, during the length of the proposed sale activity (5 years). Displacement for prescribed fire ignition would be short term, when considering helicopter ignition and monitoring. During this time, grizzly bears using the area could be displaced from key habitats, which may alter their normal ability to find food, breed and raise young, or find shelter. Given the design of the project, distribution of hiding cover and security core and low levels of public motorized access, displacement would have minimal effects to grizzly bears and not compromise a bear's ability to find food or have security. Further, the active/inactive subunit rotation would concentrate commercial activities during active periods and during inactive periods decrease overall displacement to grizzly bears, by limiting duration of salvage activities that may occur during the summer months and confining commercial activities to the denning season (USDI 1997).

The Beaver Creek Subunit is active from 2015 through 2017, and the Buck Holland Subunit is active from 2018 through 2020. Within an inactive subunit, commercial use activities (major forest management activities, such as road construction and timber harvest) may not occur during the restricted period with the exception of salvage harvest and administrative use. Within an inactive subunit, salvage harvest (activities to harvest dead and dying trees) may occur during the restricted period, but only between the dates of June 16 and August 31. Salvage harvest activities cannot continue for periods of more than 2 consecutive weeks or for more than 30 days in aggregate. Units that do not have a dead or dying tree component from insects, disease, or blowdown would be harvest outside of the Restricted Period when the bear is denning (November 16 through March 31).

Administrative use is also allowed in Inactive subunits. Administrative use includes timber sale layout, road location, pre-commercial thinning, road maintenance, tree planting and slash disposal. Administrative use may also include minor actions, such as post and pole collection if the activity is less than 2 weeks in duration.

Timing restrictions under the SVGBCA for Spring Habitat would further reduce displacement of grizzly bear from harvest and access activities during the spring. Management activities in Spring Habitat, defined as areas within designated linkage zones and below 5,200 feet (USDI 1997), would not occur within the Spring Period (April 1 through June 15). This timing restriction would apply to all units except units: 109, 110, 113, 114, 116, 118, 119, 120, 229, 259, 260, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 4110, and 4262. These units are not located in Spring Habitat as defined by the SVGBCA.

## HABITAT SECURITY/MORTALITY RISK

There would be temporary road construction under Alternatives 2 and 3. Temporary roads would be constructed to the minimum standards necessary for log hauling. Table 80 displays temporary road information for Alternatives 2 and 3.

**TABLE 80. TEMPORARY ROADS PROPOSED FOR THE BEAVER CREEK PROJECT FOR ALTERNATIVES 2 AND 3.**

| ALTERNATIVE | TEMP ROAD NAME | UNITS ACCESSED | NEW CONSTRUCTION (MI) | EXISTING TEMPLATE (MI) |
|---|---|---|---|---|
| 2, 3 | A | 3 | --- | 0.17 |
| 2, 3 | A | 1 | 0.07 | --- |
| 2 | A1 | 84, 102, 238, 239, 250, 252 | -- | 1.18 |
| 2, 3 | A1 | 252 | 0.15 | --- |
| 2 | B1 | 93, 94, 96, 97, 257, 494 | 0.45 | --- |
| 2, 3 | C | 6, 7 | 0.45 | --- |
| 2 | C1 | 93, 96, 256 | 0.37 | --- |
| 2, 3 | D | 17, 18 | --- | 0.34 |
| 2, 3 | D1 | 90, 91 | 0.18 | --- |
| 2, 3 | E | 19, 419 | 0.14 | --- |
| 2 | E1 | 259, 260 | 0.30 | --- |
| 2 | F | 27, 28, 30 | 0.21 | --- |
| 2, 3 | F1 | 116, 117, 118 | 0.41 | --- |
| 2, 3 | G | 21, 25 | 0.20 | --- |
| 2, 3 | G1 | 112, 114, 115 | 0.21 | --- |
| 2 | H | 23 | 0.13 | --- |
| 2, 3 | H1 | 252, 253, 254 | 0.43 | --- |
| 2, 3 | K | 45, 218 | 0.04 | --- |
| 2, 3 | K | 45, 218 | 0.02 | --- |
| 2, 3 | L | 48, 49, 449 | 0.11 | --- |
| 2, 3 | M | 50, 51, 52, 53, 227, 228 | --- | 0.49 |
| 2 | N | 53, 228 | --- | 0.12 |
| 2 | N | 53, 228 | 0.07 | --- |
| 2, 3 | O | 51, 227 | --- | 0.13 |
| 2, 3 | P | 55, 56 | 0.08 | --- |

**TABLE 80. TEMPORARY ROADS PROPOSED FOR THE BEAVER CREEK PROJECT FOR ALTERNATIVES 2 AND 3.**

| ALTERNATIVE | TEMP ROAD NAME | UNITS ACCESSED | NEW CONSTRUCTION (MI) | EXISTING TEMPLATE (MI) |
|---|---|---|---|---|
| 2, 3 | Q | 61 | 0.23 | --- |
| 2, 3 | R | 62, 63 | --- | 0.08 |
| 2, 3 | R | 62, 63 | 0.29 | --- |
| 2 | S | 64, 65, 66 | 0.12 | --- |
| 2, 3 | Z | 76, 240 | --- | 0.30 |
| **Total Miles of Temporary Roads** | | | **Alt 2 - 4.7 mi**<br>**Alt 3 – 2.5 mi** | **Alt 2 - 2.8 mi**<br>**Alt 3 – 2.5 mi** |

Temporary roads that are constructed within a unit boundary are not expected to have additional displacement effects above the surrounding mechanical activity. Temporary roads that are constructed outside of a unit boundary would have additional effects to grizzly bear; there would be additional ground disturbance that can decrease available forage and hiding cover, and there would be potential short-term displacement from a larger area.

No vegetation management activities are proposed in security core. No temporary roads would be built in existing security core; however the temporary decrease in security core would result in the influence from temporary roads A1, F1, G1 and H1 (the temporary roads would be built within 500 meters of security core). It is unlikely that all these temporary roads would be active simultaneously. However, all together the temporary road activity would influence approximately 245 acres (1 percent) of security core area in the Beaver Creek Subunit (Project File Exhibit H-5).

Temporary roads would be rehabilitated following use. The rehabilitation work would include the removal of any culverts, water bar placement, seeding, recontouring, and the placement of woody debris on the reclaimed road. Despite the rehabilitating of temporary roads that occur outside of a cutting unit boundary, there would be obvious evidence of ground disturbance and clearing of vegetation that remains after a temporary road is reclaimed. Motorized use on rehabilitated roads is not expected due to road closures and reclamation work rendering the road unnavigable.

Temporary roads would not increase the net Total Road Density (TRD) in the subunit. Open road densities (ORD) and TRD would increase temporarily during sale activities. However, the project would result in a net reduction in TRD, a net increase in security core and no net change in ORD.

The proposed prescribed fire in the wilderness would occur in security core. The prescribed burn would be ignited by helicopter. Helicopter use for the fire activity is estimated to occur 1-2 days of ignition (depending on weather conditions) and several days of aerial monitoring. Ignition would include low altitude flights over the canopy in the proposed burn area, while monitoring would include higher elevation flights (above 1640 feet [500 meters]) to observe the fire.

In timbered habitats, McLellan and Shackleton (McLellan et al. 1989) found that an overt avoidance or displacement response required high intensity helicopter activity, such as carrying equipment within 656 feet (200 meters) of a grizzly bear. Vegetative cover has been suggested to minimize the displacement impact on grizzly bears from human activity. McLellan and Shackleton (McLellan et al. 1989) found that bear response varied by disturbance type and displacement was greater in open areas than when the bear was in cover. Reactions of bears to human activity were greatest to people on foot and least to aircraft.

A Level I team reviewed literature on aviation effects to grizzly bears and produced a guide to effects in grizzly bear habitat (Anderson et al. 2009). While, the aerial ignition would include low altitude flights for ignition over security core, the displacement effects of this activity would not be prolonged as the low altitude activity would occur for only 1-2 days. Further aviation activity for monitoring would occur at higher altitudes where sound from the aircraft would likely not affect the bear. Burning would occur during the fall period when bear foods can be widespread and not concentrated on a particular aspect or elevation. Security core would continue to provide security for grizzly bears if the prescribed fire was implemented. The prescribed fire would not increase human access within security core after implementation. The aerial ignition would occur outside of breeding or denning seasons. While some bears may be displaced by helicopter activity and burning, it is unlikely that the displacement would be long term or would interfere with patterns of breeding, feeding or sheltering.

## USE OF RESTRICTED ROADS

Existing open roads and closed roads (currently bermed or gated) would be used to access proposed treatment units in Alternatives 2 and 3. Use of open roads would not be a change from the existing condition. Use of gated or bermed roads would increase human activity levels in areas normally more secure for the grizzly bear. Under Alternative 2, approximately 52 miles of gated or bermed roads would be used for accessing proposed cutting units, implementing road BMPs, implementing fire activities or conducting aquatic restoration activities. Under Alternative 3, approximately 42 miles of gated or bermed roads would be used for accessing proposed cutting units implementing road BMPs, implementing fire activities or conducting aquatic restoration activities.

The bermed and gated roads are Maintenance Level (ML) 1 roads. They are constructed to the minimum standards necessary and are designed to be re-used for timber management. The gated roads are closed year-long. During timber harvest activities, both the bermed and gated roads would remain closed to public use. Because they are all ML 1 roads, they are currently included in the TRD for a grizzly bear subunit. Roads not proposed for decommissioning, storage, recontouring or realignment would return to being bermed or gated at the completion of project activities.

The following actions would help to mitigate the potential negative effects to grizzly bear from the use of normally restricted roads:

- Roads that are currently closed, but that would be used for access and for hauling, would be closed to the general public during the time that they are utilized for fuel management or forest treatments.
- Where berms are removed for access to treatment units, temporary gates would be installed.
- Berms would be re-installed when sale activities in that area are completed.
- Vegetation and/or rock barriers would be retained around berms and gates, where needed, to maintain closure effectiveness following sale activities.

## ROAD DECOMMISSIONING, RECONTOURING, REALIGNMENT, AND STORAGE

Both Alternatives 2 and 3 propose 4.5 miles of NFS road for decommissioning, 12.6 miles of road storage or ISS, and 0.15 miles of road realignment. No work would occur for roads proposed for passive decommissioning. Road realignment would connect the road system in a more efficient manner and reduce overall road mileage in the Beaver Creek Subunit. Decommissioned roads would be removed from the road system.

Road storage and decommissioning activities would be conducted to meet the “reclaimed” road definition under Amendment 19 (see Regulatory Consistency Section for more information). These roads would be managed to be completely impassable to motorized traffic and for forest entrances to be unattractive to forest users. All culverts would be removed. The first 200 to 600 feet would be recountoured and the remainder of the road would have placement of debris and be seeded, so that the road prism would no longer function as a road. Stored roads would remain on the road system. After completion of project activities and success of road treatments, there would be no on-the-ground difference to a grizzly bear between stored roads and decommissioned roads. The only difference between these two would be that stored roads would retain a road number in the road database.

For active decommissioning, recontouring, realignment and storage activities, equipment and human activity could result in short-term displacement; however, this activity would be brief in duration and effects would be relaxed immediately after work is completed. In the long term, road treatments would decrease total motorized road density in both project subunits and increase grizzly bear security core in the Beaver Creek subunit promoting security for the grizzly bear.

### AQUATIC RESTORATION AND PLANTING ACTIVITIES

Aquatic restoration activities may result in displacement of grizzly bears in the nearby area. This displacement would be short term and would occur outside of the spring period. Work for aquatic restoration would create a relatively small disturbance relative to the project subunits (approximate female home range). Work along NFSR #906 would likely have little displacement impact as this road is currently open to public travel and some level of displacement may already be occurring. Mechanical work would be limited to occurring near road corridors. Planting and aquatic restoration activities are judged to have minimal impact to bear habitat use and mortality risk in the project area.

## ALTERNATIVE 2 AND 3 – ACTION ALTERNATIVES CUMULATIVE EFFECTS

The Swan Valley contains established human activities, including vegetation management, road management, private land development, and recreational use. Road construction and logging activity have occurred on Federal and private forested land throughout the Swan Valley, with most major logging activity on Federal lands, including road building, occurring almost a decade ago. Logging and road construction have continued on private and public timberlands up to the present time.

In 2008, the Montana Legacy Project between the TPL, TNC, and PCTC, enabled the Flathead National Forest to approximately 47,000 acres of former PCTC lands in the Swan Valley. This historic land acquisition would benefit grizzly bears in the Swan Valley by minimizing the negative effects of human-related activities and the development of private lands; it would help maintain grizzly bear habitat now and into the future, and provide for grizzly bear security by reducing the mortality risks associated with habitat fragmentation.

However, on these Legacy Lands, timber projects have been conducted by TNC as part of a fiber agreement associated with the donation of these lands. Harvest activities by TNC have occurred within the project subunits. The Barber Chair, Two Bears, and Beaver Highway Projects have reduced hiding cover within the Beaver and Buck Holland Subunits. These harvest activities included the use of old road templates that existed on former PCTC lands that were never mapped; following harvest activities these roads were rehabilitated. The baseline environmental condition of this analysis reflects the effects of these TNC projects. Patches of regenerating forest vegetation that serves as hiding cover remain in these harvest areas. None of these harvest activities occurred within riparian habitats. These projects were implemented in compliance with the SVGBCA. The SVGBCA guidelines include visual screening from open roads, cover retention, and timing restrictions that benefit the grizzly bear. The subunit would continue to meet guidelines for no net change in route density and hiding cover thresholds. Reduction of hiding cover within treatment areas would last approximately 20 years until vegetation grows enough for sufficient cover.

The Glacier Loon project is a planned USFS forest health and fuels reduction project that would occur in the Glacier Loon and Buck Holland Subunits. The Glacier Loon Project would reduce hiding cover in the Buck Holland Subunit by 157 acres. When considering both the Glacier Loon and Beaver Creek Project effects, the Buck Holland Subunit would still meet Forest Plan direction and cover would be distributed to allow secure grizzly bear travel throughout the subunit. The Glacier Loon Project is consistent with the SVGBCA, Amendment 19, and Forest Plan direction.

The Cold Jim project is an approved USFS fuels reduction and forest health project and the Chilly James project is a watershed restoration project, both of which are occurring in the Cold Jim Grizzly Bear subunit which does not have any spatial overlap with the Beaver Creek or Buck Holland Subunit. When considering the Cold Jim, Chilly James, Glacier Loon, and Beaver Creek Project effects, all of the affected subunits would still meet Forest Plan Direction and cover would be distributed to allow secure grizzly bear travel throughout the subunits. All of these projects are consistent with the SVGBCA, Amendment 19, and Forest Plan direction.

A Special Food Storage Order on the Flathead National Forest has contributed to improved conditions for grizzly bears. The Food Storage Order requires all users of NFS lands to store food, garbage, and other bear attractants in a bear-resistant manner. Contractors, and others implementing the Beaver Creek Project, would be required to comply with this order.

To further minimize the risk of human-grizzly conflicts in the Swan Valley, the Forest Service and local residents have become very active in providing information and educational programs on living in grizzly bear country and on food storage techniques. In addition, the Forest and local partners have provided bear-proof storage containers for the community, and employed a Bear Ranger to work with local publics in an effort to reduce human-bear conflicts and to help enforce the Forest Food Storage Order. In 2008, a working group was initiated in the upper Swan Valley, Swan Valley Bear Resources, near the community of Condon, Montana, whose mission is to involve the community in a Bear Smart Program.

Under the action alternatives, as described above, direct and indirect effects would include a temporary decrease in forage, a decrease in hiding cover across the project area, a decrease in habitat security, and an increase in potential for displacement during the proposed implementation of the Beaver Creek Project. In the long term, the Beaver Creek Project would reduce TRD and increase security core benefitting grizzly bear security. The treatments in the project subunits would also promote bear foods over time. The greatest negative effects to grizzly bear would occur with implementation of Alternative 2, due to the larger amount of acres treated and hiding cover reduced. Although the action alternatives would have varying degrees of negative effects on grizzly bear habitat in the project subunits, the cumulative effects of the proposed actions with past, present, and known future actions in the Swan Valley would not preclude grizzly bear use in the valley and would not jeopardize the recovery of the grizzly bear across the NCDE because:

1. Design features in place for the proposed project (e.g., subunit rotation, spring restrictions, distance to cover) limit potential long-term displacement of grizzly bears and help provide for grizzly bear security (see Design Criteria).
2. There would be a net increase in security core, and there are adjacent subunits and wilderness that could provide security for grizzly bear that might be temporarily displaced. Across the Flathead National Forest, approximately 67 percent of the land base is in wilderness or inventoried roadless.
3. The Flathead National Forest and the Swan Valley community have been very active in minimizing the risk of human-grizzly conflicts.
4. With a high degree of confidence, Kendall et al. (Kendall et al. 2009) estimated that 765 grizzly bears (range of 715 to 831) make their home in the NCDE. Overall, the genetic health and diversity of the population is good (Kendall et al. 2009).
5. After 10 years and based on the number of females with cubs being monitored, a reliable trend estimate indicates a stable to growing population at 3 percent which includes high survival rates for grizzly bears (USDA 2015b).
6. The best current information suggests that the grizzly bear population on the Flathead National Forest and the NCDE is expanding its range beyond the recovery zone and has a population above recovery plan level estimates. With more bears and people on the landscape, human/bear encounters are expected to increase with mortal consequences

to bears; but with an expanding grizzly bear population, the higher level of mortality is not thought of as being excessive or beyond what is expected to be sustainable (USDA 2015b).

# REGULATORY FRAMEWORK AND CONSISTENCY

## AMENDMENT 19

Amendment 19 (USDA 1995b) of the Flathead Forest Plan is a comprehensive programmatic strategy that addresses grizzly bear habitat security. It was developed to minimize negative impacts of motorized access identified in the 1987 Grizzly Bear Compendium (Interagency Grizzly Bear Committee 1987), and was based on recommendations of the 1994 IGBC Taskforce Report and the 1993 Progress Report for the South Fork Grizzly Bear Project (Mace et al. 1993), commonly referred to as the South Fork Study. The South Fork research examined effects of motorized use on road on grizzly bear habitat selection. The IGBC issued guidance on motorized access management in 1994 and revised this guidance 1998 to provide a consistent approach to motorized access management for grizzly bears.

Amendment 19 provides motorized access standards and objectives for grizzly bear habitat management. The forest standard includes “no net increase” in total or open motorized road access density and “no net decrease” in security core and “Forest Service actions will result in a net gain towards the objectives on National Forest System Lands.” The Forest Plan objectives include the following: 1) limit high density (> 1 mile/square mile) open motorized access to no more than 19 percent of a BMU subunit; 2) limit high density (> 2 miles/square mile) total motorized access to no more than 19 percent of a BMU subunit and; and 3) provide security core areas that equal or exceed 68 percent of each BMU subunit (referred to as 19/19/68 objectives). These objectives applied to all grizzly bear subunits that are predominantly (greater than 75 percent) NFS land.

Amendment 19, Appendix D, describes types of roads and how they should be used to calculate motorized access densities. Reclaimed roads are defined as roads treated in such a manner as to no longer function as a road or trail (A19 Appendix D pg. 2). Amendment 19 lists the minimum treatments to a reclaimed road (pg. 2). Roads that fully satisfy the definition of a reclaimed road are not included in calculations of ORD, TRD, and security core. Roads proposed for storage would receive treatments to meet the “reclaimed” definition under Amendment 19 (See Design Criteria). These roads would have culverts removed, entrances recontoured, seeded road beds, and natural debris placed on road bed. The treatments would be to a degree that the road no longer functions as a road for any motorized vehicles. These road treatments would be monitored over time for effectiveness of treatments. In the Beaver Creek Project, both decommissioned and stored roads would be managed to meet the reclaimed definition and would not be counted in TRD or included in security core calculations. The only difference between the two treatments would be that stored roads would retain a road number in the database and would remain on the road system.

At the time Amendment 19 became forest direction in 1995, the grizzly bear subunits associated with the Beaver Creek Project were less than 75 percent NFS ownership. The Nature Conservancy’s 2010 donation of land to the Forest Service increased NFS ownership to above 75 percent within the Beaver Creek and Buck Holland Subunits. Based on a recent court order, the numerical objectives of Amendment 19 now apply to these subunits as they are over 75 percent.

As described previously, during the activities proposed with the Beaver Creek Project, there would be a temporary increase in the ORD and TRD, and a temporary decrease in security core (in Beaver Creek only) in whichever subunit the activities were occurring; the road densities would be changing on a regular basis, both increasing and then decreasing, as restricted roads and temporary roads are utilized, then rehabilitated once a purchaser moves to another part of the project area. The changes in ORD, TRD, and core would be temporary; there would be no net increase in open or total motorized road densities and no net decrease in security core at the completion of the project. Over the long term, road reclamation (decommissioning and storage) would decrease TRD and increase security core in the project subunits and the Beaver Creek Subunit in particular. Based on these road treatments the project proposes, the Beaver Creek Subunit would meet A19's 19/19/68 numerical road density objectives enhancing grizzly bear habitat security.

Road densities are calculated using a moving window technique. The subunit would continue to meet Amendment 19 direction under the proposed project. The existing situation, during, and post project road densities for the Beaver Creek and Buck Holland Subunits are summarized in Table 81. The 'during project' estimates are a worst case scenario, assuming all units are active at the same time, all haul routes and temporary roads being used. This scenario is necessary because the analysis cannot predict where/when contractors would implement the proposed activities in the subunit. The event that all units are active simultaneously is highly unlikely especially given the active/inactive subunit schedule which could include limited operating time frames for summer and winter harvest where snow and temperature conditions limit the scale and speed at which contractors can work. Further, contractors are typically awarded groups of units for project activities and are not able to work in all the awarded units simultaneously as the 'during project' analysis assumes.

**TABLE 81. PERCENTAGE OF SUBUNIT AREA WITH > 1 MI/MI$^2$ OPEN ROAD DENSITY, > 2 MI/MI$^2$ TOTAL ROAD DENSITY AND SECURITY CORE.**

| SUBUNIT | OPEN ROAD DENSITY (ORD) | | | TOTAL ROAD DENSITY (TRD) | | | SECURITY CORE | | |
|---|---|---|---|---|---|---|---|---|---|
| | PRE | DURING | POST | PRE | DURING | POST | PRE | DURING | POST |
| Beaver Creek Alt 2 | 6% | 31% | 6% | 26% | 28% | 19% | 66% | 65% | 68% |
| Buck Holland Alt 2 | 24% | 30% | 24% | 41% | 41% | 37% | 40% | 40% | 40% |
| Beaver Creek Alt 3 | 6% | 29% | 6% | 26% | 27% | 19% | 66% | 65% | 68% |
| Buck Holland Alt 3 | 24% | 30% | 24% | 41% | 41% | 37% | 40% | 40% | 40% |

At project completion under either action alternative, the Beaver Creek Project would reduce TRD in the Beaver Creek subunit by 7 percent. The project would fully meet A19 numerical objectives for ORD, TRD, or security core. Open road density would remain well below the 19 percent A19 objective at 6 percent.

In 2009, the Flathead Forest submitted a BA for A19 and a revised schedule for allowable sale quantity and objectives and standards for grizzly bear habitat management. This schedule revised the 2005 A19 implementation schedule through 2018 or until consultation on a revised Forest Plan is completed, by committing to complete specific actions that will reduce open motorized access density (ORD) and total motorized access density (TRD), as well as increase core (areas with no motorized route access) within specific grizzly bear subunits. The 2009 BA stated:

> "The Forest proposes to revise the implementation schedule for A19, based in part on the following factors: 1) the Forest realized in 1995 there may be unanticipated or impractical results obtained when the A19 objectives were applied to site specific analyses; 2) the FNF Forest Plan has not yet been revised; 3) the best available science indicates that the NCDE grizzly bear population was growing in terms of abundance, occupied habitat and connectivity in areas of historically low genetic interchange; 4) the 2004 abundance estimate of 765 grizzlies more than doubled the existing estimate; 5) the ongoing partnerships to determine grizzly bear population trend: and 6) annual costs of currently authorized decommissioning basically exhausts the Forest's financial capacity" (USDA 2009).

On January 31, 2014, the USFWS issued a BO on the effects of the revised implementation schedule for Amendment 19 extending the time frame for implementation access management direction and objectives through 2018 (USDI 2014a). The USFWS defined "harm" to grizzly bears as; when OMAD (ORD) exceeds 1 mile per square mile in 19 percent of a subunit, TMAD (TRD) exceeds 2 miles per square mile in 19 percent of a subunit, and security core is below 68 percent of a subunit (USDI 2014a). This condition occurs in the project subunits and the Flathead Forest received "take" for this condition in the USFWS' 2014 BO on Amendment 19. The USFWS (USDI 2014a) acknowledges "that recent information on the grizzly bear population in the NCDE (Kendall et al. 2009; Mace 2011) suggests that the grizzly bear population has grown despite the fact that A19 management direction has not been met in every grizzly bear subunit" including the existing condition in the Beaver Creek and Buck Holland Subunits.

The Buck Holland Subunit would not meet the 19/19/68 objectives under Forest Plan Amendment 19. However, the Project would reduce total motorized route densities by 4 percent in the Buck Holland subunit (Table 82). The proposed activities would move the subunit towards Amendment 19 objectives and improve habitat security for bears. Project design features and compliance with Forest Plan direction and the SVGBCA would favor the needs of the bear (see below). The USFWS' 2014 BO on the Amendment 19 Revised Schedule examined the period from the end of 2009 through 2018, the access improvements that have been accomplished during this period, planned access improvements, and additional access changes included in recent project decisions and/or consultations. The 2014 Incidental Take Statement included the existing habitat baseline in the Beaver Creek and Buck Holland Subunits.

### FOREST PLAN

The Forest Plan includes guidelines for timber management within MS-1 lands. Within the project subunits, lands are designated as MS-1 lands. All activities under both Alternatives 2 and 3 are consistent with the guidelines for MS-1 lands in the Forest Plan (1986 pg. II-31) (Project File Exhibit H-5). Management area 11C provides direction for secure grizzly bear travel route through vegetative manipulation. MA 11C requires hiding cover to be maintained over at least 70 percent of the MA 11C area. At least 70 percent hiding cover would be maintained in both Alternatives 2 and 3 and cover would be well distributed to allow for secure travel for traveling and foraging grizzly bears throughout the project area subunits. Road closures are currently and would continue to be monitored to ensure effectiveness and bear security within the area.

## EFFECTS OF A FOREST PLAN AMENDMENT TO ASSIGN MANAGEMENT AREAS TO ACQUIRED LANDS

The Beaver Creek Project includes a Forest Plan Amendment to assign interim management areas (MAs) to approximately 5,457 acres of former PCTC lands acquired by the USDA Forest Service to be managed as part of the Flathead National Forest. These interim management areas will be in effect on acquired lands until the ongoing Forest Plan Revision effort is completed, anticipated in 2 years.

The effects of the Forest Plan Amendment to grizzly bear habitat management within the analysis area under Alternative 1 – No Action Alternative are minor because as is described above the Forest Plan standards, objectives and guidelines apply to all lands managed by the Flathead National Forest even if management areas are not assigned. The effects of the Forest Plan Amendment under Alternative 2 and 3 are slightly beneficial to grizzly bear habitat by assigning 2,312 acres to MA 11C for management consistency within a grizzly bear travel route. These MA assignments are consistent with the existing condition of these lands and the management direction assigned to adjacent lands and will not preclude future MA assignment under the Flathead Forest Plan Revision effort.

The cumulative effects of this forest plan amendment are very limited due to the geographic scope and expected duration of the amendment. At the Flathead National Forest scale, this amendment is only addressing management area direction on less than 1 percent of the NFS acreage on the Flathead National Forest. Additionally, the duration of this amendment is expected to be short-term since forest plan revision is ongoing with a decision expected in 2017. When the revision effort is completed, new management areas will be assigned across the entire Flathead National Forest, including the Beaver Creek project area, and will supersede any of the interim management areas proposed in this amendment. Reasonably foreseeable activities identified on the lands associated with the amendment is very limited as identified in Table 17 in Chapter 3 of this EA. If future land management activities occur on these lands they will be subject to forest-wide direction found in the Flathead National Forest Land and Resource Management Plan, federal and state laws, and other Forest Service regulations, as they are now, and will be guided by the proposed management area direction. Future land management activities such as timber harvest, road work, changes to public access etc. would be subject to site-specific NEPA analysis in the future.

## SWAN VALLEY GRIZZLY BEAR CONSERVATION AGREEMENT

The Beaver Creek and Buck Holland Subunits occur within the SVGBCA Area. The SVGBCA's purpose is to "establish an ecosystem-based management plan throughout the Conservation Area which allows affected Parties to realize economic and recreational benefits of their ownership while helping conserve the Bear and other species." The following table summarizes the guidelines established under the SVGBCA and consistency of the Beaver Creek Project's action alternatives.

**TABLE 82. ALTERNATIVES 2 AND 3 CONSISTENCY WITH SWAN VALLEY GRIZZLY BEAR CONSERVATION AGREEMENT.**

| GUIDELINE | PRE-TREATMENT | POST TREATMENT | COMPLIANCE |
|---|---|---|---|
| Open Road Densities:<br>No more than 33% of a given Subunit shall exceed ORD of 1 mile/sq. mile during the Restricted Period. | Beaver Creek: 6%<br>Buck Holland:24% | Beaver Creek: 6%<br>Buck Holland: 24% | Yes<br>(would increase temporarily during implementation, but there would be no net increase) |
| Operations And Uses:<br>For Inactive Subunits, Commercial use (major forest management) will not occur during the Restricted Period. Salvage activities may occur (see below). | | Commercial use would not occur during the Restricted Period. Salvage activities would be consistent with SVGBCA. | Yes |
| Salvage Harvest*:*<br>Short term activities to harvest dead and dying trees resulting from fire, disease, blowdown or the like and shall not continue for periods of more than two consecutive weeks or for more than 30 days in aggregate during a given calendar year in the non-denning period (April 1 – August 31). | Dead and dying insect killed trees exist in some of the proposed units (Project File Exhibit I-10). | Salvage activities would occur between June 16$^{t}$ and August 31$^{st}$ and would not exceed 30 days in aggregate or for more than two consecutive weeks | Yes |
| Spring Period:<br>No management activities (other than replanting, limited burning, and non-motorized Administrative Use) during the Spring Period (April 1 – June 15) in Spring Habitat (Within Linkage Zones below 5,200' elevation). | | No project activities other than allowed activities are proposed within Spring Habitat during the Spring Period. | Yes |
| Road Locations:<br>Limit the construction of new roads in Preferred Habitat and Riparian Zones. (Minimize the density/mileage of roads built in these areas). Those | | No new permanent road construction on NFS lands. Temporary roads would be reclaimed. No roads are proposed in RHCAs. Road | Yes |

**TABLE 82. ALTERNATIVES 2 AND 3 CONSISTENCY WITH SWAN VALLEY GRIZZLY BEAR CONSERVATION AGREEMENT.**

| GUIDELINE | PRE-TREATMENT | POST TREATMENT | COMPLIANCE |
|---|---|---|---|
| existing roads in these areas not needed for management will be reclaimed or relocated. | | reclamation is proposed. | |
| Cover: Cover will be managed so that a minimum of 40% is maintained in each sub-unit. | Beaver Creek:61% Buck Holland: 54.5% | Beaver Creek: 53 or 58% Buck Holland: 53.5% | Yes |
| Cover: Visual screening will be the management objective in areas adjacent to open roads. | | Visual screening would be retained along open roads. | Yes |
| Cover: Even-aged cutting units will be laid out so that no point in the unit is greater than 600 feet from cover. | | In the clearcut, seed tree, and shelterwood units, which are essentially even-aged management or regeneration, no point in the unit would be more than 600 feet from cover. | Yes |
| Riparian Zones: Use uneven-aged forest management practices. | | No treatment would occur in riparian zones as defined by the SVGBCA (SMZs). Alternative 2 proposes treatments in RHCAs which encompass a greater area than SMZs. Cover would be retained in riparian zones. | Yes |
| Security: Contribute to security in Linkage Zones by reclaiming or restricting roads. Reclaim roads to enhance use of Preferred Habitat or other high quality habitat areas, and to complement adjacent areas of secure habitat. | | All temporary roads would be rehabilitated; reclamation of roads is proposed. | Yes |
| Security: Do not increase TRD on National Forest System lands except to grant legal access to inholders. | There has been no net increase in TRD. | No net increase in TRD. Implementation would result in net decrease of 7% TRD. | Yes |
| ORD = Open Motorized Access Density, TRD = Total Motorized Access | | | |

The NFMA requires the Forest Service to “provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives,” 16 USC 1604(g)(3)(B). The Flathead’s Forest Plan provides standards and direction for resource use throughout the forest.

## DETERMINATION

The grizzly bear is listed as a “Threatened” species under the ESA. A BA was prepared and submitted to the USFWS for consultation.

# WOLVERINE

## INTRODUCTION

The wolverine (*Gulo gulo luscus*) is a proposed Threatened species on the Flathead National Forest. Among other species and habitats, the wolverine is an indicator that the needs of other species that use remote mountainous areas are met, particularly those associated with cirque basins, avalanche chutes, and deep snow. The wolverine occurs on the Flathead National Forest, in northwest Montana, and is connected to the populations that extend into Canada and Alaska. The USFWS in December 2010 (USDI 2010), after review of all available scientific and commercial information, found the North American wolverine occurring in the contiguous United States is a Distinct Population Segment (DPS) and that addition of this DPS to the Lists of Endangered and Threatened Wildlife and Plants was warranted but precluded by higher priority actions to amend the Lists.

Federal actions concerning the wolverine date back to 1995 and culminated in a proposal to list the wolverine DPS as threatened on February 4, 2013 (USDI 2013b). After further review of all available scientific and commercial information, the USFWS subsequently withdrew that proposal, and published their determination on August 13, 2014 (USDI 2014b), that adding the North American wolverine occurring in the contiguous United States as a DPS to the Lists of Endangered and Threatened Wildlife and Plants was not warranted (USDI 2014b). On April 14, 2016 the Court remanded the matter to the U.S. Fish and Wildlife Service for further consideration consistent with order CV 14-246-M-DLC (Consolidated with Case Nos.14-247-M-DLC and 14-250-M-DLC). On May 24, 2016, the USFWS again listed wolverine as a proposed species on the Flathead National Forest.

Wolverines occur naturally in low densities, and current population levels and trends are not definitely known (USDI 2013b). However, there is evidence that their population is increasing (USDI 2014b) and that wolverines are expanding both within areas currently occupied, as well as suitable habitat not currently occupied (USDI 2014b).

# AFFECTED ENVIRONMENT

## HABITAT

In the contiguous United States, wolverine year-round habitat is found at high elevations, especially in cirque basins and avalanche chutes that have food sources such as marmots, voles, and carrion (Copeland 1996; Copeland et al. 2007; Hornocker et al. 1981; Inman et al. 2007; Magoun et al. 1998; Squires, Copeland, et al. 2007). Deep, persistent, and reliable spring snow cover is the best overall predictor of wolverine occurrence in the contiguous United States (Copeland et al. 2010; Copeland et al. 2007). Deep, persistent spring snow correlates well with wolverine year-round habitat use across wolverine distribution in North America and Eurasia at both regional and local scales (Copeland et al. 2010; Inman et al. 2012). Wolverine year-round habitat use also takes place almost entirely within the area defined by deep, persistent spring snow (Copeland et al. 2010).

Natal dens have been found in remote, high elevation cirque basins in late winter and in large woody debris within subalpine forest (Copeland 1996). Young are born in a den among rocks or tree roots, in a hollow log, under a fallen tree, or in dense vegetation, including sites under snow. Cold habitat and a persistent snow layer needed for complex snow tunnels during the denning period (April 15 to May 15) appear to be essential for reproductive dens (Aubry et al. 2007; Copeland et al. 2010) and genetic dispersal paths (Schwartz et al. 2009).

Denning has been found to occur in areas of deep persistent spring snowpack. The USFWS (USDI 2013b) determined the best available science for wolverine natal denning habitat to be a composite of two models produced by Inman (Inman et al. 2012) and Copeland (Copeland et al. 2010). The Copeland (Copeland et al. 2010) model was used for this analysis. This model includes all known wolverine natal dens in the wolverine distinct population segment. On average, most denning occurs at higher elevations within the area defined by the model. Wolverine year-round habitat use also takes place almost entirely within the area defined by deep persistent spring snow (Copeland et al. 2010a, pp. 242-243). Wolverines rarely, or never, den in lower elevation forested habitats, although they may occupy these habitats occasionally (Magoun et al. 1998). Based on this model, approximately 21,839 acres or roughly 63 percent of the Beaver Creek Project Area contains areas suitable for wolverine denning. This includes modeled deep, persistent, spring snowpack occurring 1 of 7 to 7 of 7 years. For additional information on the snowpack model, wolverine security and deep persistent snowpack throughout the Region or on the Flathead National Forest, reference the supplemental information for wolverine in the project file (Project File Exhibit H-22).

Wolverine densities and home range size are believed to be closely linked to food availability and differences in habitat quality (Hornocker et al. 1981). Wolverines are opportunistic feeders and consume a variety of foods. They primarily scavenge carrion and have an excellent sense of smell that enables them to find food beneath deep snow (Hornocker et al. 1981). Female wolverines forage close to den sites in early summer, progressively ranging further from dens as kits become more independent (May et al. 2010). Wolverines in Glacier National Park had average adult male home ranges of 496 kilometers$^2$ (193 miles$^2$) and adult female home ranges of 141 kilometers$^2$ (55 miles$^2$) (Copeland et al. 2006).

> "Wolverine home ranges generally do not occur near human settlements, and this separation is believed to be largely due to differential habitat selection by wolverines and humans" (Copeland et al. 2007; May et al. 2006).

Krebs et al. (Krebs et al. 2007) examined wolverine habitat use on multiple-use lands in British Columbia. Females were negatively associated with recently logged areas and areas with large amounts of high elevation winter recreation (helicopter and back-country skiing). The habitat use models suggested habitat associations of female wolverines are complex; they likely involve responses to food, predation risk, and human activity (Krebs et al. 2007). Wolverines have also been documented to use space near areas of high human activity. In one study, wolverines did not strongly avoid developed habitat within their home ranges (May et al. 2006). Wolverines have been documented to persist and reproduce in areas with high levels of human use and disturbance, including developed alpine ski areas and areas with motorized use of snowmobiles (Heinemeyer et al. 2012). Wolverines may respond positively to human activity and developments that are a source of food. They scavenge food at dumps in and adjacent to urban areas, at trapper cabins, and at mines (Banci 1994).

In summary, based on the best available science, the USFWS concluded that wolverines do not avoid human development of the types that occur within suitable wolverine habitat and that wolverines may disperse or move across areas of human development (USDI 2013a). Wolverines are not thought to be dependent on vegetation or habitat features that may be manipulated by land management activities. They have been documented using both recently logged areas and burned areas (USDI 2013a).

## POPULATION

The USFWS (USDI 2013a) believes that densities and population levels in the northern Rocky Mountains are not lower today than they were historically.

> "The northern Rocky Mountain population (north of Wyoming) was reduced to historic lows or possibly even extirpated during the early 1900s, and then increased dramatically in the second half of the 1900s as predator control efforts subsided and trapping regulations became more restrictive (Aubry et al. 2007). This increase likely indicates a population rebound from historic lows in this period."

Krebs et al. (Krebs et al. 2004) conducted a synthesis for wolverine vital rates and sources of mortality across North America. Trapping was the greatest source of man-caused mortalities and starvation was the greatest source of natural mortality. Trapping is managed by MFWP and is not currently permitted for wolverine in Montana.

The effective population for wolverines in the Rocky Mountains was calculated to be 35 (Schwartz et al. 2009). This effective population size is exceptionally low, which means that this is a species that seems to be able to persist at extremely low numbers. The fragmented nature and distribution of wolverine habitat in the lower United States results in a contiguous United States population that is more vulnerable to extirpation because of lack of connectivity between subpopulations. This contributes to inbreeding and reduces the chances of recolonization of habitat patches after local extinction. In the contiguous United States, 250 to 300 wolverines account for probably less than 2 percent of the entire *G. g. luscus* population. The USFWS (USDI 2010) concluded that the wolverine population in the contiguous United States is both discrete and significant under DPS policy.

Wolverine populations in the northern Rocky Mountains appear to be connected to each other at the present time through dispersal routes that correspond to habitat suitability (Schwartz et al. 2009). Linkage zones are defined as "places where animals can find food, shelter, and security while moving across the landscape between suitable habitat." Wolverines prefer to travel in habitat that is most similar to habitat they use for home-range establishment, i.e., alpine habitats that maintain snow cover well into the spring. There is no evidence that wolverine dispersal is affected by infrastructure development (Schwartz et al. 2009). In the contiguous United States, wolverines must cross unsuitable habitats to achieve connectivity among subpopulations, which is required to avert further genetic drift and continued loss of genetic diversity (Copeland et al. 2007).

On the Flathead National Forest, trapping records and observations of wolverines or their tracks have been received for every major drainage, with over 275 wolverine reports since 1933. During the 10-year period from 2003 to 2012, wolverines have been reported at a minimum of 25 separate locations, distributed across the Flathead National Forest (Project File Exhibit H-22).

During the winters of 2012 through 2015, winter carnivore monitoring was conducted within the Swan, Clearwater, and Blackfoot Valleys. Monitoring included snow track transects that were presumed lynx, wolverine, or fisher tracks and were backtracked until hair or scat was collected for species genetic identification. During the winters of 2013 through 2015, bait stations were set up to attract and collect hair samples from carnivores in the area. The DNA results are still pending from the winter of 2015; however, monitoring from 2012 through 2014 detected 15 unique wolverine genotypes, 10 of which were detected in the Swan Valley (Southwestern Crown Carnivore Monitoring Team 2014). Wolverines were detected in the Beaver Creek Project Area.

## ALTERNATIVE 1 - NO ACTION
## DIRECT, INDIRECT, AND CUMULATIVE EFFECTS

Under Alternative 1, there would be no fuel reduction or forest health activity on NFS lands in the Beaver Creek Project Area. There would be no negative direct effects to the wolverine associated with this alternative. Effective wolverine habitat is not associated with a specific vegetative type. In the absence of the proposed treatments, natural vegetative succession or an increase in wildfire potential would not produce significant indirect effects on the wolverine or wolverine habitat. The Nature Conservancy's activities have occurred in the project area; however, no additional activities are currently proposed by TNC. Alternative 1 would not contribute significantly to cumulative effects on wolverine in the Beaver Creek Project Area.

## ALTERNATIVES 2 & 3 – ACTION ALTERNATIVES
## DIRECT AND INDIRECT EFFECTS

### NATAL SECURITY

Alternatives 2 and 3 propose vegetation and road management and wilderness burning activities within modeled wolverine denning habitat (Project File Exhibit H-22). Spring snow persists into mid-June where units and modeled habitat overlap within the project area (Project File Exhibit H-

22). Vegetation and road treatment activities would not be implemented when spring snow persists on the ground; hence, proposed activities would not overlap temporally during wolverine natal denning. Wilderness burning would not be implemented until certain conditions are met to meet burning objectives. Wilderness burning would occur during the fall outside of wolverine natal denning time periods.

## PREY BASE

As described above, ungulate carrion is an important food for wolverine, as well as a variety of small mammal species. Proposed vegetative treatments in Alternatives 2 and 3 would affect ungulates in the area (reference the Management Indicator Species: Big Game Section in this EA). Existing understory vegetation and overstory tree canopies would be reduced to varying degrees as a result of proposed commercial and non-commercial treatments; the greatest reductions would occur in Alternative 2. Although there would be no change expected in overall ungulate population numbers in the Beaver Creek Project Area as a result of the proposed treatments, the vegetative treatments would alter white-tailed deer and elk use patterns in the project area, as the ungulates adjust their behavior to avoid human presence or disturbance in the short-term and as they adjust to changes in forage and cover availability over the short and long term.

Other wolverine prey species may include mountain goat or small mammals like snowshoe hare (Lofroth et al. 2007). Mountain goats are found throughout the summer months in the high, rocky elevations of the project area where no activities are proposed. The proposed activities would not impact mountain goats. Snowshoe hare habitat would remain well distributed throughout the project area as a result of implementing either Alternative 2 or 3 (See Canada Lynx Section of this EA for discussion of snowshoe hare habitat). Design Criteria for down woody debris would maintain habitat for small mammals distributed to varying degrees in a mosaic across the project area. Woody debris (microhabitat for small mammals) would remain largely unaffected in the high elevations of the Mission Mountains Wilderness where the greatest amount of wolverine summer ranger occurs.

## OVERALL HABITAT SECURITY

Although wolverine use of lower elevation habitat is uncommon, field surveys for wolverine have detected wolverine on the mid-elevation slopes of the Beaver Creek Project Area during the winter months. It is possible that short-term displacement of wolverine could occur in proposed treatment areas on the mid to upper slopes as a result of proposed activities in Alternatives 2 or 3; however, this potential displacement is small, considering project activities may occur during the summer and fall when wolverines are using high elevation habitat in the Mission Mountains. Winter activities (commercial units) would have most potential to displace wolverine, but activities implemented during the winter would occur over a relatively small portion of the project area and would likely have little impact to wolverine habitat use. Wolverines are not thought to be dependent on specific vegetation or habitat features that might be manipulated by land management activities, nor is there evidence to suggest that land management activities, such as timber harvest, are a threat to the conservation of the species (USDI 2013a). The majority of security core for grizzly bears would provide an area free from human activity for wolverine during implementation of project activities.

Wolverines are known to successfully disperse long distances between habitats through human dominated landscapes and across developed transportation corridors (USDI 2013a). Temporary road construction is proposed under each of the action alternatives (Alternative 2 - 5 miles; Alternative 3 – 7.5 miles). Temporary roads would be rehabilitated following use. Use of NFS roads or temporary road for project activities would still allow for wolverine movement across the project area in connection with other parts of the Swan or Clearwater Valleys.

### AQUATIC RESTORATION PROJECTS

Activities associated with aquatic restoration under Alternatives 2 or 3 would not likely impact wolverine to any measurable degree due to the low elevation of the activities and that these activities would occur outside of winter.

## ALTERNATIVES B AND C – ACTION ALTERNATIVES
## CUMULATIVE EFFECTS

Historically, prior to settlement of the Swan Valley, wolverine had unlimited access to a variety of habitats and most likely traveled from high-elevation summer habitats to low-elevation winter big game ranges. Management actions, such as road building, and other human developments, such as residential development, winter recreational activities (e.g., snowmobiling), and trapping, have increased human presence in once remote areas. In their proposed ruling, the USFWS determined that global climate change is the primary threat to the species, and that legal and incidental trapping of wolverines are substantial threats in concert with climate change. Management activities of land management agencies, for example, winter recreation and timber harvest, were not identified as threat (USDI 2013a).

Regulated trapping in Montana has been managed by MFWP through scientifically-based regulations intended to sustain furbearer populations. Traditionally, MFWP and the MFWP Commission reviewed and refined trapping regulations to ensure the use of best management practices for trapping activities. In the past, licensed trappers provided MFWP with important information to assist in state wildlife management programs. Legal trapping in Montana in the recent past removed an average of 10.5 individuals from the population each year (USDA 2015b). The 2012/2013 wolverine trapping season was cancelled after a temporary restraining order was issued by a District Court Judge against the wolverine trapping season in Montana (USDA 2015b). Currently, wolverine trapping has not been re-opened by the MFWP. Regardless, the Beaver Creek Project would not increase public motorized access within the project area. Trapping access within the Beaver Creek Project Area would not change from the existing condition as a result of the project activities under Alternatives 2 or 3.

National Forest System lands in the Beaver Creek Project Area outside of wilderness are open to winter snowmobile travel from December 1 through March 31, conditions permitting. Harvest may open up some forest areas to snowmobile use. Access to these areas would diminish over time as roads and harvest units grow back in with forest vegetation. Some winter logging activities may occur during the same time period as recreational snowmobile use. Burning, road management, planting, aquatic restoration would likely coincide with public snowmobile use within the project area. Wolverines have been documented to persist and reproduce in areas with high levels of human use and disturbance including developed alpine ski areas and areas with motorized use of snowmobiles (Heinemeyer et al. 2012). Wolverine presence in the project area with concurrent snowmobile use has been documented with winter monitoring efforts (Southwestern Crown Carnivore Monitoring Team 2014). Additionally, snowmobile use is not allowed within the Mission Mountains Wilderness, which comprises approximately 57 percent of the project area.

Harvest activity by TNC has occurred within the project area. The Nature Conservancy's activities removed mature trees, but retained patches of regenerating forest vegetation that would serve as hiding cover for wolverine prey species and create some continuity of forest canopy cover between patches of older forest stands. None of these harvest activities occurred within riparian habitats.

It is thought that wolverines are conserved through extensive unroaded areas and forest management standards associated with access management in roaded areas (Amendment 19), and by providing a connected, undeveloped forest matrix (USDA 2015b). With limited activities where the primary habitat of this species is located there would be little risk of population loss; species viability would be maintained.

# EFFECTS OF A FOREST PLAN AMENDMENT TO ASSIGN MANAGEMENT AREAS TO ACQUIRED LANDS

The Beaver Creek Project includes a Forest Plan Amendment to assign interim management areas (MAs) to approximately 5,457 acres of former PCTC lands acquired by the USDA Forest Service to be managed as part of the Flathead National Forest. These interim management areas will be in effect on acquired lands until the ongoing Forest Plan Revision effort is completed, anticipated in 2 years.

The effects of the Forest Plan Amendment to wolverine habitat within the analysis area under Alternative 1 – No Action Alternative are minor because the Forest Plan standards and guidelines apply to all lands managed by the Flathead National Forest even if management areas are not assigned. The effects of the Forest Plan Amendment under Alternative 2 or 3 are also minor in scale because although they allow for timber management to occur on some lands, wolverines are not thought to be dependent on vegetation or habitat features that may be manipulated by land management activities (USDI 2013b).. These MA assignments are consistent with the existing condition of these lands and the management direction assigned to adjacent lands and will not preclude future MA assignment under the Flathead Forest Plan Revision effort.

The cumulative effects of this forest plan amendment are very limited due to the geographic scope and expected duration of the amendment. At the Flathead National Forest scale, this amendment is only addressing management area direction on less than 1 percent of the NFS acreage on the Flathead National Forest. Additionally, the duration of this amendment is expected to be short-term since forest plan revision is ongoing with a decision expected in 2017. When the revision effort is completed, new management areas will be assigned across the entire Flathead National Forest, including the Beaver Creek project area, and will supersede any of the interim management areas proposed in this amendment. Reasonably foreseeable activities identified on the lands associated with the amendment is very limited as identified in Table 17 in Chapter 3 of this EA. If future land management activities occur on these lands they will be subject to forest-wide direction found in the Flathead National Forest Land and Resource Management Plan, federal and state laws, and other Forest Service regulations, as they are now, and will be guided by the proposed management area direction. Future land management activities such as timber harvest, road work, changes to public access etc. would be subject to site-specific NEPA analysis in the future.

# DETERMINATION

The Beaver Creek Project was analyzed for effects to wolverines based on vegetation changes, movements across the landscape, and disturbance from other associated human activities. The determination for Alternative 1 is "No Impact." Both Alternatives 2 and 3 of the Beaver Creek Project would not result in a jeopardy determination for the wolverine. The determination is based on the following: No activities would overlap temporally with wolverine natal denning, activities would be primarily limited to low to mid elevations and would not likely displace wolverine during the summer months, effects to wolverine prey base would be minimal, and some displacement may occur due to wolverine primarily in the winter months.

# REGULATORY FRAMEWORK AND CONSISTENCY

The wolverine is currently a proposed threatened species on the Flathead National Forest. Section 7(a) 2 of the ESA requires that federal agencies must ensure that their activities are not likely to jeopardize the continued existence of any species or result in the destruction or adverse modification of designated critical habitat. On May 20, 2014 the USFS submitted a Biological

Assessment to the USFWS analyzing routine forest projects and the impacts to wolverine. The Assessment determined that forest management and fuels reduction were not a threat to the species (Project File Exhibit H-22). On May 23, 2014, the USFWS concurred with the analysis and determined that routine USFS projects would not jeopardize wolverine (Project File Exhibit H-22). In addition to analyzing wolverine as a sensitive species, the programmatic consultation was reviewed and the project was determined to be consistent with the effects considered by this consultation (Project File Exhibit H-22). The Beaver Creek project would not jeopardize wolverine.

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# WILDLIFE – SENSITIVE SPECIES

## INTRODUCTION

Sensitive wildlife species are those species that may show evidence of a current or predicted downward trend in population numbers or in habitat suitability that could substantially reduce species distribution. Sensitive wildlife species are designated for each National Forest by the Regional Forester (FSM 2670.5) and managed under the authority of the NFMA. The Flathead National Forest has 14 species designated as wildlife sensitive species (Project File Exhibit H-2).

Due to the diverse habitats that occur across Flathead National Forest not every sensitive species will occur within each project area. The sensitive species for Flathead National Forest are listed below in Table 83.

**TABLE 83. SENSITIVE WILDLIFE SPECIES ON THE FLATHEAD NATIONAL FOREST.**

| BIRDS | MAMMALS | AMPHIBIANS |
|---|---|---|
| Harlequin Duck | Fisher | Boreal (Western) Toad |
| Black-backed Woodpecker | Gray Wolf | Northern Leopard Frog |
| Flammulated Owl | Northern Bog Lemming | |
| Bald Eagle | Rocky Mountain Bighorn Sheep | |
| Common Loon | Townsend's Big-eared Bat | |
| American Peregrine Falcon | | |

Based on habitat, species distribution, and field surveys, the harlequin duck, American peregrine falcon, flammulated owl, rocky mountain bighorn sheep, northern bog lemming, Townsend's big-eared bat, and northern leopard frog are unaffected by the proposed project. These species will not be discussed further in this document; however, the rationale for these species is summarized in Project File Exhibit H-3.

## ANALYSIS AREA

### SPATIAL BOUNDS

The Beaver Creek Project Area was considered for the evaluation of direct and indirect effects on sensitive species. This approximately 34,962-acre area is large enough to include the home ranges of several individuals or pairs of a species, and is representative of the effects of fire, natural tree mortality, timber harvest, human recreational activity, and road management across the landscape. The actions proposed in the alternatives that could directly or indirectly affect sensitive species are contained within this area. Cumulative effects were considered within the Beaver Creek Project Area boundary. A multi-scale assessment was also conducted to address population viability concerns.

### TEMPORAL BOUNDS

The length of time for activities proposed by the Beaver Creek Project is approximately five years. This is based on the probable contract length for the proposed project, and the timeframes for related activities. The length of time for direct, indirect, and cumulative effects is approximately 100 years. This is based on the length of time for natural forest processes to occur, snags to be created, and forest vegetation to provide a variety of characteristics suitable for different sensitive species. Specific temporal bounds for different direct, indirect, or cumulative effects are discussed below.

# DATA SOURCES, METHODS, AND ASSUMPTIONS USED

Data used included field surveys, timber stand data, VMap data, research literature, and GIS and dataset information for features, such habitat features existing in the project area including habitat types, riparian structures, canopy cover, etc.

# REGULATORY FRAMEWORK AND CONSISTENCY

In accordance with FSM 2673.42, determinations have been made on the degree of impact the proposed activities may have on sensitive species (Project File Exhibit H-3). Along with Chapter 1, Chapter 2, and the sub-section below on each species, these determination statements meet the requirements of the BE for Sensitive Wildlife Species. These statements are based on available information on the distribution, presence in the project area, habitat requirements, and management strategies for these species, as well as the project design and location. These determination statements are for the segment of the population using the Affected Area, not the entire population, and an additional analysis that assessed viability at the forest scale. All alternatives are consistent with the NFMA diversity requirements for wildlife.

Federal laws and direction applicable to Sensitive Species on the Flathead National Forest include the NFMA and FSM 2670. The NFMA requires the Forest Service to:

> "provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives," 16 USC 1604(g)(3)(B).

The Flathead Forest Plan provides standards and direction for resource use throughout the forest. Amendment 21 to the Flathead Forest Plan has standards to address snag and downed woody retention, as well as protection of existing old growth habitat (See Old Growth and Snag and Downed Woody Sections).

The proposed project and all of its alternatives are consistent with pertinent legislation and species specific management and recovery plans including:

- Bald Eagle, Golden Eagle Protection Act,
- Migratory Bird Treaty Act,
- Montana Bald Eagle Management Guidelines, and
- Gray Wolf Recovery Plan Direction.

The USDA Forest Service is bound by Federal statutes (ESA, NFMA), regulation (USDA 9500-4), and agency policy (FSM 2670) to conserve biological diversity on NFS lands. Federal laws and direction applicable to sensitive species include the NFMA and FSM direction. Forest Plan Amendment 21 has standards to conduct analyses to review programs and activities, to determine their potential effect on sensitive species, and to prepare a BE. The Forest Plan also states that "adverse impacts to sensitive species or their habitats should be avoided." A goal in Forest Plan Amendment 21 is to "ensure that Forest Service actions do not contribute to the loss of viability of native species."

In accordance with FSM 2673.42, determinations have been made as to the degree of impact the proposed activities may have on sensitive species.

# BALD EAGLE

## AFFECTED ENVIRONMENT

### HABITAT

Bald eagles are opportunistic feeders, preying on fish, waterfowl, and small mammals; stealing food from other predators; and scavenging carrion. It can be assumed that the lands surrounding the larger bodies of water provided ample forage opportunities for bald eagles. During the breeding season, important foraging habitat is usually less than 10 miles from their nest. Some eagles stay in the general vicinity of the nesting area while others may wander or migrate up to hundreds of miles to wintering grounds (USDI 2006).

Historically, bald eagle habitat in and near the Flathead National Forest was probably much as it exists now, except that in many areas nesting habitat apparently had relatively frequent low-severity ground fires with occasional large, stand-replacing crown fires. It was probably rare for any potential territory to not encompass some nesting habitat within 0.5 mile of its associated water body. Nesting territory use generally occurs from approximately February through August, with the following the activity sequence:

1. Egg laying February to mid-April;
2. Incubation spans 31 to 35 days;
3. Eggs hatch from mid-March to mid-May; and
4. Nestling period lasts 11 to 14 weeks.

Bald eagles tend to nest in the tallest trees within a stand (Swenson et al. 1986). In Montana, bald eagles nest in stands containing large trees (>30 inches DBH) with uneven canopy structure and in direct line of sight of a large river or lake generally 0.5 mile away (Montana Bald Eagle Working Group 1994).

### POPULATION STATUS

The Flathead National Forest is in the Pacific States Bald Eagle Recovery Area (USDI 1986) and the Upper Columbia Basin Zone (Zone 7). The Bald Eagle Recovery Team recommended a set of criteria to measure recovery that included among other items a minimum of 800 nesting pairs in the seven western state area (USDI 1986). The number of nesting pairs in the Pacific States exceeded the recovery goal of 800 in 1990, and has continued to increase to approximately 1,627 nesting pairs by 2001 (USDI 2006). In the 1986 Recovery Plan, the recovery goal for delisting eagles in Montana was 99 breeding pairs (USDI 1986).

Across Montana in 2009, there were 526 bald eagle territories, of which 387 were known to be occupied (DuBois 2010). Montana's nesting population continues to increase well beyond predicted carrying capacity (Montana Bald Eagle Working Group 2010). Average production for the state was excellent with a mean brood size of 1.77 fledged/successful nest; 77.5 percent nesting success (191) for observed active nests (367); and an estimated number of young fledged (based on active nests) at 503 young fledged eagles (DuBois 2010).

The bald eagle has had large population increases, robust productivity, and has reoccupied most of Montana in recent years. The population continues to increase and has expanded well beyond predictions, and seems biologically secure (USDA 2015b).

There are several known and monitored bald eagle nests in the Swan Valley. Currently, there are no known nests within the Beaver Creek Project Area; however bald eagles are known to use

Lindbergh Lake for foraging. If a nest is discovered, it would be protected in accordance with the Montana Bald Eagle Management Guidelines (Montana Bald Eagle Working Group 2010). Potential nesting habitat exists along the Swan River and Lindbergh along the northern boundary of the project area. Feeding opportunities occur along the Swan River and the larger lakes in the project area including Lindbergh, Crystal, High Park, Lost, Beaver, and Gray Wolf Lakes and scattered within early seral/structural stage open areas.

Bald eagles are known to pass through the area, but there are no known concentrated feeding sites or roosting areas. Bald eagles use the Swan Valley for foraging and as a migratory route.

# ENVIRONMENTAL CONSEQUENCES

## ALTERNATIVE 1 - NO ACTION
## DIRECT, INDIRECT, AND CUMULATIVE EFFECTS

The No Action Alternative would have no direct effect on bald eagle roosting, foraging, or nesting sites. There would be an increased chance of a stand-replacing wildfire that may reduce roosting sites within the project area or burn along the Swan River, removing potential nesting trees.

The Beaver Creek Project Area contains established human activities and developments including roads, timber management, numerous recreational opportunities, and residential development. It is expected that these activities would continue on public and private lands. Potential foraging habitat and roosting trees for bald eagles would still be available throughout the project area, along the Swan River, and in project area lakes. Alternative 1 would not contribute to these effects.

## ALTERNATIVES 2 AND 3 – ACTION ALTERNATIVES
## DIRECT AND INDIRECT EFFECTS

### NESTING HABITAT

There are no known bald eagle nesting sites in the Beaver Creek Project Area. Bald eagle nests are commonly found near water bodies like lakes or rivers. The Beaver Creek Project Alternative 2 proposes a harvest treatment approximately 0.25 mile from the Lindbergh Lake shore (Unit 83) and 0.1 miles from Beaver Lake (Units 114 and 262). Wilderness burning is proposed within 0.25 mile of Crystal Lake. Spring grizzly bear restrictions under the SVGBCA would diminish potential for eagle disturbance by limiting harvest activity during the egg laying/incubation period (mid-February to the beginning of June) (Montana Bald Eagle Working Group 2010). Wilderness burning would occur outside of eagle nesting time periods. Given the distance of harvest units and proposed burning to potential nesting habitat, disturbance would be unlikely to occur to potential nesting habitat on Crystal, Lindbergh, and Beaver Lakes. Further, potential nesting habitat is widespread throughout the Beaver Creek Project Area, and given the juxtaposition of proposed activities there would be very little potential disturbance to nesting habitat as a whole.

### FEEDING/ROOSTING HABITAT

There are no known concentrated feeding sites or roosting sites in the vicinity of the proposed project. Typically, bald eagles select the larger, more dominant trees as individual roost trees along lakes or open rivers. Mature forests or old growth habitat areas have the greatest potential for providing high quality roost trees or feeding habitat. No old growth habitat would be treated under either Alternative 2 or 3. Potential quantity of roost trees would not be substantially reduced in either action alternative. Eagles likely select roost trees along the larger lake shores or along the Swan River or shorelines of the lakes within the project area. The southern shoreline of Lindbergh Lake contains steep slopes down to the lake's edge. This sloped area contains a great quantity of potential roosting trees where eagles can perch above the lake between foraging bouts. Of the proposed activities, only Unit 83 (Alternative 2) would be located on this west facing slope above Lindbergh Lake.

Proposed harvest or burning activities are unlikely to remove roosting trees adjacent to water bodies within the project area. Wilderness burning would reduce some live trees that are killed due to prescribed fire, but standing snags would still provide for eagle perching and roosting.

Displacement may occur from harvesting activities due to noise from machinery or equipment used to implement project activities. Activities that occur during the winter would not high displacement potential to eagles as the majority of the eagle population would have migrated for the winter. Effects from displacement would likely be small given the amount of roosting habitat available in the project area and the mobility of eagles. Potential displacement would not inhibit a bald eagle's ability to find available feeding or roosting habitat.

### Mortality Risk

Possible mortality factors include hazardous structures, such as power lines, collision with vehicles, disturbance during incubation and nesting periods, illegal killing, and use of certain pesticides that could cause reproductive failure. Implementation of the Beaver Creek Project would not increase the risk of mortality. Hauling on roads would be spread out over time and space and forest roads in the project area do not allow for high vehicle speeds (less than 30 mph). Helicopter activities used for ignition of wilderness burning would be short term in duration and intensity. Potential eagle collisions with the helicopter are considered highly unlikely. There would be no significant increase in road kills as a result of project implementation.

### Road Decommissioning, Realignment, Recontouring, and Storage

Machinery to complete road work may result in noise or other disturbance that could displace eagles within the area. Proposed areas for active decommissioning, realignment, recontouring, and storage would not be located within 0.4 miles of any potential eagle foraging areas. These activities would not likely have any measurable effect on eagles.

### Resource Enhancement Projects

Planting and aquatic restoration activities are not judged to have effects to eagles or eagle habitat above the associated disturbance of the other proposed activities under Alternatives 2 or 3.

## Alternatives 2 and 3 – Action Alternatives Cumulative Effects

There are part-year and yearlong residences in the area, as well as other past established human activities including road building, hiking, fire suppression, firewood cutting, hunting, trapping, and special uses. Private lands in the project area are more developed than these areas were historically. However, the development of homes and logging/clearing on private lands is primarily distributed in the lower elevations of the project area. Past development along the shoreline of Lindbergh Lake, Cygnet Lake, and the Swan River has likely reduced eagle nesting habitat and increased human disturbance to eagles on private property.

A wood fiber agreement was created as part of the Montana Legacy Project. Through this agreement, TNC retains the timber rights to transferred Legacy Lands until 2018. The Nature Conservancy's harvest activities have occurred in the Beaver Creek Project Area, including the Two Bear Harvest and the Beaver Highway Projects. These projects included 544 acres of overstory removal and 111 acres of commercial thinning. Commercial thinning units were thinned to 20-foot spacing (approximately 109 trees per acre) and overstory removal treatments retained approximately 1 to 8 trees per acre greater than 10 inches DBH and regenerating vegetation in the understory. Tree regeneration would continue on Legacy Lands over the next 50 years and the change would benefit numerous bird species that associate with different forest structural stages through time.

The cumulative effect of past activities, the proposed activities of this project, and future activities, would not preclude eagle use of habitats in the area. There appears to be little risk of population loss, and species viability would be maintained. For additional information on the status of bald eagle on the Flathead National Forest, and the status at broader scales, reference the document Flathead National Forest Evaluation and Compliance with NFMA Requirements to Provide for Diversity of Animal Communities (USDA 2015b).

# EFFECTS OF A FOREST PLAN AMENDMENT TO ASSIGN MANAGEMENT AREAS TO ACQUIRED LANDS

The Beaver Creek Project includes a Forest Plan Amendment to assign interim management areas (MAs) to approximately 5,457 acres of former PCTC lands acquired by the USDA Forest Service to be managed as part of the Flathead National Forest. These interim management areas would be in effect on acquired lands until the ongoing Forest Plan Revision effort is completed, anticipated in 2 years.

Alternative 1 - No Action Alternative proposes not to assign management areas to acquired lands although forest-wide standards and guidelines would continue to apply to all NFS lands on the Flathead National Forest.

Alternative 2 proposes to assign 55 acres of acquired lands to MA 2, 8 acres of acquired lands to MA 5, 2,312 acres to MA 11C, 320 acres to MA 12, 2,033 acres to MA 15, 712 acres to MA 15C, and 17 acres to MA 17. These proposed MA assignments were made in consideration of the characteristics of the acquired parcel and the management direction on surrounding lands. Table 11 describes the management emphasis for each of these MAs, but lands assigned to MA 5, MA 11C, MA 15, MA 15C, and MA 17 are considered suitable for timber production, while MA 2 and MA 12 are considered unsuitable for timber production although management activities may occur to benefit other resources.

Alternative 3 proposes different MA assignments to reflect public concern about the scenic integrity of lands on the east side of Lindbergh Lake. To accomplish this, Alternative 3 assigns MA 5 instead of MA 15 on approximately 502 acres of acquired land on the east side of Lindbergh Lake to maintain or enhance the scenic quality of these lands when viewed from Lindbergh Lake. Although MA 5 would allow for timber harvest to occur on these lands, it would emphasize the maintenance of a natural appearing landscape where management activities are not evident.

The effects of the Forest Plan Amendment to bald eagles within the analysis area under Alternative 1 – No Action Alternative are minor because the Forest Plan standards and guidelines regarding treatment within RHCAs apply to all lands managed by the Flathead National Forest even if management areas are not assigned. The proposed management area assignments in Alternative 3 are slightly more beneficial to bald eagles than those proposed in Alternative 2, because it will likely reduce the amount of timber harvest that occurs within 0.5 miles of Lindbergh Lake, although MA 5 still allows timber harvest to occur. These MA assignments are consistent with the existing condition of these lands and the management direction assigned to adjacent lands and will not preclude future MA assignment under the Flathead Forest Plan Revision effort.

The cumulative effects of this forest plan amendment are very limited due to the geographic scope and expected duration of the amendment. At the Flathead National Forest scale, this amendment is only addressing management area direction on less than 1 percent of the NFS acreage on the Flathead National Forest. Additionally, the duration of this amendment is expected to be short-term since forest plan revision is ongoing with a decision expected in 2017.

When the revision effort is completed, new management areas will be assigned across the entire Flathead National Forest, including the Beaver Creek project area, and will supersede any of the interim management areas proposed in this amendment. Reasonably foreseeable activities identified on the lands associated with the amendment is very limited as identified in Table 17 in Chapter 3 of this EA. If future land management activities occur on these lands they will be subject to forest-wide direction found in the Flathead National Forest Land and Resource Management Plan, federal and state laws, and other Forest Service regulations, as they are now, and will be guided by the proposed management area direction. Future land management activities such as timber harvest, road work, changes to public access etc. would be subject to site-specific NEPA analysis in the future.

## DETERMINATION

In accordance with FSM 2600, a determination has been made as to the degree of impact the activities proposed might have on bald eagles. Based on available information, surveys from the project area, Forest Plan requirements, and management strategies, as well as project design and location, the determination for Alternative 1 – No Action is "No Impact." The determination for Alternatives 2 and 3 is "may impact individuals or their habitat, but will not result in a loss of species viability or create a significant trend toward federal listing."

# BLACK-BACKED WOODPECKER

## AFFECTED ENVIRONMENT

### HABITAT

Based on current knowledge of the life history, biology, and ecology of the black-backed woodpecker, certain elements are thought to be essential to the conservation of the species. These elements include the presence of dead and dying, insect-infested trees (forage), and large snags (nesting). The effects analysis for the black-backed woodpecker focused on the presence of insects and potential nesting trees and the potential effects the action alternatives could have on these habitat characteristics.

Black-backed woodpeckers forage in areas with concentrations of dead or decaying trees and logs, often in recently burned forests. The trees in which they feed have frequently only been dead for 2 to 3 years, since these trees harbor the most insects. They use live or dead trees (usually 8 to 12 inches DBH) for nesting. Black-backed woodpecker populations have always been transitory. When an epidemic, windstorm, or fire occurred in the past, black-backed woodpeckers would move into that area. As time went on and the insect numbers decreased, the woodpeckers would move on to another area. There was probably more feeding habitat historically, prior to fire suppression activities. Hutto (Hutto 2008) reports that the black-backed woodpecker is "extremely specialized on severely burned forests." He found that "96 percent of their detections on Landbird plots were in burned forest conditions, where this species was 16 times more likely to occur than anywhere else."

Between 2001 and 2004, approximately 200,000 acres burned in over 70 fires across the Flathead National Forest. These fires created pulses of habitat suitable for relatively high densities of black-backed woodpeckers. Less than 5 percent of this habitat had salvage harvest, leaving the vast majority of habitat available in large tracts. Between 2007 and 2012, approximately 138,632 acres burned(USDA 2013a).

Hutto (Hutto 2007), in a study of bird use of habitats burned in the 2003 fires in northwest Montana, found that within burned forests, there was one dominant variable that influenced the distribution of birds, and that is fire severity. Some species, including the black-backed woodpecker, were relatively abundant only in the high-severity patches. Dudley and Saab (Dudley et al. 2007) estimated an average home range size of 511 acres of this high-quality habitat per nesting pair.

Hutto's preliminary results also suggested burned forests that were harvested fairly intensively (seed tree cuts, shelterwood cuts) within a decade or two prior to the fires of 2003 were much less suitable as post-fire forests to the black-backed woodpecker and other fire dependent bird species. Even forests that were harvested more selectively within a decade or two prior to fire were less likely to be occupied by black-backed woodpeckers. There is currently no recent post-fire habitat (within the last 3 years) for black-backed woodpecker in the Beaver Creek Project Area (see Fire and Fuels Section of this EA for more information). Considering the 138,632 acres burned between 2007 and 2012, approximately 4.5 percent was post-fire salvage logged within 4 years of the fire on Flathead National Forest lands (USDA 2013a).

Black-backed woodpeckers also do occur in unburned landscapes (Bull et al. 1986). During extended periods of wet, cool summers when few fires burn, black-backed woodpeckers appear to disperse and forage on small bark beetle outbreaks at low densities (Saab et al. 1998). Hoyt and Hannon (Hoyt et al. 2002) reported black-backed woodpeckers in old forest stands long distances from any burned areas, suggesting the species is not "restricted" to post-burn areas.

Nappi and Drapeau (Nappi et al. 2009) suggested that old growth habitats may allow population persistence between fires in regions with longer fire cycles. Approximately 2,004 acres of old growth forest has been identified through stand exams on NFS lands in the vicinity of the proposed cutting units (Map 3-4). Mid-successional forest habitat may also provide feeding habitat. Portions of the project area have high levels of dead standing trees as a result of mountain pine beetle, root disease, Douglas-fir beetle, and other insect or disease mortality and these may provide both feeding and nesting habitat.

## POPULATION

Habitat for the black-backed woodpecker is abundant and well distributed across the Northern Region and the Flathead National Forest (Samson 2005). In addition, habitat amounts are expected to increase as fires and insect outbreaks continue to increase in size and in a pattern distinctly different from the recent past with fire suppression (Gallant et al. 2003; Hessburg et al. 2003; Zack 1994).

An analysis of vegetation composition, structure, and landscape pattern on the Flathead National Forest (Project File Exhibit U-12) found that 15 percent of the Flathead National Forest has had some intensity of wildfire since 1999. An analysis of 10 large fires indicated that an average of 47 percent of the area within the fire perimeter burned with high intensity, creating high quality habitat for black-backed woodpeckers.

Habitat models based on forest and regional scales suggest that habitat exceeds amounts needed for a minimum viable population (Samson 2005). Evidence suggests that the black-backed woodpecker is increasing in numbers in the United States (Dixon et al. 2000). Virtually all climate model projections indicate that warmer springs and summers would occur over the region in coming decades. Westerling et al. (2006) states;

> "These trends will reinforce the tendency toward early spring snowmelt and longer fire seasons. This will accentuate conditions favorable to the occurrence of large wildfires, amplifying the vulnerability the region has experienced since the mid-1980's."

These models and trends indicated a surplus of black-backed habitat above historical levels. Black-backed woodpecker populations fluctuate naturally due to variation in insect epidemics and wildfires over time, moving into and out of habitat areas as habitat suitability changes. In northwest Montana, it is likely that black-backed woodpecker populations increased between 2003 and 2008 due to the large number of acres that experienced high-intensity burns during this time period (USDA 2015b). Evidence suggests the black-backed woodpecker is increasing in numbers in the United States (Dixon et al. 2000).

Black-backed woodpeckers are known to occur throughout the Swan Valley, usually in low numbers. Snags with beetle killed trees and late seral to old growth forest stands in the Upper Swan Valley and in the Beaver Creek Project Area provide potential habitat conditions for a low-density population.

For additional information on the status of the black-backed woodpecker on the Flathead National Forest, and the status at broader scales, please see Flathead National Forest Evaluation and Compliance with NFMA Requirements to Provide for Diversity of Animal Communities (USDA 2015b).

# ENVIRONMENTAL CONSEQUENCES

## ALTERNATIVE 1 - NO ACTION
## DIRECT, INDIRECT, AND CUMULATIVE EFFECTS

Alternative 1 would maintain the existing situation. There would be no direct physical change to the landscape; insects and disease would continue to cause tree mortality in the Beaver Creek Project Area, and black-backed woodpeckers would respond to insect outbreaks. Indirectly, taking no action to harvest dead trees, reduce fuels or thin mature forest would increase the potential for high-intensity, high severity, stand-replacing fires to occur in portions of the project area in the future. This could result in wildfires, which would create large areas of highly suitable habitat for this species, depending on the size and intensity of fires. Intense wildfires would benefit black-backed woodpeckers by increasing available habitat.

Timber harvest on NFS, private, and State lands in the Swan Valley would continue, probably salvaging a portion of the potential feeder and nesting trees for black-backed woodpeckers. Harvest by TNC would reduce snags on Legacy Lands within the project area. High levels of human activity would continue, with the potential for snags along open roads to be taken out as firewood.

Fire suppression efforts would continue and depending on fire season conditions, fire severity may be moderated by suppression efforts. Since 2001, there have been a number of large wildfires on the Flathead National Forest and throughout western Montana. Black-backed woodpecker numbers in the Flathead should remain high (USDA 2015b).

Alternative 1 would not contribute substantial negative cumulative effects on black-backed woodpecker.

## ALTERNATIVES 2 AND 3 – ACTION ALTERNATIVES
## DIRECT AND INDIRECT EFFECTS

### FORAGE AND NESTING HABITAT

Mature tree harvest and fuels reduction activity would reduce the potential quality and quantity of feeding and nesting habitat for black-backed woodpeckers by reducing the risk of future high intensity fires in the Beaver Creek Project Area. Currently, there have been no large wildfires

Both Alternatives 2 and 3 would harvest beetle killed trees within the proposed project units. Beetle killed trees currently exist in most stands of the Beaver Creek Project Area at varying levels (see Vegetation Section of this EA for information). While black-backed woodpeckers are highly specialized to select burned forest, some information exists that beetle killed trees may provide some potential food source for black-backed woodpeckers (Rota et al. 2014; Saab et al. 2014). This potential food source is not likely high quality, but may be utilized by some woodpeckers during long cycles between fires (Rota et al. 2014). Mountain pine beetle activity and beetle killed snags would still persist in the project area if either Alternative 2 or 3 were implemented. There are also other predominately lodgepole pine and other forest stands, that contain dead or dying trees from mountain pine beetle in the upper elevations of the Beaver Creek Project Area that are not proposed for treatment.

There would be no proposed treatment in old growth under Alternatives 2 and 3; these stands also have some potential for providing both nesting and feeding habitat.

Alternatives 2 and 3 are consistent with the Forest Plan and would include the retention of a minimum average of 6 snags per acre that are 12 to 20 inches DBH; all snags greater than 20 inches DBH would be left, as well. If existing snag densities are below these densities, substitute live trees would be left.

An indirect negative effect to black-backed woodpecker could be the decreased chance of a large stand-replacing wildfire. Large-scale, severe wildfires on the landscape would be beneficial to black-backed woodpeckers since the fires increase the quality feeding and nesting habitat.

### Prescribed Fire and Wilderness Burning

Prescribed burning would increase fire killed trees in the project area and increase black-backed habitat within the project area primarily through the burning proposed in the Mission Mountains Wilderness. Fires burn in a mosaic pattern and the wilderness prescribed burn would be implemented to produce moderate-severity fire results. While the wilderness burning would not be implemented during conditions that would produce high severity burning, it is expected that the burning would produce some low-quality black-backed woodpecker habitat. This analysis assumes the wilderness burning would produce black-backed woodpecker habitat in a patchwork across 1,104 acres (Project File Exhibit H-20).

Prescribed burning outside the wilderness would also benefit black-backed woodpecker to some degree, as it would result in some tree mortality. This degree would be small given that fire implementation would occur after thinning and the fire type would be a low intensity ground fire.

### Temporary Roads and Road Realignment

The Beaver Creek Project proposes some temporary road construction. Alternative 2 would construct approximately 7.5 miles, and Alterative 3 would construct 5 miles of temporary road. Both alternatives propose 0.15 miles of road realignment. Alternative 2 also proposes to construct an access route for a fish barrier installation along Sunset Creek (See Aquatics Resources for more details). Where construction or realignment activity occurs, some snags could be cut down; there would be a small decrease in the amount of potential feeder or nesting tree habitat to the black-backed woodpecker as a result of temporary road construction. Given the distribution snag availability and mountain pine beetle affected stands within the project area, potential snag removal would have little impact on black-backed woodpecker.

### Security/Mortality Risk

Under Alternatives 2 and 3, it is possible that project implementation would directly affect individual black-backed woodpeckers through disturbance or incidental mortality if nesting trees are cut down during the nesting period. However, this is unlikely given the current absence of post-fire habitat within the project area. The Design Criteria (Table 16) for project implementation outside of the spring period (for grizzly bear) would help to mitigate this mortality risk by decreasing the potential for direct disturbance or mortality during the spring season.

### ROAD DECOMMISSIONING AND INTERMITTENT STORED SERVICE

In Alternatives 2 and 3, 4.5 miles of road decommissioning and 12.58 miles of intermittent stored service (ISS) are proposed. Road decommissioning would help to decrease the potential for future management action where displacement or removal of habitat could occur. This decrease would benefit the long-term habitat security for wildlife species, including black-backed woodpecker.

### AQUATIC RESTORATION ACTIVITIES AND PLANTING

Activities associated with aquatic restoration projects and planting could result in short-term displacement from mechanical activity. The effects of this displacement would likely be minor as these activities would not be occurring in high quality black-backed woodpecker habitat (e.g., burned forest). Little vegetation would be removed. No proposed activities are located within old growth habitat.

## ALTERNATIVES 2 AND 3 – ACTION ALTERNATIVES CUMULATIVE EFFECTS

Prior to 2001, there were few wildfires of considerable size since 1926. Then, across the Flathead National Forest and most of western Montana, large acreages of black-backed woodpecker habitat were created by wildfires. Between 2001 and 2004, approximately 200,000 acres in over 70 fires burned on the Flathead National Forest, creating a substantial amount of black-backed woodpecker habitat. Less than 5 percent of this habitat was salvage harvested, leaving the vast majority of potential black-backed woodpecker habitat intact.

Fire suppression has been the greatest factor limiting the distribution of potential black-backed woodpecker habitat. In the Beaver Creek Project Area between 1970 and 2014, there were 51 ignitions that were all actively suppressed (see Fire and Fuels Section of this EA). Previously in the project area, the 2001 Sunset Peak Fire burned 30 acres. The Lindbergh Lake Fire burned 64 acres in 2008. Other more recent fires have created black-backed woodpecker habitat in the Swan Valley (See Fire and Fuels Section of this EA). Beyond wildfire, within the project area and throughout the valley, mountain pine beetle and disease have produced a pulse of snags in the past 6 years (USDA 2015b).

A wood fiber agreement was created as part of the Montana Legacy Project. Through this agreement, TNC retains the timber rights to transferred Legacy Lands until 2018. The Nature Conservancy's harvest activities have occurred in the Beaver Creek Project Area, including the Two Bear Harvest and the Beaver Highway Projects. These projects included 544 acres of overstory removal and 111 acres of commercial thinning. Commercial thinning units were thinned to 20 foot spacing (approximately 109 trees per acre) and overstory removal retained approximately 1 to 8 trees per acre greater than 10 inches DBH and regenerating vegetation in the understory. The Nature Conservancy's harvest activities reduced canopy cover and snag density on Legacy lands within the project area. Some snags were retained in TNC harvest units.

Firewood cutting would continue off of open roads in the project area. The Beaver Creek Project would not increase public motorized access. Open roads and increased human use on private lands could affect the availability of snag habitat and negatively affect black-backed woodpeckers. Road closures in place for the grizzly bear have improved security for potential black-backed woodpecker habitat in the Beaver Creek Project Area. The combination of the direct, indirect, and cumulative effects of the project would not result in a decrease in viability for black-backed woodpecker.

## EFFECTS OF A FOREST PLAN AMENDMENT TO ASSIGN MANAGEMENT AREAS TO ACQUIRED LANDS

The Beaver Creek Project includes a Forest Plan Amendment to assign interim management areas (MAs) to approximately 5,457 acres of former PCTC lands acquired by the U.S. Forest Service to be managed as part of the Flathead National Forest. These interim management areas will be in effect on acquired lands until the ongoing Forest Plan Revision effort is completed, anticipated in 2 years.

The effects of the Forest Plan Amendment to black-backed woodpeckers within the analysis area under Alternative 1 – No Action Alternative are minor because the Forest Plan standards and guidelines regarding treatment apply to all lands managed by the Flathead National Forest even if management areas are not assigned. The effects of the Forest Plan Amendment under Alternative 2 and 3 are also minor in scale because although they allow for timber management to occur on some lands the forest will continue to manage to minimize the effects to black-backed woodpeckers and their habitat. These MA assignments are consistent with the existing condition of these lands and the management direction assigned to adjacent lands and will not preclude future MA assignment under the Flathead Forest Plan Revision effort.

## DETERMINATION

In accordance with FSM 2600, a determination has been made as to the degree of impact the activities proposed might have on black-backed woodpeckers. Based on available information, surveys from the project area, Forest Plan requirements, and management strategies, as well as project design and location, the determination for Alternative 1 – No Action is “beneficial” and the determination for Alternatives 2 and 3 is “may impact individuals or their habitat, but will not result in a loss of species viability or create a significant trend toward federal listing.”

# COMMON LOON

## AFFECTED ENVIRONMENT

### HABITAT

The southern edge of the loon’s breeding range extends into the United States across many of the eastern states and into the Rocky Mountains. The original extent of the population is unknown, although populations have declined with the settlement of the west.

Loons are completely dependent on water. Loons in Montana are associated with larger bodies of water (lakes >13 acres) (Hammond 2008). They are disturbed easily, so high quality habitat includes the more secluded lakes or larger lakes with portions of the shoreline that remain relatively undisturbed during the spring and summer months. Residential development has decreased available shoreline nesting habitat on some lakes in the Swan Valley.

The Montana Common Loon Conservation Plan (Hammond et al. 2008) recommends limiting activity within 0.25 mile of critical foraging lakes or on territorial lakes (Class A and B) during breeding time periods (April 1 to June 15). The plan recommends avoiding activities near brood-rearing areas from May 28 to July 15, unless nesting has completely failed.

Swan Valley lakes are monitored each season for loon presence. Within the Beaver Creek Project Area, lakes that are known to have had loon pairs and historic nesting include Lindbergh Lake, Cygnet Lake, and Crystal Lake. The Montana Conservation Plan for the Common Loon uses loon monitoring data and research to prioritize for lakes for conservation. Other lakes in the project area are not nesting lakes due to their high elevation, size and foraging has been detected less than 50 percent of the years where observations have been made (Hammond 2009).

### POPULATION

The global population of the common loon is considered secure; however, many local populations are small and isolated, and are vulnerable to extirpation primarily due to habitat loss and human encroachment (MFWP 2005). Northwestern Montana supports the highest density of nesting common loons in the lower 48 states west of the Mississippi River (MFWP 2005). Current statewide cooperative annual surveys (1994 through 2010) indicate approximately 117 to 194 adults in Montana, averaging 40 to 70 territorial pairs annually (Hammond 2008) and producing 33 to 54 chicks annually (Montana Common Loon Working Group 2007). The loon chick fledging rate in northwest Montana suggests a slightly increasing population (Hammond et al. 2008) . Statewide, evaluation of the last 14 years of Loon Day results indicates a relatively stable loon population with some degree of fluctuation across their habitat (USDA 2015b).

Hammond (Hammond 2008) calculated that there is little probability of extinction for the loon population in northwestern Montana if habitat and disturbance conditions are maintained. On the Flathead National Forest, 25 lakes are known to be occupied or to have suitable nesting conditions (USDA 2015b). During the 2014 nesting season, 4 loon pairs nested in the Swan Valley. Of these nests, only one was located in the project area on the west end of Crystal Lake in the Mission Mountains Wilderness. No recent (last 10 years) nesting activity has occurred on Cygnet or Lindbergh Lake.

## ENVIRONMENTAL CONSEQUENCES

### ALTERNATIVE 1 – NO ACTION
### DIRECT, INDIRECT, AND CUMULATIVE EFFECTS

There would be no proposed timber treatment or forest health activities under this alternative. The occurrence and abundance of different forest conditions would fluctuate and change over time as the area progresses through various successional stages. There would be no direct effects to the vegetation near water bodies or associated activity as a result of implementing the No Action Alternative. Security for the common loon would likely remain the same.

There would be no changes in the level of general motorized access; there would be no proposed road decommissioning with the No Action Alternative.

Indirectly, the likelihood of stand-replacement fires could be increased under Alternative 1 as compared to the action alternatives, with an increased risk of the loss of vegetation along lake shorelines. However, the level of effects would depend on the size and intensity of the wildfire, which would depend on the actual location, intensity, moisture, and weather conditions associated with a presently unknown future fire event.

Human occupancy of private lands in the Swan Valley and along Lindbergh and Cygnet Lakes is likely to increase, as is overall human activity in the Beaver Creek Project Area. This increase in human use would likely increase the potential for disturbance of nesting loons. The majority of loon nesting lakes in the Beaver Creek Project Area is surrounded by NFS lands (except Cygnet); thus, the likelihood of additional shoreline development (removal of nesting habitat) on these lakes is low. However, there is nothing about the No Action Alternative that is likely to interact cumulatively, causing substantive negative effects on the common loon.

## ALTERNATIVES 2 AND 3 – ACTION ALTERNATIVES DIRECT AND INDIRECT EFFECTS

### NESTING AND FORAGING HABITAT

Of the proposed activities, only Unit 83 (proposed in Alternative 2) would occur within 0.25 mile of potential loon habitat in the project area. Due to spring grizzly bear guidelines, no activity would occur in this unit until after June 15. If Unit 83 were completed during the winter months, loons would not be present in the project area due to migration. The nest on Crystal Lake is located, at nearest, 1 mile away from the prescribed wilderness burn, and the burn would not occur during loon nesting season. No effects would occur to nesting loons or loon nesting habitat in the project area.

A potential direct effect on loons would be possible disturbance of an individual or pair that was using Lindbergh Lake for nesting, feeding, or loafing. Disturbance is not expected given that the proposed activities in Alternatives 2 and 3 are generally located far from lake shorelines in the project area, and these activities are located at least several hundred feet in elevation from the lakes themselves. Activities proposed under action alternatives would not inhibit foraging activity on lakes within the project area.

## ALTERNATIVES 2 AND 3 – ACTION ALTERNATIVES CUMULATIVE EFFECTS

As described above under the No Action Alternative, the project area contains established human activities and developments. Road building, private lands development, recreational activities (on land and water) would continue in the project area. It is expected that these activities would continue. The proposed project does not propose any change in access to the lakes within the project area. Lakeshore development and on water recreation could disturb nesting loons and result in nest abandonment. The loon foraging/nesting lakes in the Beaver Creek area (with exception of Cygnet and part of Lindbergh Lake) are completely on NFS lands; thus, the likelihood of shoreline development (removal of nesting habitat) on these lakes is low.

Active conservation across the Swan Valley and the Flathead National Forest includes implementing nest protection measures to limit human disturbances, such as:

1. Deploying floating signs to reduce boat activity near nest sites or chick-rearing habitat,
2. Using informational signs at bulletin boards and kiosks for anglers and boaters in occupied or foraging habitat and,
3. Conducting public education efforts using Loon Rangers targeted at anglers and other watercraft users to reduce boat activity near nest sites and encourage responsible watercraft use near loon broods.

The Nature Conservancy’s past harvest activities in the project area have not occurred adjacent to or within 0.5 miles of Lindbergh Lake, Crystal Lake, or Cygnet Lake and have not impacted common loon habitat. Considering all the direct, indirect, and cumulative effects, the proposed project would not impact common loon viability.

# EFFECTS OF A FOREST PLAN AMENDMENT TO ASSIGN MANAGEMENT AREAS TO ACQUIRED LANDS

The Beaver Creek Project includes a Forest Plan Amendment to assign interim management areas (MAs) to approximately 5,457 acres of former Plum Creek Timber Company (PCTC) lands acquired by the U.S. Forest Service to be managed as part of the Flathead National Forest. These interim management areas will be in effect on acquired lands until the ongoing Forest Plan Revision effort is completed, anticipated in 2 years.

The effects of the Forest Plan Amendment to common loons within the analysis area under Alternative 1 – No Action Alternative are minor because the Forest Plan standards and guidelines regarding treatment apply to all lands managed by the Flathead National Forest even if management areas are not assigned. The effects of the Forest Plan Amendment under Alternative 2 and 3 are also minor in scale because although they allow for timber management to occur on some lands the forest will continue to manage to minimize the effects to common loons and their habitat. These MA assignments are consistent with the existing condition of these lands and the management direction assigned to adjacent lands and will not preclude future MA assignment under the Flathead Forest Plan Revision effort.

The cumulative effects of this forest plan amendment are very limited due to the geographic scope and expected duration of the amendment. At the Flathead National Forest scale, this amendment is only addressing management area direction on less than 1 percent of the NFS acreage on the Flathead National Forest. Additionally, the duration of this amendment is expected to be short-term since forest plan revision is ongoing with a decision expected in 2017. When the revision effort is completed, new management areas will be assigned across the entire Flathead National Forest, including the Beaver Creek project area, and will supersede any of the interim management areas proposed in this amendment. Reasonably foreseeable activities identified on the lands associated with the amendment is very limited as identified in Table 17 in Chapter 3 of this EA. If future land management activities occur on these lands they will be subject to forest-wide direction found in the Flathead National Forest Land and Resource Management Plan, federal and state laws, and other Forest Service regulations, as they are now, and will be guided by the proposed management area direction. Future land management activities such as timber harvest, road work, changes to public access etc. would be subject to site-specific NEPA analysis in the future.

### DETERMINATION

In accordance with FSM 2600, a determination has been made on the impact the proposed activities could have on sensitive species. Based on available information on the common loon's distribution, presence/absence from the project area, habitat requirements, and management strategies, as well as project design and location, the determination for Alternative 1 is "No Impact;" the determination for Alternatives 2 and 3 is "May impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or loss of viability to the population or species."

# FISHER

## AFFECTED ENVIRONMENT

### HABITAT

Fishers are larger, weasel-like predators that occupy a variety of upland and lowland forests, with an affinity for forested riparian habitats. Fishers occur most commonly in landscapes dominated by mature forest cover, and they prefer late-seral forests over other habitats (Lofroth et al. 2010; Powell et al. 1994). However, in two studies in the Northern Rockies, fishers have also been observed using young to medium-age stands of conifers (Jones 1991; Roy 1991). In central Idaho, for example, fishers preferred "mature forest" (13.5 to 18.5 inches DBH) and "old growth forest" (>18.5 inches DBH) in summer, but have been detected in "young forest" (4.5 to 13.5

inches DBH) in winter (Jones 1991). While these younger stands may not provide the structural diversity necessary for denning or resting (although they may) especially in stands that are regenerating after fire or timber harvest in which large live and dead trees were retained, prey availability may be high enough to support fishers, particularly in winter months (Jones 1991).

Habitat associations vary across the range of fishers. In the Northern Rockies, evidence suggests fishers are most commonly associated with mesic mixed conifer forest types (Heinemeyer 1993; Jones 1991; Powell et al. 1994). In the Cabinet Mountains of Montana, fishers selected mixed conifer and cedar/hemlock forests and avoided subalpine and hardwood stands; north slopes were selected, whereas south slopes were avoided (Heinemeyer 1993; Roy 1991). In central Idaho, Jones (Jones 1991) found that fishers selected sites that were dominated by grand fir, Engelmann spruce, and cedar/hemlock, and avoided drier sites (ponderosa pine, upland subalpine fir, and xeric grand fir), although these sites were rare in the study area, occupying only a small proportion of the sampled area. Schwartz et al. (Schwartz et al. 2013) found that fisher were selecting for habitat at two scales:

1. A stand scale as indicated by stands that have large mean and maximum DBH trees (as well as a large variation in tree size), and
2. A landscape scale as indicated by the preference for landscapes with a high proportion of large trees.

The authors suggested that that while fishers can be detected in riparian stringers that bisect open landscapes, this habitat may not be sufficient for persistence (Schwartz et al. 2013).

Fisher occurrence in the Rocky Mountain region was positively correlated with canopy cover up to an apparent threshold of 60 percent. Previously, it was thought that fishers in western North America may favor riparian forests (Lofroth et al. 2010). The majority of fisher locations from studies in the Northern Rockies were near riparian areas: 65 percent of locations were within 200 meters of water in the Cabinet Mountains (Heinemeyer 1993), and 70 percent of locations were within 328 feet (100 meters) of riparian areas in central Idaho (Jones 1991). Other research, has found that fisher use forest outside of riparian areas. Although riparian forests were important to fishers in some locales in British Columbia primarily for denning habitat (e.g., black cottonwood [*Populus balsamifera trichocarpa*] forests), Raley et al. (Raley et al. 2012) did not detect consistent use or selection for riparian forests. Although riparian habitats may be especially useful for fishers, many upland habitats also offer a combination of the habitat characteristics associated with fisher use.

Hillis and Lockman (Hillis andLockman 2003a) mapped fisher habitat in Region One, where fishers are generally limited to west of the Continental Divide, fisher habitat was defined as low-to-mid elevation, mesic, mature, and old forests, within 328 feet (100 meters) of streams. To address patch size and habitat connectivity relevant for fishers, they excluded any patch of habitat that was less than 160 acres and more than 600 feet from the nearest patch of adjacent cover (Jones 1991; Ruggiero et al. 1994). That habitat was compared against levels of habitat that would have been available in pre-fire suppression/pre-logging periods. What they found was that fisher habitat occurs at historically normal levels at both the Flathead National Forest and Region One scales. More recently, Samson (Samson 2006) showed that on the Forests and the Region as a whole, forested ecosystems are more extensive now than in historic times. Research on fisher is ongoing. Multiple agencies and organizations, including the Forest Service, are currently conducting surveys to detect fisher in the Rocky Mountains. Fishers are more difficult to monitor than most species, and monitoring results are often inconclusive (USDA 2015b). Fisher research is ongoing in the Region. The goals of current research and monitoring are to:

- Delineate the geographic range of fisher;
- Determine which Rocky Mountain fisher populations have native genes; and
- Index the abundance of fisher in the different populations.

Fishers are thought to need good snow interception in the winter months (Allen 1983). Sites used by the fisher for shelter or sleeping include hollow logs, tree cavities, brush piles, and used burrows and/or dens. In a study done in Idaho, the average diameter of trees used by fisher as resting sites was 22 inches (Jones 1991). Maternity dens tend to be hollow cavities high in trees. The fisher preys on small mammals (snowshoe hare, grouse, voles, squirrels, mice, etc.) and carrion.

In the Northern Rockies, fishers have existed under a disturbance regime that has created numerous openings in a matrix of mature forested habitats. While fire can result in destruction of some late successional habitat, it is also responsible for maintenance and creation of habitat features important to fisher (Hayes et al. 2006). The denser, coniferous stands near water, which are preferred by fisher, would have experienced longer intervals between fires than drier, more open forest lands. The increased pulse of large logs on the ground that would have followed a fire or insect event would have been beneficial.

Fishers are apparently tolerant of human activity, but the ease of human access into an area correlates with fisher mortality through direct or incidental trapping (Claar et al. 1999). Fishers generally avoid areas with low canopy cover and conversely prefer large areas of contiguous interior forest with vegetative and structural aspects that lead to abundant prey.

Fishers are thought to be among the most habitat-specialized mammals in North America (Hayes et al. 2006). Fragmentation can affect fishers' use of the landscape because moderate to high amounts of contiguous cover are a consistent predictor of fisher occurrence at large spatial scales. In California, Zielinski et al. (Zielinski et al. 2013) examined fisher scat densities as an index of use when comparing two fuels reductions means classified as restorative and extractive. The research found low fisher scat densities in areas with regeneration treatments and relatively high scat densities (used as an index of fisher habitat use) in areas that used thinning, underburning and individual tree selection to accomplish fuel reduction means. Hayes et al. (2006) discuss how fisher may still use forest stands where small patch cuts or light harvest may have little negative impact on fisher if adequate late successional forest habitat is available.

Due to numerous wetlands in the Swan Valley and the availability of moist forest conditions, fisher habitat appears to be extensive and well distributed in the valley's lower elevation zones and along the west side of the Swan Valley at the low to mid-elevations of the Mission Mountains (USDA 1994b). Although fisher in the Swan Valley are not likely to be restricted to stream course zones, riparian habitats in the valley are important and provide key travel and movement corridors with dense multi-storied coniferous forests and snag and down woody debris structures (Aubry et al. 2012). Riparian habitats in the Swan Valley are also more likely to provide the dense canopy cover and complex structure (e.g., snags, broken tops, down woody material) that fisher are associated with. Moister old growth habitats in the Swan Valley would also be very important for the fisher, for the same reasons. Reproductive dens are typically in the oldest and largest trees available (Naney et al. 2012).

Home range size may vary based upon many factors, but the average home range for a female fisher is expected to be about 15 square miles (Jones 1991). The project area boundary was used to determine effects of the proposed activities upon fisher. It is large enough to include a few fisher home ranges and is representative of effects of timber harvest, temporary road construction, road management, prescribed and natural fires, natural tree mortality, and other factors across the landscape. It is large enough to evaluate the ability of the habitat to support recovery of this species, but small enough to not obscure effects of the alternatives. All of the actions proposed in the alternatives are contained within this area.

Potential fisher habitat was defined as mature and late seral forests with a dominant spruce/fir or cedar component less than 6,300-foot elevation in the project area (Project File Exhibit H-4). Important resting/denning habitat was further defined as within 328 feet (100 meters) of perennial riparian landtypes and features (Project File Exhibit H-4). There are 12,170 acres of potential fisher habitat within the project area. Within 328 feet (100 meters) of water, there are approximately 5,017 acres of important resting and denning habitats in the project analysis area.

Other foraging habitat and forest stands with sufficient canopy for travel exist within the project area. Relative to the rest of the Swan, the Beaver Creek Project Area does not have as abundant denning/resting habitat. Further north along the Mission Range, a broad band of cedar, spruce and fir create more abundant habitat in drainages such as Glacier, Elk, Cold, Jim, Piper, Porcupine, and Woodward Creeks (Project File Exhibit H-4). Within the Beaver Creek Project Area, the most abundant and largest patch of denning/resting habitat is located along the Swan River within the Mission Mountains Wilderness.

An analysis examining project effects of vegetation management on future habitat patch size, large tree recruitment, and connectivity was conducted for American marten, which has similar habitat requirements and was considered applicable to fisher for habitat connectivity (Project File Exhibit H-17).

## POPULATION

The fisher population was reduced dramatically in the 1800s and early 1900s through overtrapping, predator and pest control, and alterations of forested habitats by logging, fire, and farming. Fishers were presumed extirpated from Montana at one time, as there were no trapping records in Montana from 1920 to 1960 (Vinkey 2003). Within Montana and Idaho, over a million acres of mature coniferous forest burned in the early part of the 20th century. This may have played a role in the decline of fisher populations.

The fisher was petitioned for listing as a TES in 2009. On April 16, 2010, the USFWS found that the petition presented substantial scientific or commercial information indicating that listing a distinct population segment of fisher in the Northern Rocky Mountains of the United States could be warranted. Therefore, with the publication of that notice, the USFWS initiated a review of the status of the species to determine if listing the fisher in the Northern Rocky Mountains of the United States was warranted. After review of all available scientific and commercial information, the USFWS found that listing the fisher in the U.S. Northern Rocky Mountains (USNRMs), which includes portions of Montana, Idaho, and Wyoming, as threatened or endangered was not warranted at this time. The fisher was not listed as endangered or threatened (USDI 2011a). Fishers were petitioned again for listing in September 2013. The status of this petition is currently pending.

Fishers are common in the northeastern and midwestern portions of the United States, but rarer in the west. Restrictions on harvesting, and reintroduction programs in the late 1950s, have contributed to population recovery in portions of the fisher's historic range. In the Rocky Mountains, they occur in Idaho, Wyoming, and Montana. After 1968, fisher occurrence was verified in the Flathead, Mission, Swan, and Whitefish Ranges (Vinkey 2003). Fishers are expected to occur in the Beaver Creek Project Area, but probably at very low population densities. It is believed that fisher population density is usually low, due to a relatively large home range, which can vary from 16 to 32 square miles (USDA 1994b). Fisher can be difficult to detect due to natural low population densities.

At the Forest Service Region 1 scale, Samson (Samson 2006) concluded that fishers (as well as the American marten, pileated woodpecker, northern goshawk, black-backed woodpecker, and flammulated owl) were secure in terms of their persistence throughout their range. Potential habitat for the fisher was found to be plentiful throughout Region 1, as Samson (Samson 2006) showed that the Forests and the Region as a whole had not declined to a critical 20 to 30 percent threshold of historic habitat remaining on the landscape, and forested ecosystems are more extensive now than in historic times (USDA 2015b).

The MFWP conducted winter track surveys for forest carnivores throughout the Flathead National Forest, which resulted in 0 to 2.5 fisher detections annually from 1990 to 2000, with no apparent trend in the data (USDA 2015b). Winter track surveys are often inconclusive, as well. The size of fisher tracks overlaps with the size of marten tracks, so positive identification is difficult.

Fishers have not been confirmed in the Beaver Creek Project Area. Fishers are more difficult to monitor than most species because monitoring results are often inconclusive. Hair snares to collect fisher hair for DNA confirmation have been put out in winter on various portions of the Flathead National Forest from 2007 to 2010, and multi-species bait stations have been used across the forest from 2012 to 2015, but fisher presence has not been confirmed. The likelihood of obtaining fisher hair is low due to its low population density. Additionally, when using non-invasive sampling techniques, such as hair collection, not every sample will yield quality DNA for analysis (Southwestern Crown Carnivore Monitoring Team 2014).

During the winters of 2012 - 2015, extensive carnivore surveys were done within the Swan Valley. The survey included transects to detect wolverine, fisher, and lynx tracks. If tracks were detected they were backtracked and DNA samples were extracted from hair or scat along the track. These samples were sent to a lab to be identified by species. Additionally, in 2012, fisher hair snare surveys were conducted systematically throughout the valley. In 2013 - 2015, multi-species bait stations were erected systematically throughout the valley. Within the Beaver Creek Project Area, no fisher tracks were detected from these winter survey efforts; however, DNA analysis for the winter of 2015 is still pending (Southwestern Crown Carnivore Monitoring Team 2014).

There is no ongoing fisher research trapping/telemetry effort on the Flathead National Forest. It is unknown whether fishers inhabit the Beaver Creek Project Area. The Beaver Creek area does not contain high amounts of fisher habitat relative to the habitat distribution throughout the Swan valley bottom and along the eastern slope of the Mission Mountains (Olson et al. 2014), it is assumed fisher are present. A larger-scale assessment for this species was also conducted to address population viability concerns (USDA 2015b).

## ALTERNATIVE 1 - NO ACTION
## DIRECT, INDIRECT, AND CUMULATIVE EFFECTS

No forest treatment would be implemented in the Beaver Creek Project Area under this alternative. There would be no direct effect to canopy cover on NFS lands, and any existing or potential den sites would be maintained. Human activity and associated disturbance would be least under this alternative.

The Nature Conservancy's harvest activities have occurred within the project area. These activities reduced quantity and continuity of canopy cover affecting habitat connectivity for fisher. These activities occurred on former industrial timber lands that were not managed to maintain large diameter, dense coniferous conditions that fisher prefer. The Nature Conservancy's activities retained patches of mature and regenerating forest through treatment areas and did not treat RHCAs providing swaths of cover for fisher connectivity.

Indirectly, under the No Action Alternative, it could be anticipated that larger more intense fires could occur within the project area than would have occurred under more historic fire and fuel loading conditions. Large, severe, stand-replacing fire could remove large amounts of fisher habitat throughout the project area. Though precise impacts of such fires would be dependent on location of the fire start, weather conditions at the time, fuel conditions at the fire origin, and many other factors, to the degree that such fires were stand replacing, they would tend to reduce the amount of fisher habitat available due to the high probability these fires would start during the warmest, driest parts of the season.

## ALTERNATIVES 2 AND 3 - ACTION ALTERNATIVE
## DIRECT AND INDIRECT EFFECTS

Comparing the action alternatives, Alternative 3 would have less impact to fisher because less acres would be harvested, Alternative 3 would retain a better distribution of early-, mid- and late-successional forest, and Alternative 2 would impact a larger percentage of fisher habitat in the short-term.

## POTENTIAL FISHER HABITAT

Alternative 2 would affect approximately 1,684 acres or 14 percent of potential fisher habitat within the project area through prescribed fire or proposed harvest activities. Alternative 3 would affect approximately 1,597 acres or 13 percent of potential fisher habitat within the project area through prescribed fire or proposed harvest activities. Table 84 summarizes effects by treatment type.

**TABLE 84. SUMMARY OF EFFECTS TO POTENTIAL FISHER HABITAT BY ACTION ALTERNATIVE.**

| TREATMENT TYPE | ALT. 2 - ACRES HABITAT CHANGED | ALT. 3 – ACRES HABITAT CHANGED | POTENTIAL EFFECTS TO FISHER HABITAT |
|---|---|---|---|
| Commercial Thin | 293 | 369 | Harvest would reduce mature tree density and open up forest stand. Largest trees would be retained, but long-lived fire resistant species would be promoted. Mature spruce and alpine fir would be decreased throughout treatment areas. Areas within 20-30 feet around large diameter long-lived fire-resistant species would be opened up for daylighting. Post-harvest canopy is estimated to be approximately 40%. Forest floor would still provide prey habitat. Fisher habitat quality would be reduced, however denning/resting sites would be reduced, but fisher travel and foraging may still occur. |
| Improvement Cut | 226 | 167 | Mature trees especially diseased and dying trees, would be removed and forest stand opened up. Understory vegetation density would decrease. Largest trees would be retained favoring long-lived fire resistant species. Fisher habitat quality would be reduced with the reduction of spruce and alpine fir. Post-harvest canopy is estimated to be approximately 40%. Fisher travel and forage may still occur. |
| Group Selection | 47 | 15 | Small areas (few acres) in the unit would be cleared and the result would be small patches of forest clearings. These clearings would be avoided by fisher. It is estimated that 30% of the acres would become unsuitable fisher habitat after treatment. The remaining acres would be retained as potential fisher habitat. |
| Seed Tree | 72 | 0 | Few mature trees would remain after treatment. The acres would become unsuitable fisher habitat after treatment. The acres would be avoided by fisher until sufficient trees regenerate to provide travel cover. |
| Wilderness Burn | 1,046 | 1,046 | Understory trees, shrubs and cover would be removed by fire to varying degrees across the area. Some mature trees may die and fall over. Largest trees and snags would be maintained in fire area. The pattern or mosaic of the burn is unknown, but it is assumed, based on past monitoring, patches of fisher habitat would remain and continue to be connected throughout the fire area. The fire would recruit snags and result in larger amounts of down woody debris beneficial to fisher. Openings in fire area (<40% canopy cover) would be avoided by fisher. |
| **Total** | **1,684** | **1,597** | |

Fishers evolved in forest types where fire frequency and intensity was mixed, and wind-throw was common, resulting in complex and intricate landscape mosaic of young, mixed-age, and late-seral components (Jones 1991).

Old growth habitats have a high potential of providing high quality fisher habitat. No old growth would be treated under Alternative 2 or 3. Thinning of forest conditions may reduce habitat conditions for some fisher prey species (e.g., snowshoe hare), but would retain or improve habitat for other species, such as squirrels, grouse, etc. Clearcut and shelterwood treatments would be avoided by fisher, though these treatments are not located in potential habitat. Stand-alone pre-commercial thinning treatments would occur in young stands typically avoided by fisher. These treatments would not occur in fisher habitat, but would release residual trees decreasing the time for these stands to become mature and provide appropriate habitat conditions for fisher travel, foraging, or denning/resting.

While commercial thin and improvement cut treatments may reduce quality of potential habitat by removing spruce/fir, decreasing stand density, and decreasing understory density, the harvest would reduce potential for stand-replacing fire and protect large-diameter trees from wildfire. High-intensity stand-replacing fire could reduce potential fisher habitat over very large forested areas throughout the project area. Over time, harvest treatments would increase growth and resilience of large trees to disturbance within the project area. The design of the project is to promote late-seral stand characteristics through the project area. Over the next 30 years, shade-tolerant trees could regenerate in the understory providing multi-story characteristics with large diameter trees in the overstory. The harvest treatments may increase fisher potential habitat and denning/resting features over the next 50 years (Project File Exhibits H-4 and H-17).

## POTENTIAL HABITAT WITHIN 100 METERS OF RIPARIAN FEATURES

Of the total potential fisher habitat acres affected, Alternative 2 would affect approximately 494 acres of important denning/resting habitat in the project area through prescribed fire or proposed harvest activities. This is approximately 9 percent of the total potential habitat within 328 feet (100 meters) of riparian features. Alternative 3 would affect approximately 408 acres within the project area through prescribed fire or proposed harvest activities. This is approximately 7 percent of the total potential habitat within 328 feet (100 meters) of riparian features. Table 85 summarizes effects to important denning/resting habitat by treatment type within 328 feet (100 meters) of riparian features.

**TABLE 85. EFFECTS TO IMPORTANT DENNING/RESTING HABITAT BY TREATMENT TYPE.**

| TREATMENT TYPE | ALT. 2 - ACRES HABITAT CHANGED | ALT. 3 – ACRES HABITAT CHANGED | POTENTIAL EFFECTS TO FISHER HABITAT |
|---|---|---|---|
| Commercial Thin | 195 | 220 | Harvest would reduce mature tree density and open up forest stand. Largest trees would be retained, but long-lived fire resistant species would be promoted. Mature spruce and alpine fir would be decreased throughout treatment areas. Areas within 20-30 feet around large diameter long-lived fire resistant species will be opened up by daylighting. Post-harvest canopy is estimated to be approximately 40%. Forest floor would still provide prey habitat. Fisher habitat quality would be reduced, however denning/resting sites would be reduced, but fisher travel and foraging may still occur. |
| Improvement Cut | 151 | 100 | Mature trees especially diseased and dying trees, would be removed and forest stand opened up. Largest trees would be retained favoring long-lived fire resistant species. Fisher habitat quality would be reduced with the reduction of spruce and alpine fir, plus the thinning of multiple forest canopies where proposed. Post-harvest canopy is estimated to be approximately 40%. Fisher travel and forage may still occur. Treatment would release trees to grow and become larger/faster over time. |
| Group Selection | 28 | 0 | Small areas (few acres) in the unit would be cleared and the result would be small patches of forest clearings. These clearings would be avoided by fisher. It is estimated that 30% of the acres would become unsuitable fisher habitat after treatment. The remaining acres would be retained as potential fisher habitat. |
| Seed Tree | 33 | 0 | Few mature trees would remain after treatment. The acres would become unsuitable fisher habitat after treatment. The acres would be avoided by fisher until sufficient trees regenerate to provide travel cover. |
| Wilderness Burn | 88 | 88 | Understory trees, shrubs and cover would be removed by fire to varying degrees across the area. Some mature trees may die and fall over. Largest trees and snags would be maintained in fire area. The pattern or mosaic of the burn is unknown, but it is assumed, based on past monitoring, patches of fisher habitat would remain and continue to be connected throughout the fire area. Openings in fire area would be avoided by fisher. |
| **Total** | **494** | **408** | |

Harvest activities within denning/resting habitats would open forest stands, reduce denning/ resting structures, and reduce canopy cover. Intermediate treatments would retain sufficient canopy cover for fisher to travel through, but would decrease the quality of habitat in the short term. Treatments would reduce the likelihood of stand-replacing fire and, in the long-term, may recruit larger trees in greater patch sizes across the landscape (Project File Exhibit H-17).

As mitigation for snag and down woody associated wildlife species, including fisher, snags and down woody material would be retained in all cutting units (see Design Criteria). The prescriptions for treatment would be designed to retain a minimum average of 6 snags per acre that are 12 to 20 inches DBH; all snags greater than 20 inches DBH would be left. If existing snag densities are below these densities, substitute live trees would be left. All standing dead western larch, ponderosa pine, and Douglas-fir trees 16 inches DBH or greater would be retained, if possible. Generally, snags to be left would be further than 150 feet from open roads and private land boundaries. Snags that pose a safety hazard to the contractor’s operation would be removed. In addition to these snag retention criteria, the minimum retention for down woody material would be approximately 10 tons per acre, where available. To achieve the tonnage required, down woody material, which includes the longest material available (e.g., 16-feet long or longer) with the largest diameters available (e.g., 15 inches DBH or greater), would be retained, in sufficient amounts to achieve the required tons per acre. It should be noted that if the snag/down woody material that is left is not in an area with less than 40 percent canopy cover, it is highly unlikely that the snag or down woody structure would be usable by fisher until sufficient canopy cover and forest structure return. Depending on the prescription for treatment, this could be up to 40 years.

Where fisher habitat is decreased through harvest, RHCA areas and other untreated important denning/resting habitat would still exist throughout the project area. Under Alternative 2, some RHCA areas would be treated. Alternative 3 would defer nearly all the treatments in RHCAs within the exception of units 460, 491 because they are located between the stream and an existing roads, and 4222 that proposes fill planting by hand over a one acre area. Alternative 3 would also treat less important denning/resting habitat overall resulting in less impact to fisher and fisher potential habitat than Alternative 2.

Based on the distribution of activities, fisher would still have the ability to travel between patches of denning/resting habitat within the project area using RHCA areas and suitable forested stands with greater than 40 percent canopy cover under either. Fisher denning/resting habitat would remain limited in Sections 31 (T19N R16W), 25 and 26 (T18N R17W). Over the next 4 decades, the project action alternatives would recruit larger trees in bigger patches of habitat across the project area (Project File Exhibit H-17). Riparian areas and mature forest would still provide fisher travel habitat north and south of these sections (see also Old Growth Associated Species section). Pre-commercial thinning and planting would recruit mature forest over time. This recruitment would benefit fisher connectivity, snag recruitment, and future denning/resting habitat over time.

## HABITAT SECURITY

Although fisher are uncommon in the Beaver Creek Project Area, it is possible that short-term displacement of fisher could occur in proposed treatment areas during winter or summer months that activities could be implemented; this short-term displacement would probably be minor as displacement effects would cease once activity is completed. No treatment would occur in old growth habitat. The highest potential for displacement would occur in denning/resting stands within 328 feet (100 meters) of riparian features. Potential displacement from aquatic restoration projects may occur, but is unlikely because these projects would be short-term and not located in potential fisher. Spring timing restrictions would decrease displacement effects. Activities planned in wilderness would be short term (2 days for planned fire ignition and follow-up fire monitoring). Wilderness and security core would still provide large, relatively disturbance free areas for fisher. Fishers are not known to avoid forest roads. Roads used for the Beaver Creek activities would remain closed to the public and the project would not increase public access beyond the existing condition.

## ALTERNATIVES B AND C – ACTION ALTERNATIVES CUMULATIVE EFFECTS

The Swan Valley has a well-developed system of glacial potholes, wet meadows, seeps, and riparian connections throughout the valley floor along both sides of the Swan River. The ecological contribution that these wetland habitats contribute to various wildlife species, including fisher, is very important (Swan Ecosystem Center 2004). There has been a loss of ecological integrity to many of these complexes as a result of residential development, forest management, permanent road construction, drought, and both fire suppression on the one hand and large-scale wildfire on the other. All of these factors combined have undoubtedly affected the amount and the connectivity of potential fisher habitat in the Upper Swan Valley and within the Beaver Creek Project Area.

Habitat loss and fragmentation have been considered a threat to fisher (Lofroth et al. 2010; Naney et al. 2012; Ruggiero et al. 1994). A wood fiber agreement was created as part of the Montana Legacy Project. Through this agreement, TNC retains the timber rights to transferred Legacy Lands until 2018. These TNC harvest activities have occurred within the project area. These harvest activities reduced canopy cover and mature trees throughout the harvest areas. These lands were formally managed as industrial timberlands and contained little potential fisher habitat. Snags that were not hazard trees were retained in TNC harvest units. Treatments did retain patches of regenerating forest vegetation that would serve as hiding cover and create some continuity of forest canopy cover between patches of older forest stands. None of these harvest activities occurred within riparian habitats.

Fishers generally avoid areas with significant human disturbance and conversely prefer large areas of contiguous interior forest with vegetative and structural aspects that lead to abundant prey. Extensive roadless and wilderness habitat reduces the risks of mortality attributed to humans and reduces the potential negative effects of fragmenting small populations. These attributes are present within the Beaver Creek Project Area. Road closures for grizzly bear security have also benefited the fisher by reducing public access for trapping.

Jones (Jones 1991), Vinkey (Vinkey 2003), Lofroth et al. (Lofroth et al. 2010) and others have concluded that fishers are extremely vulnerable to trapping, both intentional and incidental trapping with overtrapping in the early history of the United States contributing to the reduction in size and presumed extirpation across the species' range. Montana has a quota system for fishers. The total fisher quota is seven, and fisher trapping is only open in Regions One and Two; the Flathead National Forest is in Trapping District One, encompassing most of northwest Montana. This area has a quota of two fishers, and one fisher was harvested in 2009. Regulated trapping in Montana is managed by the MFWP. Motorized access for trappers would not increase above the existing condition due to proposed activities under any alternative. Road recontouring, storage and decommissioning would decrease hiking, horseback, or bicycle access on roads in the project area due to aggressive use of recontouring road entrances, placement of natural debris and planting on road surfaces. This decrease of access would benefit fisher security.

While other factors outside of the Forest Service's control (such as trapping, predator/pest control, or alteration of private forest habitats) could be associated with fisher population decline, management actions taken on the Flathead National Forest would provide the habitat composition and structure for fisher across the forest. There would continue to be adequate old growth, riparian habitat, and mid- to late-seral forest matrix habitat to maintain connectivity of functional home ranges (USDA 2015b). There appears to be little risk of population loss across the Forest and Region due to forest management activities (USDA 2015b).

## EFFECTS OF A FOREST PLAN AMENDMENT TO ASSIGN MANAGEMENT AREAS TO ACQUIRED LANDS

The Beaver Creek Project includes a Forest Plan Amendment to assign interim management areas (MAs) to approximately 5,457 acres of former Plum Creek Timber Company (PCTC) lands acquired by the U.S. Forest Service to be managed as part of the Flathead National Forest. These interim management areas will be in effect on acquired lands until the ongoing Forest Plan Revision effort is completed, anticipated in 2 years.

The effects of the Forest Plan Amendment to fisher habitat within the analysis area under Alternative 1 – No Action Alternative are minor because the Forest Plan standards and guidelines apply to all lands managed by the Flathead National Forest even if management areas are not assigned. The effects of the Forest Plan Amendment under Alternative 2 or 3 are also minor in scale because although they allow for timber management to occur on some lands activities proposed activities will be analyzed site specifically for their potential effects to fisher and their habitat. These MA assignments are consistent with the existing condition of these lands and the management direction assigned to adjacent lands and will not preclude future MA assignment under the Flathead Forest Plan Revision effort.

The cumulative effects of this forest plan amendment are very limited due to the geographic scope and expected duration of the amendment. At the Flathead National Forest scale, this amendment is only addressing management area direction on less than 1 percent of the NFS acreage on the Flathead National Forest. Additionally, the duration of this amendment is expected to be short-term since forest plan revision is ongoing with a decision expected in 2017. When the revision effort is completed, new management areas will be assigned across the entire Flathead National Forest, including the Beaver Creek project area, and will supersede any of the interim management areas proposed in this amendment. Reasonably foreseeable activities identified on the lands associated with the amendment is very limited as identified in Table 17 in Chapter 3 of this EA. If future land management activities occur on these lands they will be subject to forest-wide direction found in the Flathead National Forest Land and Resource Management Plan, federal and state laws, and other Forest Service regulations, as they are now, and will be guided by the proposed management area direction. Future land management activities such as timber harvest, road work, changes to public access etc. would be subject to site-specific NEPA analysis in the future.

### DETERMINATION

In accordance with FSM 2600, a determination has been made as to the degree of impact the activities proposed might have on fisher. Relative to the rest of the west side of the Swan Valley, existing potential fisher habitat is not as abundant in the Beaver Creek area. While the project would affect a low proportion of the potential habitat, treatments would recruit large trees, larger patch sizes and maintain connectivity within the project area in the long term. Based on available information, surveys from the project area, Forest Plan requirements, and management strategies, as well as project design and location, the determination for Alternative 1 – No Action is “no impact,” and the determination for Alternatives 2 and 3 is “may impact individuals or their habitat, but will not result in a loss of species viability or create a significant trend toward federal listing.”

# BOREAL (WESTERN) TOAD

## AFFECTED ENVIRONMENT

### HABITAT

Adult western toads are largely terrestrial, will travel considerable distances from water, and are found in a variety of habitats from valley bottoms to high elevations. Generally, toads require three types of habitat; breeding ponds, forest summer range or overland dispersal, and overwintering burrows (Keinath et al. 2005).

Toads breed in lakes, ponds, and roadside ditches, where they prefer shallow, warm areas with mud bottoms (Maxell 2000). On the Flathead National Forest, toad reproduction has been found at over 100 locations (annual “Herp Days” surveys). Of the 70 sites where boreal toads were observed on the Flathead National Forest in the annual surveys, there were 76 percent in the NL1E riparian landtype, 6 percent in the FL1C landtype, 4 percent on lake margins, 1 percent each in NL1A, and 11 percent outside riparian landtypes, as defined in the 1995 Riparian Landtype Inventory conducted on the Flathead National Forest (Project File Exhibit M-105). These landtypes are found on all Flathead National Forest Ranger Districts, but comprise a small fraction of the land base. The dominant riparian landtype, NL1E, is characterized by a low gradient (nearly level, valley bottom, 2 to 4 percent slopes), with relatively fine substrates (clays, silts, fine and medium sand), with a willow and sedge (NL1E) potential vegetation community. The majority of incidental observations were of tadpoles in roadside ditches or of adults found upland and away from breeding habitat.

Considering NL1E, NL1A, and FL1C riparian land types, there is an estimated 1,221 acres of toad breeding habitat in the Beaver Creek Project Area. This estimate is likely biased and underestimates the amount of breeding habitat in the project area, as it does not include large lake shorelines or unmapped small, nearly stagnant water pools on the edges of the Swan River or in the wilderness. These areas have been observed in the wilderness, but not thoroughly inventoried. The toad breeding habitat estimated for this analysis is distributed primarily in the low elevations of the Beaver Creek Project Area, north of NFS road #906.

Considering summer range or dispersal habitat, toads select habitat based on open canopy sites, south facing slopes, occurrence of water and within proximity to high densities of refugia or microhabitat features (downed woody debris, etc.) (Bull 2006). Toads may travel long distances between breeding sites. Bull (Bull 2009) documented toad movements of more than 0.6 miles (1,000 meters) from breeding pools in a single season. Schmetterling and Young (Schmetterling et al. 2008) found toads to disperse over 1.2 miles (2 kilometers), where dispersal movements occurred predominately in riparian areas. Toads overwinter in borrows of rodents, natural ground cavities, or beneath down woody debris (Keinath et al. 2005). All considered, toad habitat should contain a mosaic of features including breeding ponds, wet areas, open forest conditions and dense forest conditions with microhabitat features, such as boulders, root wads, down woody debris littered throughout the mosaic.

Disturbance of wet areas that are important to the western toad, and lands adjacent to wet areas, has increased. Timber management, road building, livestock grazing, residential development, agriculture, and recreational activities have decreased the amount of functional breeding habitat for the western toad throughout the Upper Swan Valley. Roads can be obstacles for toads as they are slow moving and vulnerable to being run over by vehicles and could be more susceptible to predation when crossing roads. The Swan Valley has a well-developed system of glacial potholes, wet meadows, seeps, and riparian connections (Swan Ecosystem Center 2004). Historically, there would have been abundant western toad habitat in the upper Swan Valley.

Fire has historically been one of these predominate forest disturbance factors in the Rocky Mountains. Fire may have short term negative effects to canopy cover and removal of down woody debris, but long-term fire can create abundant down woody debris and convert forest stages to an early stage around wetlands, thereby enhancing the life of the wetland (Maxell 2000; Pilliod et al. 2003). Hossack and Corn (Hossack et al. 2007) found that toads occupied wetlands in burned areas after fire and that burned-over wetlands did not have increased water temperatures 2 to 3 years after fire. Guscio (Guscio 2007) found that toads selected burned areas in Glacier National Park the year following the Robert Fire.

### POPULATION

Population historical data indicates that boreal toads were widely distributed and very common in Montana and other western states, but the species has apparently undergone severe population declines in the past 25 years (Currim 1996). Surveys in the late 1990s indicate that they are absent from many historic locations and that they now occupy less than 10 percent of suitable habitat (Maxell 2000). Factors associated with population declines range from natural population fluctuations to the effects of human-induced factors, such as pollution, pesticides, habitat destruction/alteration, increases in UV radiation, and the introduction of predators or competitors.

The boreal toad is well distributed across western Montana, with over 1,800 observations recorded (MFWP 2010a). Boreal toads were found in 27 percent (11 of 40) of watersheds surveyed across western Montana, and breeding was observed in 21 percent (7 of 33) of the watersheds that have apparently suitable breeding habitat (Maxell 2000).

The Flathead National Forest has completed amphibian surveys across the forest since 1994. Amphibian surveys have documented the occurrence of western toads in the Beaver Creek Project Area and throughout the Upper Swan Valley. The ponds and wetlands in or adjacent to the Beaver Creek Project Area provide potential breeding habitat for the toad.

## ALTERNATIVE 1 - NO ACTION
## DIRECT, INDIRECT, AND CUMULATIVE EFFECTS

Under the No Action Alternative, there would be no fuels reduction or forest health treatments. There would be no direct effects on the western toad and less overall human disturbance in the Beaver Creek Project Area as a result of implementing Alternative 1.

Indirectly, there could be an increased risk of a stand-replacement fire occurring in or adjacent to the project area. Depending on the specific location and extent of a stand-replacement fire, there is the possibility that vegetation could change enough to trigger hydrologic affects that could affect boreal toad habitat. However, specific effects are not possible to predict. A wildfire event would not necessarily be a negative effect for western boreal toads; a study of boreal toads in Glacier National Park found that they dramatically increased in numbers after fires in 2001 and 2003 (Guscio 2007).

There are currently established human activities and developments in the Beaver Creek Project Area and throughout the Upper Swan Valley that have the potential to negatively affect the western toad. These activities include timber management, road building and maintenance, residential development, agricultural use, and recreational activities. Some of these activities have decreased the amount of functional breeding habitat or decreased the security for western toad on non-breeding habitat in the Upper Swan Valley.

The Nature Conservancy's activities have occurred in in the project area. The Nature Conservancy's project areas reduced down woody debris, canopy cover, and may have resulted in some toad mortality.

Alternative 1 would not contribute significantly to these cumulative effects, because there would be no additional cumulative effects to breeding habitat as a result of the No Action Alternative and no significant direct or indirect effects.

## ALTERNATIVES 2 AND 3 – ACTION ALTERNATIVES DIRECT AND INDIRECT EFFECTS

Comparing Alternatives 2 and 3, Alternative 2 would have greater impacts to boreal toad within the project area. Alternative 2 proposes treatment within RHCA buffers surrounding toad breeding wetlands in the project area. Alternative 3 would defer nearly all the treatments in RHCAs within the exception of units 460, 491 because they are located between the stream and an existing roads, and 4222 that proposes fill planting by hand over a one acre area.

### RIPARIAN HABITATS

Wetland complexes provide important breeding habitat for the toad. Riparian habitat would include wetlands, ponds, or potholes. There are management guidelines and BMPs in place (e.g., INFISH) that mitigate effects to riparian habitat. Riparian Habitat Conservation Areas restrict activities within a designated distance from streams, lakes, and wetlands (see Aquatics Section of this EA). The riparian guidelines in place would help protect important riparian breeding habitat for boreal toad.

Alternative 2 proposes daylighting, pre-commercial, and commercial treatments in approximately 110 acres or 2 percent of the total RHCA area in the project area. Of the proposed RHCA treatment acres, 57 acres would occur adjacent to toad breeding wetlands in the project area (Units 412, 419, 429, 430, 431, 432, 4208, 4209, 4222, 4225, 4226, and 4262). Considering impacts to the total perimeter of the breeding habitat of in Alternative 2, vegetation treatments would occur over 4 percent of the total wetland perimeter in the project area.

Work within the toad breeding RHCAs would reduce canopy cover and down woody debris. This reduction may result in displacement of toads from these treated habitats for an unknown amount of time. Some adult toad mortality may occur from machinery working within RHCAs (Keinath et al. 2005). Reduction of canopy may benefit toad habitat in treated parts of the RHCA where high canopy cover exists and permanently shades the forest floor. Toads have been found to select for open forest sites when dispersing from breeding habitats (Bull 2006). Reduction of canopy would allow more sunlight to reach the forest flow and may benefit toad habitat by increasing areas for thermoregulation (Maxell 2000).

Design Criteria within RHCA units would retain some down woody debris and would include large tree boles and slash from limbed trees (Table 16). Dead and down woody debris would not be affected in RHCA areas that are not proposed for treatment. Considering that only a small percentage of RHCAs treated in the project area, sufficient dead and down woody debris would be maintained throughout riparian areas, treated and untreated, for toad overwintering and protection from predators. The wetland most impacted by the proposed RHCA treatments in Alternative 2 would be by Units 419 and 429, which would treat approximately 35 percent of the RHCA perimeter of the wetland located in Sections 17 and 18 (T19N R16W).

Alternative 3 would defer nearly all the treatments in RHCAs within the exception of units 460, 491 because they are located between the stream and an existing roads, and 4222 that proposes fill planting by hand over a one acre area.

### FOREST HABITATS

Vegetative treatments and associated construction of temporary roads would have direct and indirect effects to forest structure and canopy cover. The Beaver Creek Project would maintain a mosaic of early, mid- and late-seral forest stages after treatment under both Alternatives 2 and 3. Microhabitat features, such as down woody debris, root wads, large rocks are known to influence toad movement and habitat use (Keinath et al. 2005). Commercial harvest and slash treatments would reduce down woody debris across the project area. Design Criteria would retain 10 tons/acre of coarse woody debris per acre where available. Snags and live trees would remain well distributed throughout the project area to provide future recruitment of down woody debris. Pre-commercial treatments would occur in young stands that do not typically contain large amounts of down woody debris, root wags, snags or other types of microhabitat features important to toad.

Mechanical and human activity associated with vegetative treatments may displace toads or result in some mortality within treatment units. The units that have the highest potential to result in displacement or mortality are those adjacent to riparian areas. The majority of toad movements and habitat use has been found to be associated with riparian land types and wet environments. With consideration of RHCAs and howellia buffers, juxtaposition of treatment units to riparian habitats in the Beaver Creek area, adult mortality or displacement from harvest activities would be minor. This is because the majority of RHCA in the Beaver Creek Project Area creates a well-connected network of habitat that toads could use for movement and dispersal from breeding wetlands. This network would be maintained under implementation of both Alternatives 2 and 3. Additionally, spring period restrictions for grizzly bears would limit commercial activities to occur during drier periods of the summer time (after June 15). Implementation of activity during winter months when toad are hibernating and not active or dispersing on the forest floor would decrease likelihood of mortality or displacement (Maxell 2000).

### WILDERNESS AND PRESCRIBED BURNING

Wilderness burning would decrease canopy cover and fire would consume down woody debris removing some microhabitat features that toads could use for overwintering or as cover from predators. The proposed wilderness burning area would not encompass any toad breeding habitat. In the long term, wilderness burning would likely improve toad habitat due to the assumed post-fire mosaic pattern of burned and unburned forest conditions in the burned area. The fire would also increase down woody debris from burned trees that have fallen over, creating microhabitat features for toads throughout the fire area.

Alternatives 2 and 3 include three broadcast burn areas that would mimic a low-intensity wildfire and, thereby, help preserve the natural pattern in a few wetlands (the other burn areas are small upland areas that have no consequence to wetlands). These three broadcast burn areas are located nearby or upstream of five wetlands. Broadcast burns would not be intentionally lit beside wetlands or stream channels, but allowed to burn through them. The fire would not actually burn marshes or open water wetlands, but may burn into wet meadows and consume plant litter. This would leave behind a natural mosaic of burnt vegetation that mimics a natural low-intensity wildfire. Broadcast burning is designed to mimic low-intensity fire. Burning would not be expected to consume existing large diameter coarse woody debris or result in a high degree of mature tree mortality (see Fire and Fuels Section of this EA for more information). Some tree mortality would occur. This tree mortality would eventually increase coarse woody debris surrounding and in between wetlands in the project area.

See the Aquatics Section of this EA for effects of wilderness and broadcast burning to water quality.

## ROAD STORAGE, DECOMMISSIONING, REALIGNMENT, BMPS

Road treatments and maintenance in the project area may displace toads or result in some adult mortality. Road realignment would allow for overall decrease of total system road within the project area. Storage and decommissioning would reduce pooling water in roadside ditches. These road side ponds can result in breeding habitat sinks for toads, as they may hold water during wet periods appearing as suitable breeding habitat, but dry up prematurely killing toad eggs.

### AQUATIC RESTORATION PROJECTS AND PLANTING

Replacement of the culvert on NFS road #906 may alter the water level of the pond to the south. The perimeter area may change altering where emergent vegetation meets the water in the short term. Vegetation would change over time, water levels fluctuate in ponds and wetlands naturally, and toads have shown a natural ability to respond to changes in water body perimeters. Planting would not have negative effects to toads.

### ALTERNATIVES 2 AND 3– ACTION ALTERNATIVES CUMULATIVE EFFECTS

There are currently established human activities and developments in the Beaver Creek Project Area that have a potential to negatively affect the western toad. These activities include timber management, road building and maintenance, residential development, agricultural use, and recreational activities. Some of these activities have decreased the amount of functional breeding habitat or decreased the security for western boreal toad on non-breeding habitat in the Beaver Creek Project Area.

The Nature Conservancy's harvest activities have occurred in the Beaver Creek Project Area, including the Two Bear Harvest and the Beaver Highway Projects. These projects included 544 acres of overstory removal and 111 acres of commercial thinning. Commercial thinning units were thinned to 20-foot spacing (approximately 109 trees per acre) and overstory removal retained approximately 1 to 8 trees per acre greater than 10 inches in DBH and regenerating vegetation in the understory. The Nature Conservancy's harvest activities have reduced canopy cover and abundance of down woody debris on Legacy Lands within the project area. These activities have retained a mosaic of forest conditions throughout the harvest areas including dense pockets of young trees and opening with relatively little canopy. Approximately 499 acres of TNC treatments occurred adjacent to wetlands (NL1E riparian landtypes) in Section 1 (T18N R17W) and Section 21 (T19N R16W). The Nature Conservancy's treatment activities did not occur in the riparian area. The remainder of TNC activities occurred in upland forest habitats not adjacent to toad breeding habitats.

While other factors outside of Forest Service control could be associated with toad population declines (such as pollution, bacterial or fungal infection, climate change, increases in UV radiation), based on the above analysis, management actions taken on the Flathead National Forest would continue to provide sufficient habitat composition, structure, and processes for the western toad (USDA 2015b). There appears to be little risk of population loss across the Flathead National Forest; species viability would be maintained.

## EFFECTS OF A FOREST PLAN AMENDMENT TO ASSIGN MANAGEMENT AREAS TO ACQUIRED LANDS

The Beaver Creek Project includes a Forest Plan Amendment to assign interim management areas (MAs) to approximately 5,457 acres of former PCTC lands acquired by the USDA Forest Service to be managed as part of the Flathead National Forest. These interim management areas will be in effect on acquired lands until the ongoing Forest Plan Revision effort is completed, anticipated in 2 years.

The effects of the Forest Plan Amendment to boreal toad habitat within the analysis area under Alternative 1 – No Action Alternative are minor because the Forest Plan standards and guidelines for RHCAs apply to all lands managed by the Flathead National Forest even if management areas are not assigned. The effects of the Forest Plan Amendment under Alternative 2 or 3 are also minor in scale because although they allow for timber management to occur on some lands activities proposed activities will be analyzed site specifically for their potential effects to boreal toad and their habitat. These MA assignments are consistent with the existing condition of these lands and the management direction assigned to adjacent lands and will not preclude future MA assignment under the Flathead Forest Plan Revision effort.

The cumulative effects of this forest plan amendment are very limited due to the geographic scope and expected duration of the amendment. At the Flathead National Forest scale, this amendment is only addressing management area direction on less than 1 percent of the NFS acreage on the Flathead National Forest. Additionally, the duration of this amendment is expected to be short-term since forest plan revision is ongoing with a decision expected in 2017. When the revision effort is completed, new management areas will be assigned across the entire Flathead National Forest, including the Beaver Creek project area, and will supersede any of the interim management areas proposed in this amendment. Reasonably foreseeable activities identified on the lands associated with the amendment is very limited as identified in Table 17 in Chapter 3 of this EA. If future land management activities occur on these lands they will be subject to forest-wide direction found in the Flathead National Forest Land and Resource Management Plan, federal and state laws, and other Forest Service regulations, as they are now, and will be guided by the proposed management area direction. Future land management activities such as timber harvest, road work, changes to public access etc. would be subject to site-specific NEPA analysis in the future.

## DETERMINATION

In accordance with FSM 2600, a determination has been made as to the degree of impact the proposed activities could have on boreal toads. Based on available information, surveys from the project area, Forest Plan requirements, and management strategies, as well as project design and location, the determination for Alternative 1 – No Action is “may impact individuals or their habitat, but will not result in a loss of species viability or create a significant trend toward federal listing” and the determination for Alternatives 2 and 3 is “may impact individuals or their habitat, but will not result in a loss of species viability or create a significant trend toward federal listing.”

# GRAY WOLF

## AFFECTED ENVIRONMENT

### HABITAT

Gray wolves range across northern North America. In the lower 48 states, populations are primarily found in the northern Rocky Mountains (Montana, Idaho, and Wyoming) and the eastern Great Lakes states. The gray wolf was delisted from the ESA on May 4, 2009, as the Northern Rocky Mountains Distinct Population Segment (USDI 2009).

The gray wolf appears to select landscapes with relatively low elevations, flatter terrain, and close to water and roads (USDA 2015b). Habitat preferences for the species appear more related to prey distribution than cover. In northwestern Montana, white-tailed deer comprised 83 percent of wolf kills, whereas elk and moose comprised 14 and 3 percent, respectively (Kunkel et al. 1999). Kunkel et al. (Kunkel et al. 2004) found wolves concentrated their hunting in wintering areas of white-tailed deer around Glacier National Park. White-tailed deer are the predominant prey of wolves within the northern Rocky Mountains, but other prey includes moose, elk, and opportunistic small mammals.

The two major components of wolf habitat that provide survival and recovery value are adequate prey base and security from risk of mortality. Additional components include special habitats, such as den sites, rendezvous sites, and travel/dispersal corridors. Wolves commonly den in undisturbed sites, usually within 400 yards of water. Although summer and winter range habitat for the major wolf prey species (white-tailed deer and elk) is probably adequate to maintain wolf population levels, the increased level of human activity and the increased road access has increased hunting vulnerability and likely reduced potential numbers of white-tailed deer and elk in the Swan Valley.

The wolf was relisted on August 9, 2010, in response to the District Court's ruling that the Montana/Idaho populations could not be separated as a distinct population segment from Wyoming and removed from Federal management (USDA 2015b). Effective May 5, 2011, the USFWS removed gray wolves in a portion of the Northern Rocky Mountain Distinct Population Segment encompassing Idaho, Montana and parts of Oregon, Washington, and Utah from the Federal List of Endangered and Threatened Wildlife.

The most important habitat attributes for wolf pack persistence are forest cover, public land, high prey density, and low livestock density (USDI 2015). Extensive roadless and wilderness habitat reduces the effects of displacement from high-density roads and trails, the risks of mortality due to vehicle collisions and other types of human-related mortalities, and the potential negative effects of fragmenting small populations. These attributes are present on the Flathead National Forest with approximately 67 percent in wilderness or inventoried roadless areas. Amendment 19 improves habitat security through motorized access management. By 2008, the open road density had decreased across the Flathead National Forest to about 0.4 miles per mi² (approx. 1,458 miles/3,688 mi²) and only 2,500 permitted animal unit months on 111,000 acres (actual numbers less due to 3 allotments in vacant status) limits the negative effects of predator control as a result of damage to livestock permitted on the Flathead National Forest (USDA 2015b).

## POPULATION

Wolves have a high fecundity rate and are highly mobile. Even with a hunting season that harvested 72 wolves, a minimum of 166 pups were documented in 2009 and Montana's population continued to increase. Despite the first legal hunt for wolves in Montana, there was a 4 percent increase from 2008, compared to 18 percent the previous year. The Montana minimum count decreased by 73 wolves from 2013 to 2014 (Bradley et al. 2014). The minimum count of wolves in Montana is estimated to be approximately 554 (Bradley et al. 2014).

Wolves are currently listed as a game species and managed by MFWP. Statewide documented wolf harvest included 94 wolves harvest in the 2013/2014 season and 119 taken in the 2014/2015 season. There were an additional 57 wolves killed to reduce livestock depredations. The total number of documented wolf mortalities in the state during 2014 was 308. The Montana Wolf Plan identifies the state's shared legal requirement with the states of Idaho and Wyoming to maintain a minimum total of 30 breeding pairs in the region (MFWP 2002). Montana itself has had more than 15 breeding pairs since 2002 (Bradley et al. 2014). Recovery goals have been exceeded across the entire recovery area.

The project area occurs in Wolf Management Unit 130. Hunting and trapping for wolves is currently permitted in the management unit. In 2013, eighteen wolves were harvested in HD 130 which includes the Swan Valley. The growth rate is slowing down, in part because of the dampening effect of the combination of public harvest and agency control, and because the best habitat is already occupied (Bradley et al. 2013; Montana Dept. of Fish 2013; Sime et al. 2010).

Approximately five packs have territories that occur within the Swan Valley. Wolves are known to move through forest stands in the Beaver Creek Project Area. There are no known or suspected denning sites, whelping areas, or rendezvous sites in the Beaver Creek Project Area.

As reported by the USFWS (USDI 2008) after severe declines, wolf populations can more than double in just 2 years if mortality is reduced and adequate food is available. Increases of nearly 100 percent per year have been documented in low density suitable habitat. The literature suggests that in some situations, wolf populations can remain stable despite annual human-caused mortality rates ranging from about 30 to 50 percent.

## ALTERNATIVE 1 - NO ACTION DIRECT, INDIRECT, AND CUMULATIVE EFFECTS

There would be no activities proposed with this alternative; there would be no direct effects to gray wolf or gray wolf habitat due to proposed treatments. Trees affected by insects and disease would continue to die and fall over. Overstory cover would decrease, creating openings in the forest canopy. As more sunlight reaches the forest floor, ground vegetation would increase, as well as conifer regeneration. As ungulate use patterns change in response to changes in cover and forage, wolves would vary their use patterns, as well.

Wildfire could still occur within the project area altering the distribution of hiding cover and changing prey patterns for gray wolves. A large, intense wildfire could potentially decrease overall cover for ungulate species, at least short term. The potential for a wildfire to occur, and the intensity of a potential fire, would be dependent on many factors, including weather at the time, location of the fire start, and fuel loadings in the path of the wildfire.

The Nature Conservancy's harvest activities have been completed in the project area. These activities have resulted in a decrease in hiding cover and security for wolves. However, wolf security remains high in the project area and hiding cover providing security from hunters is well distributed through the project area. A mosaic of hiding cover would remain in TNC treatment areas benefitting wolf security.

Continued expected increases in human occupancy of private lands in the Swan Valley would be likely to lead to more human use and possible associated disturbance of or conflicts with gray wolf, even under the No Action Alternative. However, the No Action Alternative is unlikely to cumulatively increase impacts to gray wolf beyond that which would intrinsically exist.

## ALTERNATIVES 2 AND 3 – ACTION ALTERNATIVES DIRECT AND INDIRECT EFFECTS

### PREY BASE

None of the proposed activities in Alternative 2 or 3 are located in areas mapped or determined to be suitable as white-tailed deer winter range (MA 9) or mule deer and elk winter range (MA 13) in the Forest Plan. Riparian habitats are also an important component of deer habitat. Deer and elk movement patterns would change due to implementation of Alternatives 2 or 3. Use patterns for gray wolf prey would change over the short term and long term to respond to changing prey patterns (See Management Indicator Species: Big Game Section of this EA for more information on big game species).

### KEY HABITAT AREAS (DENNING SITES, RENDEZVOUS AREAS, AND WHELPING SITES)

There are no known or historical den sites, rendezvous areas, or whelping sites in the area proposed for treatment under Alternative 2 or 3. Treatments under Alternative 2 that are proposed for RHCA areas have potential to change the forest structure around potential denning habitat. These areas were surveyed and no denning sites, rendezvous areas, or whelping sites were detected within the project area or the proposed RHCA treatment units. If future sites are detected, contract provisions would include measures for their protection. Spring period timing restrictions for grizzly bears would reduce potential displacement to denning wolves within the project area by restricting activities until after June 15 in the elevations below 5,200 feet (see Design Criteria, Table 16).

## HABITAT SECURITY

Wolves in the Beaver Creek Project Area could be displaced during project implementation during summer or winter months. In addition to the actual logging activity (vegetative treatments), between 5 and 7.5 miles of temporary road would be constructed to access units depending on differences between Alternatives 2 and 3. Temporary roads would be rehabilitated following use. The work would include the removal of any culverts, water bar placement, seeding, re-contouring, and the placement of woody debris on the reclaimed road. Temporary roads and restricted roads used for proposed activities would be closed to public motorized use and would limit public access throughout the project area.

Wolves are not dependent on any one specific forest vegetation structure or type. A diverse set of forest conditions would continue to exist throughout the Beaver Creek Project Area if Alternative 2 or 3 was implemented. Additionally, there are large blocks of unroaded land and wilderness within the Beaver Creek Project Area that could provide secure habitat for the gray wolf free from human activity. In addition, design features in place for grizzly bear would benefit gray wolf security. Hiding cover standards and distribution throughout the project area would benefit gray wolf security. Furthermore, visual screening retained along open roads would reduce visibility from open motorized routes.

Because wolves are adaptable animals, the expected increase in human activity within the project area would result in temporary displacement of wolves from habitats that they might otherwise use. Wolves occupying the Beaver Creek Project Area would likely move to nearby adjacent areas further away from human development and disturbance.

Implementing Alternative 2 or 3 would not substantially increase the mortality risk for the gray wolf. Any increased chance for an encounter between wolves and humans because of the Beaver Creek Project, would present a low risk of mortality for the wolf. Potential encounters would center on land management activities and not livestock depredation or other high-risk activities commonly associated with wolf mortality. In combination with visual screening and maintaining road closures to the public, the project would not be expected to increase mortality risk to wolves above the existing condition.

## PRESCRIBED FIRE AND WILDERNESS BURNING

Wilderness burning and prescribed fire would burn at low and moderate severities within the project area. Based on monitoring information and scientific literature, these burn areas would likely produce increased amounts of forage for wolf prey species within fire areas over the next 5 years (See Big Game Section of this EA). Burning activity may displace some wolves for short periods while initiation or other activities occur. Displacement would be short term and would not likely impact wolves to any measurable degree.

## ROAD DECOMMISSIONING, RECONTOURING, STORAGE, AND REALIGNMENT

In both Alternatives 2 and 3, there are 4.5 miles of decommissioning, 12.58 miles proposed for storage and 0.15 miles of road realignment. Road realignment would reduce the overall road system mileage within the project area. Road treatments are proposed on gated or bermed roads closed to the public. Road treatments would help increase long-term habitat security for gray wolf by decreasing the overall potential for motorized access in the project area. All road treatments are proposed on gated or bermed roads closed to public motorized use. The improvement for long-term habitat security through road decommissioning, storage, and realignment is likely small as these roads have very little existing motorized use (administrative or contractor only). Habitat security would remain high throughout the Beaver Creek Project Area. Road work activities could result in displacement of wolves while work is occurring. Wolves regularly use forest roads within the project area as travel and hunting corridors. Displacement would likely have little effect on wolf travel throughout the project area, as wolves are capable of traveling through a diverse set of forest landscapes and cover types, as well as on forest roads.

### AQUATIC RESTORATION ACTIVITIES

Activities associated with aquatic restoration could result in short-term displacement. This displacement would likely be minor due to the limited duration for the projects. Little vegetation would be removed. None of the proposed projects are located within old growth habitat or would substantially reduce cover in any stand. The aquatic restoration activities would have little impact on wolves within the project area.

### ALTERNATIVES 2 AND 3 - ACTION ALTERNATIVES CUMULATIVE EFFECTS

Under each of the alternatives, although wolf hunting patterns would undoubtedly change as a result of proposed vegetation management, existing wolf prey base would be maintained. There would be no direct or indirect effects to known or suspected denning, whelping, or rendezvous sites; potential denning, whelping, and rendezvous habitat is not considered limiting across the Swan Valley.

Road closures in the Swan Valley that have been implemented to increase grizzly bear security have increased wolf security, as well. The recent Forest Service land acquisitions (e.g., Montana Legacy Project) have helped to maintain natural landscape linkages and to reduce the risk of private land development.

Any increased chance for an encounter between wolves and humans because of the Beaver Creek Project would present a low risk of mortality for the wolf, since the encounter would center on land management activities and not livestock depredation or other high-risk activities commonly associated with wolf mortality. There are no livestock (cattle) grazing concerns associated with this project area. No livestock-wolf conflicts have occurred on the Holland-Grazing allotment in the past 5 years. Considering the past history with this allotment and current population of wolves in the Swan Valley and Flathead Forest, no negative population effects would occur considering the interaction of the proposed activities and the grazing presence in the project area. Mortality risk for gray wolf, as a result of the implementation of any of the proposed alternatives, would be low.

Harvest by TNC in the project area has reduced hiding cover within harvest areas for wolves and for prey species. Conversely, reduction of canopy cover could produce more shrubs on the forest floor benefiting abundance of forage for ungulate species in the long term. The Nature Conservancy’s prescriptions removed mature trees, but retained patches of regenerating forest vegetation that serve as hiding cover and create some continuity of forest canopy cover between patches of older forest stands.

Population viability would not be a concern for gray wolves in Montana or across the Flathead National Forest (USDA 2015b). There appears to be little risk of population loss and species viability would be maintained (USDA 2015b).

## EFFECTS OF A FOREST PLAN AMENDMENT TO ASSIGN MANAGEMENT AREAS TO ACQUIRED LANDS

The Beaver Creek Project includes a Forest Plan Amendment to assign interim management areas (MAs) to approximately 5,457 acres of former PCTC lands acquired by the USDA Forest Service to be managed as part of the Flathead National Forest. These interim management areas will be in effect on acquired lands until the ongoing Forest Plan Revision effort is completed, anticipated in 2 years.

The effects of the Forest Plan Amendment to gray wolf and the habitat their prey use within the analysis area under Alternative 1 – No Action Alternative are minor because the Forest Plan standards and guidelines apply to all lands managed by the Flathead National Forest even if management areas are not assigned. The effects of the Forest Plan Amendment under Alternative 2 or 3 are also minor in scale because although they allow for timber management to occur on some lands habitat needs for prey species for gray wolf. These MA assignments are consistent with the existing condition of these lands and the management direction assigned to adjacent lands and will not preclude future MA assignment under the Flathead Forest Plan Revision effort.

The cumulative effects of this forest plan amendment are very limited due to the geographic scope and expected duration of the amendment. At the Flathead National Forest scale, this amendment is only addressing management area direction on less than 1 percent of the NFS acreage on the Flathead National Forest. Additionally, the duration of this amendment is expected to be short-term since forest plan revision is ongoing with a decision expected in 2017. When the revision effort is completed, new management areas will be assigned across the entire Flathead National Forest, including the Beaver Creek project area, and will supersede any of the interim management areas proposed in this amendment. Reasonably foreseeable activities identified on the lands associated with the amendment is very limited as identified in Table 17 in Chapter 3 of this EA. If future land management activities occur on these lands they will be subject to forest-wide direction found in the Flathead National Forest Land and Resource Management Plan, federal and state laws, and other Forest Service regulations, as they are now, and will be guided by the proposed management area direction. Future land management activities such as timber harvest, road work, changes to public access etc. would be subject to site-specific NEPA analysis in the future.

# DETERMINATION

In accordance with FSM 2600, a determination has been made as to the degree of impact the activities proposed might have on gray wolves. Based on available information, surveys from the project area, Forest Plan requirements, and management strategies, as well as project design and location, the determination for Alternative 1 – No Action is “may impact individuals or their habitat, but will not result in a loss of species viability or create a significant trend toward federal listing. The determination for Alternatives 2 and 3 is “may impact individuals or their habitat, but will not result in a loss of species viability or create a significant trend toward federal listing.”

**TABLE 86. SENSITIVE SPECIES ANALYSIS SUMMARY - SPECIES WITH NO IMPACT.**

| SPECIES (STATUS[1]) | SPECIES PRESENCE | HABITAT PRESENCE | DETERMINATION |
|---|---|---|---|
| Harlequin Duck (S) | Harlequin ducks are monitored on the Flathead Forest on an annual basis. Harlequin ducks have not been observed in the Beaver Creek Project Area or in the Upper Swan Valley. Statewide, harlequins are most abundant in western Montana. Monitoring efforts on the Flathead Forest and in Glacier National Park indicate that harlequin populations are stable, with at least 159 nesting pairs in Montana (USDA 2015) | In Montana, most harlequin ducks breed and feed in fast moving, low gradient streams. There are no known nests and no suitable harlequin duck breeding streams in the project area. The Swan River has been monitoring for harlequin ducks and no observations have been made. | This project would have “no impact” upon this species because there is no breeding or feeding habitat in the project area. Further, the project proposes no activities near potential breeding or feeding habitat. Therefore, the project would not result in loss of species viability of create a significant trend toward federal listing. |

**TABLE 86. SENSITIVE SPECIES ANALYSIS SUMMARY - SPECIES WITH NO IMPACT.**

| SPECIES (STATUS[1]) | SPECIES PRESENCE | HABITAT PRESENCE | DETERMINATION |
|---|---|---|---|
| Peregrine Falcon (S) | The Montana Peregrine Watch monitors peregrine activity in Montana. There are no known nests or territories in the project area. The number of known active peregrine falcon territories in Montana has increased dramatically from 0 in the mid-70s to 84 active territories in 2009 (USDA 2015) | There is no suitable nesting habitat in the project area. The closest known nest is near Bigfork (over 30 miles away). Peregrines are not likely to feed or travel through the project area, but would be most likely to feed or travel through more open valley habitats to the north or east of the project area. | This project would have “no impact” upon this species because there is no breeding or feeding habitat in the project area. Therefore, the project would not result in loss of species viability of create a significant trend toward federal listing. |
| Northern Leopard Frog (S) | Historically, this species has been documented at very few western Montana: valley-bottom sites near Kalispell/Kila; near Eureka, and near the Nine Pipe National Wildlife Refuge. Due to these adjacent sightings, this species is listed on the Flathead National Forest’s sensitive species list, but none have been documented on the Flathead National Forest since about 1950, despite extensive amphibian surveying on the Flathead National Forest within the past 14 years (USDA 2015) | Breeding habitats used by northern leopard frogs in Montana include low elevation and valley bottom ponds, spillway ponds, beaver ponds, stock reservoirs, lakes, creeks, pools in intermittent streams, warm water springs, potholes, and marshes with emergent vegetation. In summer, adults and juveniles commonly feed in open or semi-open wet meadows and fields with shorter vegetation, usually near the margins of water bodies. They do not use drier upland habitats. They are inactive in winter. | This project would have “no impact” upon this species because there are no observations of leopard frog in the Swan Valley and the project area has no habitat. Therefore, the project would not result in loss of species viability or create a significant trend toward federal listing. |
| Rocky Mountain Bighorn Sheep (S) | There are no herds that are resident on the Flathead National Forest. The closest resident herd is on Wild Horse Island in Flathead Lake (USDA 2015). Bighorn sheep populations in the 3 resident herds adjacent to the Flathead National Forest are relatively stable, but may be susceptible to periodic die-offs due to infection (MFWP 2010b). Bighorn sheep are not found in the Beaver Creek Project Area. | Bighorns prefer cliffs and mountain slopes, as well as rolling foothills. Dispersers will sometimes cross intermountain valleys. Snow depth is most important in winter and availability of high quality green forage is most important in spring and summer. Immediate or nearby cliffy-rocky areas are important year-round. Semi-open to open vegetation types with presence of grasses are preferred (MFWP 2010c). | This project would have “no impact” upon this species because it is not located in the vicinity of any resident herds of bighorn sheep nor is it in a linkage area between populations. Therefore, the project would not result in loss of species viability or create a significant trend toward federal listing. |

**TABLE 86. SENSITIVE SPECIES ANALYSIS SUMMARY - SPECIES WITH NO IMPACT.**

| SPECIES (STATUS[1]) | SPECIES PRESENCE | HABITAT PRESENCE | DETERMINATION |
|---|---|---|---|
| Townsend's Big-eared Bat (S) | Extensive bat surveys were conducted on the Flathead National Forest in 2006 and 2007. Specialized equipment that detects night-time echolocations of bats was also used. Researchers encountered difficulty in identifying species using echolocations, so this data is still being analyzed. One male Townsend's big eared bat (COTO) was captured in a mist net in the South Fork sub-watershed (USDA 2015). Townsend's big-eared bats are unusually difficult to survey for because they are "quite effective at avoiding mist-nets" and difficult to detect acoustically because they use low-intensity calls (Hendricks et al. 2005)(. Statewide, this bat is found at numerous locations in western Montana and also at scattered locations across other parts of the state. Mining sites in other portions of Kerr Mountain have been surveyed for big-eared bats and none were detected. | Caves, abandoned mines, and, less frequently, old buildings are used for maternity roosts and hibernacula. There is no habitat suitable for maternity roosts or hibernacula within the project area. The foraging behavior of this bat has not been reported or studied in Montana. In California, the mean center of feeding activity was 3.2 kilometers from their cave for females and 1.3 kilometers for males. Townsend's big-eared bats feed on various nocturnal flying insects near the foliage of trees and shrubs, especially near meadows and streams. Although there are meadows and streams in the project area, this habitat is such a long distance from areas with suitable breeding or roosting habitat that it is highly unlikely to be used by Townsend's big-eared bats. | This project would have "no impact" upon this species because there are no caves, abandoned mines or old buildings that could be used for maternity roosts or hibernacula within 5 miles of project activities. Therefore, the project would not result in loss of species viability of create a significant trend toward federal listing. |
| Northern Bog Lemming (S) | Reliable detection of bog lemmings requires a trapping effort. Bog lemmings have been documented at 21 widely scattered locations in western Montana (USDA 2015). They appear to be absent from areas of potentially suitable habitat, but the reasons are not understood. In Montana, the northern bog lemming is at the southern margin of its global distribution and the project area may be beyond its limits. | Northern bog lemmings have a small home range of less than 1 acre. On the Flathead National Forest, potential habitat is identified as a specific subset of riparian landtypes NL1A or NL1E, which includes sphagnum bogs or fens with sphagnum moss, grasses, and sedges. The Beaver Creek Project Area does not have specific bog or fen sites used by northern bog lemmings and none of the proposed RHCA treatments would occur within bog lemming habitat. | This project would have "no impact" upon this species because there is no breeding or feeding habitat in the project area. Therefore, the project would not result in loss of species viability or create a significant trend toward federal listing. |

**TABLE 86. SENSITIVE SPECIES ANALYSIS SUMMARY - SPECIES WITH NO IMPACT.**

| SPECIES (STATUS[1]) | SPECIES PRESENCE | HABITAT PRESENCE | DETERMINATION |
|---|---|---|---|
| Flammulated Owl (S) | The Forest Service conducted a regional survey of 243 flammulated owl detections across western Montana and Idaho in 2005. Additional flammulated owl monitoring was conducted in the project area in 2013. No flammulated owls were detected. Flammulated owls have been detected in the Swan Valley in Dog Creek, but have not been detected in the project area. Flammulated owls are believed to have low abundance on the Flathead National Forest due to low natural occurrence of habitat (USDA 2015). | In Montana, flammulated owls are associated with mature and old-growth xeric ponderosa pine/Douglas-fir stands. Habitat modeling done by the Northern Region, USDA Forest Service, based on past research findings and using FIA information, produced a summary of habitat estimates for the flammulated owl by National Forest (Samson 2005). At the Region-wide and Ecological Province level, habitat for the flammulated owl is abundant and well-distributed in the Northern Region. Habitat on the Flathead National Forest is estimated to be approximately 5,741 acres (0.3% of the Flathead National Forest), according to an update to Samson's 2005 paper (Samson 2006). On the Flathead National Forest, the stands preferred for nesting by flammulated owls are naturally limited by climate, terrain and soil conditions. In the project area, there is no xeric dry-site ponderosa pine. The Beaver Creek Project Area does not propose any activities in xeric dry-site stands. The project area is composed of very little warm-dry forest types (4%) and has no ponderosa pine cover types (see Vegetation Section of this EA). | This project would have "no impact" on this species because there is no habitat within the project area and no activities are proposed for old growth stands. Therefore, the project would not result in loss of species viability or create a significant trend towards federal listing. |

# OLD GROWTH ASSOCIATED WILDLIFE

## INTRODUCTION

Old growth is defined in Amendment 21 of the Flathead National Forest Plan as “a community of forest vegetation that has reached a late stage of plant succession.” The generic description is as follows:

- The age of the dominant cohort of trees is significantly older than the average time interval between natural disturbances (interval will vary depending upon forest cover type and habitat type);
- The dominant trees are approaching their average life expectancy on the site;
- Forest composition and structure are different from younger stands;
- Rates of change in composition and structure of the stand are slow relative to younger forests;
- There is a significant showing of decadence (wide range of defect and breakage in both live and dead trees).

In The Dictionary of Forestry (Helms 1998), old growth forests are described as having:

- Large trees for the species and site;
- Accumulations of large dead standing and fallen trees;
- Decay or breakage of tree tops, boles, or roots;
- Multiple canopy layers;
- A wide variation in tree size and spacing; and
- Canopy gaps and understory patchiness.

The characteristics of old growth forest described above provide habitat for many plant and animal species (Table 87). For the purpose of this discussion, old growth associated species includes any wildlife species that use the various attributes of old growth forests for some or all of their ecological needs. These needs may include nesting, denning, security, or foraging habitat. For some species, closed canopy old growth provides snow capture and reduces snow depths, insulates the animals from cold winds, and provides protection from predators. More open canopies, or open understories, provide foraging opportunities for prey and predator species alike.

Stands across the analysis area were screened for old growth characteristics. The Western Montana Zone Old Growth Type Characteristics were used to classify old growth forests (Green et al. 1992). The Western Montana Zone definition uses certain criteria, including forest type, tree age and diameter, trees per acre, number and diameter of snags, amount of down woody, and tree canopy layer structure. Field surveys were conducted to verify old growth characteristics in mature stands throughout project area stands outside the wilderness. These surveys included all stands that contain proposed project activities as well as adjacent stands where no activities are proposed.

Due to public interest, American marten and northern goshawk were specifically analyzed within this section. The following analysis discusses effects to verified old growth stands and northern goshawk, as well as effects of the project activities to American marten and marten specific habitats. Northern goshawk and American marten are not sensitive's species in Region 1 nor are they listed as MIS species on the Flathead Forest. Both of these species are known old growth habitat associates.

**TABLE 87. HABITAT REQUIREMENTS OF OLD GROWTH ASSOCIATED WILDLIFE SPECIES. (BASED ON WARREN 1998 AND LRMP AMENDMENT 21 FEIS).**

| SPECIES | COVER TYPE IN AFFECTED AREA | CANOPY | EDGE | LARGER PATCHES | SNAG | DOWN LOG | FOREST OCCURRENCE |
|---|---|---|---|---|---|---|---|
| American Marten | Mixed mesic, lodgepole, spruce/fir forests | Closed | - | + | X | X | Known current |
| Bald Eagle (S) | Mixed mesic forests, near large lake or river | Open | | + | X | | Known current |
| Black-backed Woodpecker (S) | Lower Montane & Montane; post-fire or insect-epidemic forests | Open | | | X | | Known current |
| Boreal Owl | Mixed mesic and spruce/fir forest mosaic | Closed | | | X | X | Known current |
| Brown Creeper | Mixed mesic, lodgepole, and spruce/fir forests | Closed | - | | X | | Known current |
| Canada Lynx (T) | Mixed mesic, lodgepole, and spruce/fir forests; gentle terrain | | + | + | X | X | Known current |
| Chestnut-Backed Chickadee | Mixed mesic and spruce/fir forests, especially cedar-hemlock | Closed | - | | X | | Known current |
| Fisher (S ) | Mixed mesic and lodgepole forests | Closed | | | | X | Suspected current |
| Flammulated Owl (S, F ) | Lower Montane and Montane, single-story. | Open | | | X | | Known current |
| Golden-crowned Kinglet | Mixed mesic, lodgepole, and spruce/fir forests | Closed | | + | X | | Known current |
| Hairy Woodpecker | Mixed mesic, lodgepole, and spruce/fir forests | Open | | | X | X | Known current |
| Hammond's Flycatcher (F) | Mixed mesic and spruce/fir forests | Closed | | | | | Known current |
| Harlequin Duck (S) | Swift mountain streams, riparian old growth (weak association) | Open | | | | X | Known current |
| Hermit Thrush | Dry mixed mesic and spruce/fir forests | Open | | + | | | Known current |
| Lewis' Woodpecker | Lower Montane ponderosa pine and old burns | Open | | | X | | Known current |
| Northern Flying Squirrel | Mixed mesic and lodgepole forests | | | + | X | X | Known current |
| Northern Goshawk | Single or multistory old growth; clear forest floor | Closed | | + | X | | Known current |
| Boreal Owl | Mature mid-elevation spruce/fir forest | Closed | | | X | | Known current |
| Pileated Woodpecker | Mixed mesic forests | Closed | | + | X | X | Known current |
| Pine Grosbeak | Mixed mesic, lodgepole, and spruce/fir forests | | | | | | Known current |
| Pygmy Nuthatch | Large single-story ponderosa pine and mixed mesic forests | Open | | | X | | Known current |
| Red-Breasted Nuthatch | Mixed mesic, lodgepole, and spruce/fir; relatively dry | Open | | + | X | | Known current |
| Silver-haired Bat | Mixed mesic and lodgepole forests; caves and snags | | | | X | | Suspected |
| Southern Red-backed Vole | Mixed mesic, lodgepole, and spruce-fir forest | | | | X | X | Known current |

**TABLE 87. HABITAT REQUIREMENTS OF OLD GROWTH ASSOCIATED WILDLIFE SPECIES. (BASED ON WARREN 1998 AND LRMP AMENDMENT 21 FEIS).**

| SPECIES | COVER TYPE IN AFFECTED AREA | CANOPY | EDGE | LARGER PATCHES | SNAG | DOWN LOG | FOREST OCCURRENCE |
|---|---|---|---|---|---|---|---|
| Swainson's Thrush (F) | Mixed mesic and lodgepole forest with shrub understory | | | | | | Known current |
| Tailed Frog | Cold, high gradient headwater streams | | | | | X | Known current |
| Three-toed Woodpecker | Mixed mesic, lodgepole, and spruce/fir forests; post-fire | | | | X | | Known current |
| Townsend's Warbler | Mixed mesic and lodgepole forest; dense understory | Closed | - | + | | | Known current |
| Varied Thrush | Mixed mesic and spruce/fir forests, especially cedar-hemlock | Closed | | + | | | Known current |
| Vaux's Swift (F) | Mixed mesic and spruce/fir forests; large hollow snags | | | | X | | Known current |
| White-breasted Nuthatch | Large single-story ponderosa pine | Open | | | X | | Known current |
| Winter Wren | Mixed mesic and spruce/fir forests, especially cedar-hemlock | | - | + | X | | Known current |

[1] T = Threatened
[2] + = Positive correlation (where known)
[3] X = Important Habitat Component
[4] - = Negative correlation (where known)
[5] S = Sensitive
[6] F = Forest-dwelling Neotropical migrant with apparently declining populations

# OLD GROWTH

## ANALYSIS AREA

### SPATIAL BOUNDS

The effects analysis area for direct, indirect, and cumulative effects to old growth associated wildlife species is the Beaver Creek Project Area. This area is large enough to include the home ranges of old growth associated species, and is representative of the effects of fire, natural tree mortality, timber harvest, and road management across the landscape. At the same time, this analysis area is small enough to not obscure the effects of the alternatives. A multi-scale assessment has also been conducted to address habitat diversity concerns.

### TEMPORAL BOUNDS

The length of time for the activities associated with the proposed fuels reduction and forest health treatments is approximately 5 years. This is based on the probable contract length for the proposed project, and the timeframes for related activities. The temporal scale of the effects analysis extends 100 years into the future, enough time for some mature stands to develop into old growth habitat and for some snag and downed wood habitat to develop as well.

# DATA SOURCES, METHODS, AND ASSUMPTIONS USED

Data used included stand exams, field surveys of snags and down woody logs, old growth surveys, project area field visits, research literature, and GIS and dataset information for features, such as general forest attributes, habitat type, and forest type. To define “old growth” stands, criteria in Green et al. (1992) were used. Late seral forest and specific stand conditions were used to further assess existing habitat characteristics for old growth associated species.

# AFFECTED ENVIRONMENT

## OLD GROWTH HISTORIC CONDITION

Historically, old growth forests in the Swan Valley ranged from open, patchy stands, maintained by frequent low-severity fire, to a mosaic of dense and open stands maintained by mixed-severity fires (Arno et al. 1995; Freedman et al. 1985). Old growth structure and composition, and the amount of old growth in a watershed, varied strongly with topography and elevation, and were shaped by a complex disturbance regime of fire, insects, and disease. Historically, old growth was most likely to develop in the valley bottoms and along streams, where fires burned less frequently and usually with less intensity. Drier site old growth, with ponderosa pine as the dominate tree species, occurred on more well drained soils, often on the flats between stream bottoms. These stands were maintained by lower intensity ground fires that were not lethal to the ponderosa pine, but which inhibited the growth of less fire tolerant species beneath the ponderosa pine. Because severe, stand-replacing fires burn at irregular intervals in response to weather patterns and fuel accumulations, variations in the amount of old growth in a local area could be expected over time (Arno et al. 1995; Freedman et al. 1985).

Historical Range of Variability (HRV) is a way of describing the normal fluctuations that occurred in ecosystems over time and can be a basis for defining the limits of acceptable ecosystem change (Morgan et al. 1994; USDA 1999b). The 75 percent range around the median of the historical variability is assumed to provide an acceptable level of habitat (Hann et al. 1998; USDA 1999b). Based on various information sources, the amount of old growth on the Flathead National Forest historically would have been on the order of 15 to 60 percent (USDA 1999b). Generally, across the Flathead National Forest and the entire Columbia River Basin, there was a higher percentage of old forest across the landscape than there is currently. Analysis for late-seral stands under Amendment 21 characterized amount of late seral forest for the Swan sub-basin as below the HRV for the subalpine, montane, and lower montane community groups (Amendment 21, pg. 44). However, at the time of the analysis, mid-seral distribution and abundance was characterized as within or above the HRV for all three community groups. For more information on old growth habitat conditions across the Flathead National Forest, see the FEIS for Forest Plan, Amendment 21 (USDA 1999b).

## OLD GROWTH EXISTING CONDITION

Over the last 100 years, old forests in the Interior Columbia Basin have declined by 27 to 60 percent and large residual trees and snags have decreased by 20 percent (Quigley et al. 1996). These changes have contributed to declining habitat conditions for numerous species of wildlife associated with old growth forests. This decrease in old growth forest has occurred within all sub-basins of the Flathead National Forest (USDA 1999b). Based on a broad Regional review using FIA data, approximately 11.0 percent of the Flathead National Forest is old growth forest, with a 90 percent confidence interval lower bound of 9.0 percent, and an upper bound of 14.1 percent (Bush et al. 2004). When comparing the HRV for old growth, or the normal fluctuations that occurred in ecosystem conditions or processes through time, it appears that in the Swan Valley, old growth forest types, or late-seral classes, are currently below the historical minimum value for all terrestrial community groups; lower montane, montane, and subalpine (USDA 1999b).

In the Swan Valley, the major differences between current conditions and historical conditions, are that the total amount of old growth forest habitat covers less land area, the patches of old growth forest are smaller in size, and remaining old growth forest habitat has changed both structurally and in distribution. This translates into smaller blocks of older forest that are not as “secure” for old growth associated species as larger blocks of old growth forest with more interior area. The decline can be largely attributed to land clearing in the valleys, timber harvest, and road construction. The existing old growth forest stands are more numerous on the mid and upper-level slopes of the Swan Range. As would be expected, conversion of old growth forest has occurred at a higher rate in the valley bottoms. Lower elevation old growth forest is less prevalent than higher elevation old growth forest throughout most of the drainages in the Swan Valley.

Based on Regional FIA Data for Beaver Creek Area (fifth code watershed 1701021101), the estimate for percent old growth in the watershed is 9.09 percent, with lower and upper bounds of 0 to 20 percent (Bush et al. 2004). This fifth code watershed includes Beaver Creek, Herrick Run, Glacier Creek, Hemlock Creek, Rumble Creek, Holland Creek, Owl Creek and portions of the Swan River. Czaplewski (2004) has documented these results, the process, and its appropriate application (Project File Exhibit I-43).

Total forest area of old growth forest is unknown throughout the totality of the Beaver Creek Project Area. Approximately 915 acres of verified old growth forest has been identified through stand exams on NFS lands in the vicinity of the proposed cutting units (Map 3-4). Old growth forest was identified within the Beaver Creek Project Area using The Western Montana Zone Old Growth Type Characteristics (Green et al. 1992). Green et al. (Green et al. 1992) established minimum criteria for designating old growth based on habitat type. These criteria included age of large trees, basal area, and number of large trees per acre. There is probably additional old growth forest located on other NFS lands within the project area, considering wilderness areas and lower elevation stands that were not field verified. Old growth on individual private lands has not been included in the old growth analysis, because the availability of old growth habitat on these lands is uncertain. Due to the past history of industrial timber management, this analysis assumed there was no old growth existing on Legacy Lands. Data from stand exams and field review supports this assumption.

Patch size of old growth forest is an important characteristic in its function, as is habitat. As mentioned previously, one of the changes from historical conditions is the fragmentation, or disruption of continuity, of old growth forest patches that are presently available across the Swan Valley. Old growth associated wildlife species use and travel through other habitats, as well, but rely on old growth for at least a portion of their habitat needs. Many of these species are sensitive to fragmentation. For example, research suggests that American marten presence is a positive association to the proportion of late-seral forest on a landscape (Wasserman et al. 2012). Old-growth associated species are also correlated to large patches of late-seral forest. Old growth and late seral patches for pileated woodpecker are estimated to be 100 to 250 acres (McClelland et al. 1999).

The average patch size (uninterrupted continuity) of verified old growth in the immediate Beaver Creek Project Area (near and adjacent to cutting units) is 57 acres, with patch sizes ranging from 5 acres to 279 acres. These patches are old growth stands that meet old growth criteria under Green et al. (Green et al. 1992). Other late-seral and mature forest surrounds old growth patches and serves to increase functional patch size for old growth associated species (Wirth et al. 2009). Verified old growth and seral classes in the Beaver Creek area are shown in Project File Exhibit H-17 and on Map 3-4.

# NORTHERN GOSHAWK

The northern goshawk is not a sensitive species within Region 1, but was included in this analysis due to past public interest on USFS projects. The northern goshawk is a species associated with old growth habitats for a portion of its territory. In their status review of Northern Goshawk, the USFWS found that the Goshawk typically uses mature forests or larger trees for nesting habitat (the nest area); however, it is considered a forest habitat generalist at larger spatial scales (USDI 1998). The USFWS found no evidence that the Goshawk is dependent on large, unbroken tracts of “old growth” or mature forest (USDI 1998). However, nest areas include forests with a narrow range of structural conditions (Reynolds et al. 1992; Squires et al. 1997).

Stand conditions used by goshawk include forests with a relatively closed overstory canopy (50 to 90 percent), and a more open understory for foraging (Beier et al. 1997; Samson 2005; Squires andKennedy 2006; Squires et al. 1997; USDI 1998). The average patch size of core nesting areas appears to be somewhat dependent on available habitat conditions; 30 acres recommended in the southwestern United States (Reynolds et al. 1992), 40 acres found by Clough (Clough 2000) in west central Montana, 148 acres found by McGrath et al. (McGrath et al. 2003) in Oregon and Washington, and approximately 80 acres found by Patla (Patla 1997) in Idaho.

Live trees large enough to support a large platform nest are required. Hayward and Escano (Hayward et al. 1989) found that nest sites in northwest Montana were often located in older stands that support widely-spaced large trees and that had water and large forest openings within 0.3 miles of the nest. Adjacent to the nest site, there is a post-fledging area that ranges from approximately 200 to 500 acres (USDA 2007 (updated December 2009)), which is, along with the nesting area, usually defended by an adult pair. The size, shape, and habitat composition of these areas varies with local conditions, but is generally in pole-sized or larger forest with closed (50 percent or greater) canopies. A recent study in southeastern British Columbia (Harrower et al. 2010) found that northern goshawk post-fledging areas in their study area averaged approximately 90 acres; they recommended that forest managers wishing to conserve goshawk should maintain areas of 50 to 100 acres for post-fledglings. Northern goshawk foraging areas are heterogeneous, with goshawks preying on a variety of medium-sized forest birds and mammals, and hunting forest edges and openings as well as forest cover. In USDA Forest Service Region 1, Canfield (Canfield 2006) examined vegetation in random sampling units where Goshawks were detected and/or nests found. She noted that all of these units had a mosaic of openings (both manmade and natural), as well as forest cover. The habitat requirements of important Goshawk prey (such as snowshoe hares, ground squirrels, red squirrels, and grouse species) range from early seral to mature forests (Squires andKennedy 2006).

Based on known old growth presence, canopy cover and forest structure surrounding old growth patches, the Beaver Creek Project Area could potentially support a minimum of two goshawk territory blocks, assuming an average goshawk home range of about 5,000 acres with no overlapping home ranges. Potential blocks would have sufficient old growth habitat for nesting, sufficient forest stands with closed canopies for post- fledging habitat, and sufficient foraging habitat (Project File Exhibit H-23).

The Northern Goshawk has a state ranking of S3: Potentially at risk because of limited and/or declining numbers, range and/or habitat, even though it may be abundant in some areas. There have been 1,853 reported observations of the goshawk in Montana, with confirmed sightings and direct evidence of breeding in western Montana in the last 5 years. On the Flathead National Forest, the abundance of this species is classified as "uncommon" in summer and winter, and "occasional" in spring/fall. Presence of the northern goshawk has been reported from all Flathead National Forest ranger districts, with 44 “positive” observations recorded from 1982 to 2000 (including observations of nests and young), and numerous observations reported from 2000 to 2010 that are pending final review on reliability.

The Flathead National Forest examined the amount and distribution of goshawk habitat found on NFS lands within the Flathead National Forest (USDA 2000). Goshawk habitat was summarized for individual sub-basins; in the 469,280 acre Swan Valley sub-basin, approximately 203,972 acres of suitable habitat were identified. Northern goshawks are known to occur in the Swan Valley. Monitoring for goshawk was conducted during the spring of 2013, 2014 and 2015 in the

Swan Valley. In 2013 and 2014, there were 3 nests monitored in the Swan Valley. Northern Goshawk have been detected within the Beaver Creek Project Area. There are no known goshawk nest sites in or near any of the proposed treatment units (Project File Exhibit H-23).

# ENVIRONMENTAL CONSEQUENCES

## ALTERNATIVE 1 - NO ACTION
## DIRECT, INDIRECT, AND CUMULATIVE EFFECTS

Since there would be no fuel reduction, prescribed fire, planting or road treatments, or vegetation management activities proposed with this alternative. There would be no direct effects to old growth habitats on NFS lands or to old growth associated wildlife species using these lands. This alternative would sustain habitat for old growth associated species, at least over the short term.

It is possible that an indirect effect of Alternative 1 would be an increased likelihood of a larger, more intense wildfire in the Beaver Creek Project Area. Indirectly, taking no action to reduce fuel buildups could increase the potential for a loss of old growth forest in the Beaver Creek area due to more severe wildfire. Wildfire has been suppressed for the last century. Without frequent low-intensity fire, vegetation has grown, increasing high-severity forest fuel conditions in the Beaver Creek Project Area (See Fire/Fuels Section). However, the level of effects would depend on the size and intensity of the wildfire, which would depend on the actual location, intensity, moisture, and weather conditions associated with a presently unknown future fire event. Likely, fire would burn more intensely and more of the area would have stand-replacement fire than occurred historically (Arno et al. 2000).

Natural vegetative processes would continue on NFS lands in the Beaver Creek Project Area. Some of the mature forest stands would become old growth stands. Existing old growth forest would experience increased tree mortality in the overstory, with younger trees growing into the natural openings. Replacement of the older trees would take many decades and the stands would take on an uneven-aged character. The amount of old growth habitat across the landscape would fluctuate as older trees are replaced by younger trees and as younger forests grow into future old growth.

## ALTERNATIVES 2 AND 3 – ACTION ALTERNATIVE
## DIRECT AND INDIRECT EFFECTS

There are no proposed treatments in existing old growth forest stands under Alternatives 2 or 3.

### OLD GROWTH ASSOCIATED SPECIES DISTURBANCE/DISPLACEMENT

Proposed activities in Alternative 2 and 3 could temporarily displace old growth habitat associated wildlife species within the project area. Potential for displacement would be greatest under Alternative 2 due to the greater number of acres proposed for project activities. Displacement could occur from harvest activity in adjacent stands to old growth patches or hauling of logs or equipment on existing roads adjacent or through old growth stands.

In Alternative 2, based on units adjacent to old growth stands and location of haul routes, the potential for displacement of old growth associated species would likely be highest in Units 32, 55, 93, 94, 99, 100, 105, 202 and 484, 495, 498, 4108 due primarily the use of haul routes on closed existing roads through verified old growth stands. Possible displacement could be up to 5 years given the expected time frame for harvest and associated activities to take place.

## INTERIOR INTEGRITY OF EXISTING OLD GROWTH

Timber harvest in stands immediately adjacent to old growth could cause negative direct/indirect effects. New "edge" is created when stands adjacent to old growth habitat are converted from a late- or mid-seral structural stage to an early-seral (seedling/sapling) structural stage (Harper et al. 2005). The creation of edge adjacent to old growth forest has two negative effects on old growth: It directly affects the adjacent old growth stand or old growth block by reducing the interior integrity of the stand or block (Russell et al. 2001), and it narrows or eventually severs the connection between different old growth patches. Weather-related effects have been found to penetrate over 165 feet into a stand; the invasion of exotic plants and penetration by predators and nest parasites could extend 1,500 feet or more (Lidicker et al. 1996). Old growth edge also occurs naturally from effects of fire, blowdown, insect and disease, and other natural phenomena (Harper et al. 2005). Edge effects can also create old growth habitat features, such as complex tree features from disease, snags, and blowdown (Harper et al. 2005).

The total perimeter of the verified old growth stands in the project area is over 28 miles. This does not include adjacent mature or late-seral forest that provides habitat for old growth associated species. Quantifying existing edge (naturally occurring or from previous management) means areas with less than 25 percent canopy cover adjacent to verified old growth stands (Project File Exhibit H-23). Approximately 2.4 miles of high contrast edge exist along verified old growth perimeter in the project area (Map 3-6).

In Alternative 2, new high contrast edge would be created adjacent to existing old growth stands by the proposed regenerative treatment in Units 100. These units would create approximately 500 feet or 0.09 miles of old growth edge resulting in a 4 percent increase in high contrast edge adjacent to verified old growth stands. Some trees in old growth stands would be expected to blow down after buffering trees in proposed units were removed. Edge influence is expected to be short-lived at abrupt edges because patch contrast declines with forest redevelopment (Harper et al. 2005). The type and speed of canopy cover at regenerating edges is locally specific and dependent on local climate, aspect, and vegetation. In the Beaver Creek Project Area, high contrast edge is assumed to last for approximately 30 years. Please see Project File Exhibit H-23 for more information on edge effects to old growth associated species.

In Alternative 3, new high contrast edge would be created adjacent to existing old growth stands by the proposed regenerative treatment in units 105. This unit would create approximately 140 feet or 0.03 miles of old growth edge resulting in a 1 percent increase in high contrast edge adjacent to verified old growth stands.

In intermediate treatments, long-lived, fire-resistant, shade-intolerant species (typically; western larch, ponderosa pine, western white pine, and occasionally Douglas-fir) would be favored for retention. The purpose of this treatment is to enlarge the growing space of desirable trees and reduce tree competition for limited site resources allowing for improved tree growth, vigor, resilience, and manipulation of fuel continuity. In pre-commercial thins, sapling and pole-sized trees generally not greater than 5 inches DBH would be removed. Intermediate treatments would retain 50 to 300 trees per acre (commercial thin treatments: 50 to 150 and pre-commercial thin: 50 to 300). Using the low estimate of trees per acre, there would be sufficient overstory and residual tree density remaining in the proposed intermediate treatment units to diminish edge effects to existing old growth habitat. This analysis assumes that commercial thins would not contribute to edge effects to old growth stands (Project File Exhibit H-10).

Proposed treatments surrounding existing old growth stands would reduce forest cover between old growth patches. Fledgling goshawks have been shown to strongly select against initiating forest types less than 40 years old (Harrower et al. 2010). Bull et al. (Bull et al. 1995) examined the use of an old growth mixed-conifer stand by two species often associated with older forests, Vaux's swifts and pileated woodpeckers. Both species continued to use the stand for nesting and roosting after harvest of small-diameter dead and dying trees.

Design Criteria (Table 16) would retain snags and down woody debris where available and provided live trees for future snag recruitment. Retention of some trees, snags, and other structural attributes has been shown to maintain use by some old growth associated species (USDA 2015b).

Prescribed fire in the wilderness would burn at low-moderate intensity. It is difficult to predict in what spatial pattern wilderness prescribed fire would burn, but some small trees or live patches of forest may remain unburned, some areas may burn in the understory and fire may consume mature trees in some areas. Large trees within the prescribed burn area would likely be retained within the prescribed fire area due to low-moderate fire intensity. Fire would create snags and coarse woody debris within the fire area which would benefit old growth associated species habitat structure over time. Low intensity fire proposed outside of the wilderness would occur at sufficient intensity to cause mortality to live large trees. See snags and down wood associated species section for more information.

Fill planting and aquatic restoration activities would not occur in existing old growth stands. Activities may displace old growth associated species using adjacent habitats.

## GOSHAWK HABITAT

The northern goshawk is associated with old growth habitats for a portion of its territory, specifically closed canopy mature forests in larger patch sizes, and can be used as an indicator species for old growth conditions with these characteristics. There is potential habitat (e.g., sufficient nesting and post-fledging habitat) for at least 2 nesting goshawk pairs within the Beaver Creek Project Area. Under Alternative 2, approximately 2,293 acres of vegetative treatments would affect potential goshawk nesting habitat or approximately 17 percent of all potential nesting habitat in the project area. Alternative 3 would affect approximately 1,920 acres or 15 percent of all potential nesting habitat in the project area. Table 88 summarized effects to potential nesting habitat by alternative.

**TABLE 88. IMPACTS TO POTENTIAL GOSHAWK NESTING HABITAT BY PRESCRIPTION AND ALTERNATIVE.**

| PRESCRIPTION | ALTERNATIVE 2 (ACRES) | | ALTERNATIVE 3 (ACRES) | |
|---|---|---|---|---|
| | POTENTIAL NESTING HABITAT | POTENTIAL POST-FLEDGLING HABITAT | POTENTIAL NESTING HABITAT | POTENTIAL POST-FLEDGLING HABITAT |
| Commercial Thinning | 610 | 41 | 605 | 30 |
| Improvement Cut | 442 | 46 | 348 | 42 |
| Group Selection | 114 | 1 | 77 | 0 |
| Day-lighting | 32 | 0 | 23 | 0 |
| Seed Tree with Reserves | 303 | 12 | 75 | 0 |
| Wilderness prescribed fire | 792 | 150 | 792 | 150 |
| **Total** | **2,293** | **250** | **1,920** | **222** |

For this analysis, a conservative approach was taken; if intermediate treatments (commercial thinning or improvement cutting) were proposed in potential nest stands, they were changed from nesting habitat to post-fledging habitat. For example, at the low end of residual tree density in commercial thinning, approximately 50 or more trees per acre would be left in intermediate treatment units, so they would have adequate canopy cover to provide high quality post-fledging (PFA) habitat as well as feeding habitat. With the reduced tree density and more open canopy created by harvest, remaining trees would be subject to less competition for limited water and nutrients, improving their growth, ability to withstand long-term drought, and improving their resilience to stand replacing wildfire and to other causes of a changing environment (see Vegetation section). Reynolds et al. (Reynolds et al. 1992) and Graham et al. (Graham et al. 1999) have suggested that the use of thinning may improve habitat for Goshawks by creating favorable habitat conditions (e.g., promoting diameter growth in overstory trees and/or creating open understories).

Daylighting treatments were assumed to maintain goshawk potential nesting habitat as these treatments would be applied on an individual tree basis. Daylighting would remove smaller diameter trees within 20 to 30 feet of a target tree, however the over canopy and structure of the stand would remain suitable for potential nesting habitat. Group selection would establish small openings of a few acres creating an uneven aged stand. While thinned parts of group selection units may remain suitable post-fledgling, this analysis considered all the unit acres unsuitable. Stands that receive regeneration treatments would not provide goshawk post-fledgling or potential nesting habitat, however these areas would remain feeding habitat for goshawk.

Intermediate treatments are judged to maintain or improve stands as post-fledgling habitat because they would create conditions where adequate canopy would remain, but the forest floor would be more open, allowing goshawks to hunt. Large live trees left in regeneration harvest units would provide perch sites and future potential nesting sites.

Wilderness prescribed fire would have mixed effects to goshawk habitat. This analysis was conservative and assumed prescribed fire would change potential nesting habitat would post-fledgling habitat. Prescribed fire would be implemented when conditions allow for low to moderate intensity burning. Fire naturally burns in a mosaic pattern. In some areas of the burn, only understory vegetation may be consumed by fire and in other areas fire may burn over story trees. The wilderness prescribed fire would likely retain much of the area in potential nesting habitat, but how much is unknown. Understory burning would promote goshawk foraging by reducing the density of understory vegetation in mature stands. Large trees and snags would be retained throughout the fire area for goshawk perching and future nesting habitat.

In the next 10 years, goshawk potential nesting habitat affected by intermediate treatments are judged to provide nesting habitat again. Regenerated stands would require a longer time (greater than 40 years) to provide goshawk post-fledgling habitat or potential nesting habitat. Sufficient potential nesting and post-fledging habitat would still remain after implementation of project activities to support at least 2 nesting goshawk pairs.

With all action alternatives, increased disturbance during the nesting period due to logging and related activities could cause nest abandonment or reduced occupancy of suitable nesting habitat. However, Grubb et al. Grubb et al. (2012) detected no negative effects to nesting goshawk in response to logging truck activity. There are no known or suspected nest sites in any of the proposed treatment units, but if an active goshawk nest is located in or adjacent to a treatment unit, logging and related activities in the immediate vicinity would be subject to timing restrictions delaying adjacent activities until July 15, making it unlikely that management activities would disturb a nesting pair of birds and cause them to abandon their nest site.

## OLD GROWTH RECRUITMENT

Old growth stands evaluated under Green et al. (Green et al. 1992) are qualified on the basis of meeting age and size criteria by habitat type. Some of these stands are on a trajectory towards old growth and currently exhibit some old growth habitat characteristics (e.g., complex stand structure, abundant coarse woody debris, large tree sizes), but do not meet the age and structure criteria used to define existing old growth stands. Treatment type of some stands would influence the trajectory of a stand towards old growth. Project design criteria would retain large trees within proposed stands. Intermediate treatments would reduce tree density and increase available resources to remaining trees increasing growth and vigor. FVS simulations indicate more larger trees per acre would be recruited over time in some intermediate treatments compared to the no action alternative (see also marten analysis). Project design criteria to retain snags, live trees for snag recruitment, and coarse woody debris for old growth associated species.

### EFFECTS OF ROAD CONSTRUCTION, DECOMMISSIONING, STORAGE, AND REALIGNMENT

Alternative 2 proposes 7.5 miles of temporary road and Alternative 3 proposes 5.0 miles of temporary road. No new construction of temporary would occur within existing old growth stands in either Alternatives 2 or 3. Proposed road realignment would not occur in existing old growth stands.

Both action alternatives propose to decommission 4.5 miles of road and place 12.58 miles of road into ISS. Road 9656 is an existing closed road that runs through an existing old growth stand. Only one road proposed for decommissioning passes through an existing old growth stand. This road would be re-contoured and decommissioned at the end of project activities. Re-contouring work may displace species in the short term (while work occurs), but over the longer term would increase habitat security by returning the road prism to the original slope. Similarly, road 10589 is an existing road that passes through existing old growth patches in the north end of the project area. The road is not currently open to the public, but receives administrative use (less than 6 trips per week). ISS treatments would not allow for administrative motorized access on NFSR #10589 and would promote old growth security in the long term to a small degree.

### AQUATIC RESTORATION ACTIVITIES AND PLANTING

No aquatic restoration activities or planting are proposed in verified old growth stands.

## ALTERNATIVES 2 AND 3 – ACTION ALTERNATIVES CUMULATIVE EFFECTS

Past land management activities in the area, including timber management, road construction, residential development, and agricultural conversion, have decreased the amount of available old growth forest and have likely fragmented the patches of old growth that are left into smaller blocks. Timber harvest activities on PCTC lands and on NFS lands in the Upper Swan Valley peaked during the mid to late 1980s, although timber harvest has continued up to the present on all land ownerships.

The Beaver Creek project is located at the southern end of the Swan River watershed south of the community of Condon, Montana. There are part-year and yearlong residences in the area, managed trail systems, and other dispersed recreational opportunities. The level of human activity in the area increases the chance for disturbance or displacement of old growth associated wildlife species. The Beaver Creek Project Area has a relatively low open road density (6% - See grizzly bear analysis) and firewood cutters have relatively low access to firewood in the project area. Other human activity in the area includes various road use permits, easements, and special use agreements (Table 17). Given the level of motorized access in the project area, the potential for displacement of old growth associated species is relatively low due to recreation, special use agreements, hunting, hiking, etc.

A wood fiber agreement was created as part of the Montana Legacy Project. Through this agreement, TNC retains the timber rights to donated Legacy Lands until 2018. The Nature Conservancy's harvest projects, Beaver Highway and Two Bears, have occurred within the project area. Harvest by TNC created activity that would reduce down woody debris and snags. Snags that are not hazard trees would be retained in TNC harvest units. Treatments retained patches of regenerating forest vegetation that would serve as hiding cover and create some continuity of forest canopy cover between patches of older forest stands. None of these harvest activities occurred within riparian habitats.

The Nature Conservancy's harvest is located primarily in previously-owned industrial timberlands. All of the TNC harvest areas occur in previously treated stands. Outside of the riparian buffers, due to past management activities these stands do not typically contain large tree size, structurally complex characteristics, or high levels of snag or coarse woody debris that would describe quality habitat for snag and down woody associated species. Past TNC activities were included in the baseline condition for this analysis.

Residential development and timber harvest on other ownership lands has, in the past, broken up the continuity of mature forest near and adjacent to old growth patches on NFS lands. The intermingled ownership pattern in the Swan Valley has presented challenges in the past in managing old growth habitat connectivity with patch sizes that occurred historically. It is anticipated that, in the future, this condition would improve due to the Montana Legacy Project; a land conveyance from PCTC to the Forest Service that has created larger blocks of public land that can be managed in larger patch sizes.

Harmful cumulative effects to old growth associated wildlife species are not expected as a result of implementing Alternative 2 or 3 because:

1. There is no proposed treatment in old growth stands,
2. Untreated, existing old growth stands in the area are expected to continue to provide potential habitat for old growth associated wildlife species, and
3. Intermediate harvest treatments (e.g., partial cutting as compared to regeneration harvest) would retain vigorous, healthy, wind-firm, fire-resistant, and longer-lived tree species.

One of the objectives of this type of treatment is to increase the amount of old growth forest over the long-term, as mature forested stands are put on a trajectory where they can become future old growth habitat. Intermediate treatments and pre-commercial thinning are simulated to recruit more large trees when compared to no treatment alternatives over the next 30 years (see Project File Exhibit H-17 for details, rationale and assumptions).

# AMERICAN MARTEN

## ANALYSIS AREA

### SPATIAL BOUNDS

The effects analysis area for direct, indirect, and cumulative effects to the American marten is the Beaver Creek Project Area. This area is large enough to include several home ranges, and is representative of the effects of fire, natural tree mortality, timber harvest, and road management across the landscape. As a species sensitive to forest fragmentation, this scale is appropriate to evaluate effects to marten and marten habitat not just within one home range, but across several home ranges to judge distribution and connectivity within the entire watershed. At the same time, this analysis area is small enough to not obscure the effects of the alternatives. A multi-scale assessment has also been conducted to address habitat diversity concerns.

### TEMPORAL BOUNDS

The length of time for the activities associated with the proposed fuels reduction and forest health treatments is approximately 5 years. This is based on the probable contract length for the proposed project, and the timeframes for related activities. Specific simulations of forest treatments were computed up to 30 years into the future as part of the analysis. However, the temporal scale of the effects analysis extends 100 years into the future, enough time for some mature stands to develop into old growth habitat, future recruitment of large snags and downed woody debris to develop as well.

## HABITAT

Marten select for mesic stand types with high degrees of forest structure including tall trees and some degree of understory presence. These stands typically have an abundant amount of snags and downed woody debris that marten can use for denning or resting between foraging bouts (Buskirk et al. 1994; Fuller et al. 2005; Payer et al. 2003; Wasserman et al. 2012). Marten habitat selection is influenced by presence of denning and resting structures, prey abundance and forest cover to avoid predators (Cushman et al. 2011; Kirk et al. 2009). Marten have been found to disperse and forage in mid-seral stands that may lack the high degree of forest structure associated with typical denning/resting habitat (Coffin et al. 2002; Vigeant-Langlois et al. 2011).

In north- central Washington, marten frequented older aged (82 years old) Engelmann spruce (*Picea engelmannii*)/subalpine fir (*Abies lasiocarpa*) and lodgepole pine (*Pinus contorta*) forests. Younger-aged (less than 25 years old) forests were used infrequently by marten (Fuller et al. 2005). Martens prey on a variety of small mammals including voles, snowshoe hares, tree squirrels, flying squirrels, and mice and shrews. Some of these species are most abundant in mature or old-growth, mesic habitats (Soutiere, in Allen 1982) but are also found in mid-successional habitats if there is adequate forest cover (Bull et al. 1999; Vigeant-Langlois et al. 2011).Martens appear closely associated with interior forest conditions and tend to avoid edges or non-forest openings where they may be at increased risk from predators (Cushman et al. 2011). However, in southwestern Montana, Koffen et al. (2002) found that marten traverse clearcuts to access mature forest. Hargis et al. (1999) postulated that some forest openings may be beneficial to marten foraging due to increase forage species produced by clearcuts, yet the research did not conclusively document a response to increased abundance and diversity of small mammal species from regeneration harvest.

Because small mammals such as marten are not as mobile as birds, they may be more limited in their ability to meet their survival needs when patches of suitable habitat are fragmented and connectivity is poor. Research has shown that martens avoid small, isolated patches of forest, but exactly how small and how isolated habitat can be and still be useable by martens is unknown. Soutiere (In: Allen 1982) concluded that martens seldom cross openings greater than 540 feet in winter, but may use these areas in summer if food and adequate cover are present (Baker In: Ruggiero et al. 1994).

Due to public request, an analysis on effects to marten habitat, habitat connectivity and recruitment of habitat over time was done using stand specific information, GIS spatial data, FS Veg simulation (www.fs.fed.us/fmsc/fvs/ ) and FragStats (www.umass.edu/landeco/research/fragstats/fragstats.html ), a statistical software that evaluates habitat shape, pattern and distribution within a defined landscape. This analysis is only one part of the information that was drawn upon to evaluate the effects of the Beaver Creek project on marten and marten habitat. The American marten is not a sensitive species nor is it a management indicator species (MIS) on the Flathead National Forest. However, the American marten is closely associated with mid to late successional mesic forests, with an abundance of snags and coarse woody debris as well as small understory trees or low shrubs. Martens are also sensitive to forest openings and have small home ranges. Considering the Beaver Creek project's restoration intent, the American Marten is judged to be a good species to analyze for effects of restoration activities to habitat features (large tree retention and recruitment) as well as the distribution and connectivity of habitat in the project area.

Marten habitat was characterized at a coarse scale in the project area using common stand exam (CSE) information, field visits to walk through stands, remotely sensed information (Vmap). Marten habitat was separated into high, medium and low quality habitat (Table 89) based on a review of the best available science, field assessments and the judgement of the district wildlife biologist. Detailed CSE examination was used first to characterize marten habitat quality. Where CSE information was not available, CSE model information was correlated to a set of parameters in VMAP to characterize habitat quality. The canopy cover threshold for marten habitat suitability has been considered 30 percent and higher (Hargis et al. 1999; Watt 1996). This analysis takes a conservative approach and considers 40 percent and higher to be suitable habitat for marten. The existing distribution of marten habitat by quality in the project area is shown in Table 90. Further information including habitat types associated with CSE and VMAP model criteria, assumptions, and rationale on this analysis is located in Project File Exhibit H-17.

**TABLE 89. MARTEN HABITAT QUALITY GENERAL DEFINITIONS AND ASSOCIATED CSE AND VMAP CRITERIA.**

| MARTEN HABITAT QUALITY | DESCRIPTION | CRITERIA |
|---|---|---|
| High | Mid to late seral habitat that provide potential year-round denning/resting habitat features and foraging opportunities. Stands are generally older than 80 years and have multiple stories. | CSE: ≥ 40% canopy cover; more than 10Trees per Acre (TPA) ≥16” DBH; ≥ 200 TPA between 2” and 6” DBH; and Age ≥ 80 years. Vmap: ≥ 40% canopy cover; Dom-MID 60 = psme, abla, pien, tmix, imix; Tree size ≥ 15” DBH |
| Medium | Mid seral stands that have forested cover and provide for foraging opportunities. Marten will travel and forage through these stands. Snags and down woody debris may be present. | CSE: ≥ 40% canopy cover; <10 Trees per Acre (TPA) ≥16” DBH. VMap: ≥ 40% canopy cover; Dom-MID 60 = psme, abla, pien, tmix, imix, pico |
| Low | Non-forest or early seral regenerating forest. Generally ≤ 25 years old. Openings afford exposure to predators. Generally unsuitable. May be crossed, but these areas are generally avoided by marten. | CSE: ≤ 40% canopy cover and/or ≤ 25 years old. VMap: ≤ 40% canopy cover; Tree size ≤ 5” DBH |
| Non-Habitat | Areas of rock, water, dry-forest types or non-forest wetland features. These areas do not provide potential habitat to marten. | VMAP = sparsely vegetated, water, herbaceous and supplemented with wetland polygons identified with NAIP 2013 imagery. |

**TABLE 90. ACRES OF MARTEN HABITAT BY QUALITY AND PROPORTION OF THE BEAVER CREEK PROJECT AREA (ACRES ARE APPROXIMATELY)**

| HIGH | MEDIUM | LOW | NON-HABITAT |
|---|---|---|---|
| 10,489 (30%) | 7,692 (22%) | 6,642 (19%) | 10,139 (29%) |

# POPULATION

American Marten has a state rank of S4: Apparently secure, though it may be quite rare in parts of its range, and/or suspected to be declining. Marten is managed as a furbearer species managed by MFWP. Based on furbearer harvest analysis, marten populations statewide are indicated to be relatively stable, with a slightly declining trend and self-maintaining on a statewide basis (Giddings 2013, 2014). Marten populations are known to fluctuate based on prey availability and habitat disturbance (Buskirk et al. 1994). An estimated 399 marten were trapped throughout MFWP region 1 between 2013 and 2014 (Giddings 2014). Based on MFWP furbearer harvest data (http://fwp.mt.gov/hunting/planahunt/harvestReports.html), there has been an average of 72 marten per year harvested in Missoula County between 2010 and 2013.

Existing habitat for marten in USDA Forest Service Region 1 was identified as lands within potential habitat that were in the mature and old size class, had a relatively dense canopy, and where patch sizes were no less than 160 acres and no farther than 600 feet from the nearest patch of existing habitat (Hillis andLockman 2003b). The ratio of existing habitat to potential habitat was compared against the historic range of variability (HRV) to determine if there had been any substantial change from historic periods. The level of existing habitat was very near the mean range of historic variability. At a broad scale, the amount of existing marten habitat is estimated to be close to what was available during mean historic periods for USDA Forest

Service Region 1 (range of 12.6 to 38.7, depending upon forest type; mean = 26.7) (Hillis andLockman 2003b). In USDA Forest Service Region 1, the loss in existing habitat from fragmentation or loss of connectivity, (i.e., patches of habitat that didn't meet the 160 acres/600 feet to adjacent habitat criteria), was 8 percent. Fine-scale validation concluded that the majority of this loss was due to logging west of the Continental Divide.

In the Flathead watershed, which has a long history of active fire suppression, marten habitat was estimated as being at levels greater than the historic range of variability. While past harvest has reduced marten habitat, past fire suppression has likely increased marten habitat in terms of multistoried forest in mesic forest habitat types.

Marten populations naturally exist at low population densities and can be difficult to monitor (Buskirk et al. 1994). Winter carnivore monitoring within the Swan Valley has detected marten distributed throughout the valley from 2012-2015 (SWCC Carnivore Monitoring Team 2014; updated with 2015 data). Marten were detected in the Beaver Creek Project Area each year (SWCC Carnivore Monitoring Team 2014, Project File Exhibit H-17).

# ENVIRONMENTAL CONSEQUENCES

## ALTERNATIVE 1 - NO ACTION
## DIRECT, INDIRECT, AND CUMULATIVE EFFECTS

Since there would be no fuel reduction, prescribed fire, planting or road treatments, or vegetation management activities proposed with this alternative. There would be no direct effects to marten habitats on NFS lands. This alternative would maintain marten habitat for the short term. Forest stands would continue to grow within the project area. Insects and disease and other abiotic factors would continue to contribute to tree mortality, blowdown and forest structure. Tree growth as simulated over time by FVS is compared to action alternatives is displayed in a table 5 below.

It is possible that an indirect effect of Alternative 1 would be an increased likelihood of a larger, more intense wildfire in the Beaver Creek project area. Indirectly, taking no action to reduce fuel buildups could increase the potential for a loss of marten habitat in the Beaver Creek Area due to more severe wildfire. Wildfire has been suppressed for the last century. Without frequent low intensity fire, vegetation has grown, increasing high-severity forest fuel conditions in the Beaver Creek Project Area (See Fuels Section). However, the level of effects would depend on the size and intensity of the wildfire, which would depend on the actual location, intensity, moisture, and weather conditions associated with a presently unknown future fire event. Likely, fire would burn more intensely and more of the area would have stand replacement fire than occurred historically (Arno et al. 2000).

Natural vegetative processes would continue on NFS lands in the Beaver Creek Project Area. Some of the mature forest stands would become old growth stands. Existing old growth forest would experience increased tree mortality in the overstory, with younger trees growing into the natural openings. Replacement of the older trees would take many decades and the stands would take on an uneven-aged character. The amount of habitat across the landscape would fluctuate as older trees are replaced by younger trees and as younger forests grow into future old growth.

## ALTERNATIVES 2 AND 3 – ACTION ALTERNATIVES
## DIRECT AND INDIRECT EFFECTS

### SUMMARY

In summary, the comparison of marten habitat connectivity across the Beaver Creek Project area is virtually the same between the existing condition and Alternatives 2 and 3. Of the action alternatives, Alternative 3 has less effects to valuable high quality marten habitat than Alternative 2. High quality marten habitat is defined to meet the full suite of marten life history needs including, foraging, denning, resting and year-round habitats. While both action alternatives have similar results regarding habitat distribution and arrangement across the project area as a whole, Alternative 3 has less effect in the short term by treating 782 fewer acres of high quality habitat and provides more habitat connectivity than Alternative 2. Further, Alternative 3 was designed to maintain an even distribution of habitat across the entire project area. The average proportion of high quality habitat per home range (3 $mi^2$ area) is highest in Alternative 3 post-implementation (Project File Exhibit H-17). While distribution of high and medium habitat quality is modeled to be similar in the project area over the next 30 years for both action alternatives, FVS models suggest intermediate treatments proposed in Alternative 2 or 3 would yield more trees per acre larger than 16-inch DBH than the No Action Alternative.

It should be noted, that it is unknown how the Fragstats metrics, displayed below, translate precisely to marten. For example, it is unknown what an increase in average nearest neighbor distance of 10 meters (see below) means to marten habitat use, prey abundance, or habitat avoidance. The results below are a coarse approximation summarizing the spatial arrangement of habitat features. These results are measured against the existing condition in the project area. This analysis considers the general arrangement of habitat features in combination with the best available science, wildlife biologist judgement, project design criteria, and forest management direction to evaluate project effects to marten. The Fragstats analysis was included as one piece of information to be considered in this report as requested by members of the public.

## MARTEN HABITAT

Different harvest would affect marten habitat in different ways. Regeneration harvest would reduce forest canopy and mature forest to a point that would likely be avoided by marten for 25 years or more. Intermediate harvest (commercial thinning, improvement cutting) would retain canopy cover suitable (40 percent or higher) for marten habitat use and would favor large trees throughout the stands. Design criteria (Table 16) specify that 10 percent understory vegetation will be retained in intermediate treatments, as well as large pieces of down woody debris and snags to be maintained, leaving these stands suitable for marten habitat. This analysis takes a conservative approach and considers high quality marten habitat affected by intermediate treatments to be changed to medium quality habitat, due to potential reduction in down woody debris, snags during harvest operations. Research has shown that partial cutting can retain marten habitat use and habitat features (Godbout et al. 2010; Lawler et al. 2012; Watt 1996). The marten models consistent with the below described (Table 91) criteria have been shown to provide for marten gene-flow across managed forest landscapes (Konen 2012). Post-harvest effects were determined through the use of FVS treatment simulations, the best available science, and the judgement of the wildlife biologist (Project File Exhibit H-17).

Daylighting would remove smaller trees for 20-30 feet around large diameter target trees and would retain high structure and canopy cover throughout the remainder of the stand. Group selection would create several acre sized openings within proposed stands. These openings would likely be avoided by marten, while the remaining parts of the stand may provide suitable cover or structure for marten habitat. This analysis considers the entire unit area to be changed to low habitat quality after group selection treatment. Pre-commerical thinning and planting would occur predominately in areas classified as low marten habitat quality.

Prescribed fire would have mixed effects to marten habitat quality. Wilderness prescribed fire would be implemented to achieve low to moderate intensity burning. Understory vegetation may be consumed in some areas, where overstory mature trees may burn in other areas. Vegetation killed in prescribed burning may provide abundant resting and denning sites in the form of down woody debris or snag habitat. Considering that fire burns in a mosaic pattern, there will likely be residual unburned forest within the fire perimeter and along the periphery of the fire area. Marten have been documented to use low and moderate burned fire areas (Koehler et al. 1977). High quality marten habitat affected by prescribed fire in the wilderness or outside was changed to medium quality habitat. Low and medium quality habitats were judged to remain unchanged in their categorization.

Considering the action alternatives, Alternative 2 would convert approximately 1,094 acres (10 percent) of high quality habitat to medium quality and change 298 acres of medium and high quality habitat to low quality habitat. Alternative 2 would increase the amount of low quality habitat likely avoided by marten from 18 percent of the project area to 20 percent. Alternative 3 would convert 312 acres (3 percent) of high quality marten habitat to medium quality and change154 acres of high and medium quality habitat to low quality habitat. Alternative 3 would increase low quality habitat likely avoided by marten from 18 to 19 percent.

To evaluate effects to distribution of marten habitat, the existing condition was compared to the amount of marten habitat that would be retained after implementation of all management activities proposed in Alternative 2 and 3. The post-activity maps for action alternatives assumed that all the project activities were completed concurrently and not implemented gradually over the expected 5-year time horizon, discussed as part of the temporal bounds. Post-activity landscapes for action alternatives were compared to the existing condition using Fragstats, a computer program that can be used to measure habitat class metrics to measure distribution and arrangement of habitat. Information on this analysis is located in Project File H-17.

Several metrics from the Fragstats program were selected to evaluate spatial arrangement and distribution of marten habitat across the landscape. The percentage of the landscape quantifies the proportional abundance of each patch type. Higher proportions of quality habitat are generally beneficial to a species. Habitat radius distance is the average distance from multiple points within a patch of habitat to the center of the habitat. This metric is a measure of patch size and shape. The measure determines the distance an animal started from any random location in a patch of habitat and traveled to the center of the patch. Distances are averaged from all the points in a habitat patch. The longer average distances (or larger patch sizes) for quality habitat are beneficial to marten. The nearest neighbor distance is the average straight-line distance from the edge of one class of habitat to the nearest same class of habitat. This is a measure of how isolated a patch of habitat is from next nearest patch of the same quality. Generally, the less isolated habitat patches are beneficial to marten as an individual does not need to travel farther across an unsuitable habitat to another suitable patch. Finally, contiguity index is a measure of spatial connectedness of classes of habitat across the landscape or how contiguous classes of habitat are. This index ranges from 0 to 1 and as values approach 1, the habitat is considered more spatially connected. For marten, it is beneficial to have suitable habitats connected. Table 5 summarizes these metrics. For more information refer to Project File Exhibit H-17 and to the Fragstats documentation (University of Massachutetts Fragstats) (http://www.umass.edu/landeco/research/fragstats/documents/fragstats.help.4.2.pdf).

**TABLE 91. SUMMARY AND DEFINITION OF FRAGSTATS METRICS.**

| METRIC | DEFINITION | APPLICATION TO MARTEN HABITAT |
|---|---|---|
| Percentage of landscape (0-100%) | Proportional abundance of habitat category within the project area. | Larger percentages of medium and high quality habitats are beneficial to marten. |
| Habitat Radius Distance (meters) | Average distance from multiple points within a patch of habitat to the center of the habitat. This metric is a measure of patch size and shape. | Longer distances indicate larger and more uniform shaped (i.e. rounded not long and skinny) habitat patches. Larger medium and high quality habitat patches are beneficial to marten. |
| Nearest Neighbor Distance (meters) | Average straight-line distance from the edge of one class of habitat to the nearest same class of habitat. Measure of habitat patch isolation. | Shorter distances to medium and high quality habitats are beneficial to marten. |
| Contiguity Index (0 – 1) | Measure of spatial connectedness of types of habitat across the landscape or how contiguous are types of habitat. | Marten benefit from contiguous medium and high quality habitats. Values approach 1 as connectedness increases. |

To examine the effects of the proposed activities to connectivity across the project area, marten were assumed to avoid moving through low habitat quality and non-potential habitat, and select for medium and high quality habitats.

Overall, there is very little difference in Fragstats metrics across the project area for the existing condition or after implementation of Alternatives 2 or 3. The results suggest that the project area retains similar proportions of habitat, habitat patch sizes, habitat patch isolation and connectedness with the implementation of either Alternative 2 or 3 relative to the existing condition of habitat in the project area. Approximately 59 percent of the landscape in the existing condition is suitable for marten travel and dispersal, where both Alternative 2 and 3 maintain 58 percent post activity (Table 92). The habitat radius distance is shortest under Alteration 2 for medium and high quality habitats. In other words, medium/high have slightly smaller patch sizes with the implementation of Alternative 2. This is likely a result of the larger amount of regeneration acres proposed by Alternative 2. Alterative 2 appears to decrease isolation of medium and high quality habitat patches. Similarly, increased low quality habitat in Alternative 2 likely produces the reduced isolation of low habitat quality patches. Under Alternative 2, regeneration treatment of existing small polygons of medium and high habitat is responsible for the decreased isolation distance of medium/high habitat after implementation.

**TABLE 92. PERCENTAGE OF LANDSCAPE, RADIUS OF HABITAT, NEAREST NEIGHBOR DISTANCE, AND CONTIGUITY INDEX.**

| HABITAT QUALITY | LANDSCAPE (PERCENT) | | | RADIUS OF HABITAT (METERS) | | | NEAREST NEIGHBOR DISTANCE (METERS) | | |
|---|---|---|---|---|---|---|---|---|---|
| ALTERNATIVE | ALT 1 | ALT 2 | ALT 3 | ALT 1 | ALT 2 | ALT 3 | ALT 1 | ALT 2 | ALT 3 |
| Medium/High | 59% | 58% | 58% | 123 | 118 | 122 | 124 | 121 | 123 |
| Low/Non-Habitat | 41% | 42% | 42% | 82 | 82 | 82 | 111 | 110 | 111 |

The Contiguity Index is 99 percent for the project area existing condition (Alternative 1) as well as the post-action landscape under both Alternative 2 and 3 indicating that suitable marten habitat (medium and high qualities) have a high degree of spatial connectedness in the present condition and after implementation of Alternatives 2 or 3.

Habitat composition at the marten home range scale was also compared between the existing condition and action alternatives. Three square-mile home ranges were created and evenly distributed across the project area (Project File Exhibit H-17). The proportions of habitat quality inside each home range were computed for the existing condition and after implementation of Alternatives 2 and 3. Average home range habitat composition would be nearly the same to the existing condition in Alternative 3. Alternative 2 would result in a 3 percent average decrease of high quality marten habitat across home ranges (Project File Exhibit H-17).

This analysis used FVS to evaluate the long term effects of proposed vegetative activities in Alternatives 2 and 3 relative to the no action alternative after 10 and 30 year intervals. The FVS simulations were run on a subset of stand prescriptions and applied across the landscape to show potential changes of habitat in the project area over time. Where CSE data was absent, correlated VMAP criteria was used. This analysis is a coarse-scale approach to evaluate the abundance, distribution and spatial arrangements of habit over time. FVS diagrams, simulation summaries, and transition criteria are located in Project File Exhibit H-17.

**TABLE 93. FVS RESULTS AND CHANGES IN TREES PER ACRE (TPA) GREATER THAN 16 INCHES DBH OVER TIME.**

| PRESCRIPTION | UNIT | YEAR | TPA ≥ 16" DBH | | MARTEN HABITAT QUALITY* | |
|---|---|---|---|---|---|---|
| | | | WITHOUT TREATMENT | WITH TREATMENT | WITHOUT TREATMENT | WITH TREATMENT |
| Commercial Thin | 16 | 2015 | 15 | 15 | High | Medium* |
| | | 2025 | 22 | 23 | High | High |
| | | 2045 | 33 | 47 | High | High |
| Seed Tree | 21 | 2015 | 0 | 0 | Medium | Low |
| | | 2025 | 0 | 1 | Medium | Low |
| | | 2045 | 13 | 9 | Medium* | Medium* |
| Improvement Cut | 89 | 2015 | 11 | 11 | High | High |
| | | 2025 | 11 | 11 | High | High |
| | | 2045 | 10 | 14 | High | High |
| Commercial Thin | 102 | 2015 | 2 | 2 | Medium | Medium |
| | | 2025 | 2 | 2 | Medium | Medium |
| | | 2045 | 2 | 2 | Medium | Medium |
| Precommercial thin | 217 | 2015 | 0 | 0 | Low | Low |
| | | 2025 | 0 | 3 | Low | Low |
| | | 2045 | 16 | 26 | Medium* | Medium* |

*Marten habitat quality is measured by all parameters listed in Table 3, not just by number of trees per acre greater than 16" DBH listed in this table. See Project File H-17 for more information.

Comparing large tree recruitment between no action and the action alternatives, intermediate treatments are modeled to produce more trees greater than 16 inches DBH per acre than the no action alternative after 10 and 30 year intervals. For example, commercial thinning in hypothetical Unit X would retain 15 trees per acre (TPA) greater than 16 inches DBH and yield 23 TPA greater than 16 inches DBH compared to 22 TPA under the No Action Alternative after 10 years. After 30 years, FVS simulations show 47 TPA greater than 16 inches DBH compared to 33 TPA greater than 16 inches DBH under the No Action Alternative. Over 30 years, PCT treatments in Unit 217 are projected to yield 26 TPA greater than 16 inches DBH compared to 16 TPA under the No Action Alternative. Regeneration harvest simulations yielded fewer trees greater than 16 inches DBH over 30 year periods (Project File Exhibit H-17). Prescriptions for vegetative treatments would retain large diameter, long lived tree species that occur within proposed units.

When comparing treatments and no-treatment scenarios, fine scale changes within stands over time may not be detectable when classifying marten habitat quality. For example, treatment in unit 89 results in more trees greater than 16 inches DBH per acre than no treatment, yet both scenarios meet the criteria for high marten habitat quality. Marten habitat would benefit from a higher quantity of larger trees. Larger trees provide mature structure and provide more potential to recruit rare large (greater than 20 inches DBH) diameter snags into the future. However, harvest treatments would decrease understory vegetation, snags and coarse woody debris in affected stands.

Table 94 displayed the estimated proportions of low, medium and high quality marten habitats projected for post-action, 10 and 30 year intervals in the project area. Maps depicting habitat arrangements in the project area are located in Project File Exhibit H-17.

**TABLE 94. ESTIMATED MARTEN HABITAT PROPORTIONS IN THE BEAVER CREEK PROJECT AREA OVER 30 YEARS.**

| HABITAT QUALITY | ALTERNATIVE 1 | | | ALTERNATIVE 2 | | | ALTERNATIVE 3 | | |
|---|---|---|---|---|---|---|---|---|---|
| | LOW | MED | HIGH | LOW | MED | HIGH | LOW | MED | HIGH |
| Post-action (0 years) | 19% | 22% | 30% | 20% | 24% | 27% | 19% | 23% | 29% |
| 10 years | 14% | 27% | 30% | 15% | 26% | 30% | 13% | 28% | 30% |
| 30 years | 0% | 23% | 48% | 0% | 24% | 47% | 0% | 23% | 48% |

Both 10 and 30 year simulations should be interpreted with caution. The habitat quality transitions are estimated and extrapolated from FVS. Outside of FVS model simulations, the model transitions do not include influence of forest disturbance factors such as unknown future management, insects, disease, or wildfire. Wildfire has had a predominate role in shaping forest conditions in the Rocky Mountains. It is unlikely that no low quality or unsuitable habitat will be absent from the project area in 30 years as natural fire or other disturbances will have altered forest conditions over part or all the project area. Tree mortality and disturbance are important to marten as snags and coarse woody debris provide valuable fine scale denning/resting habitat. A diversity of habitats and various forest seral stages (young, middle aged, old) are important to provide a suite of habitats for marten foraging, denning/resting, and travel.

Forest would regenerate over time in low quality marten habitat over time. It is estimated that these areas would become suitable for marten again (medium habitat quality) after approximately 25 years; however time may vary based on site specific growing conditions, tree density, and residual trees left after implementation, elevation etc. (Payer et al. 2003). High quality marten habitat affected by intermediate treatments in the action alternatives was assumed to be high quality marten habitat again in 10 years after treatment based on snag retention, coarse woody debris retention and partial understory retention design criteria, as well as FVS simulations and field inspection.

Project activities could displace marten while activities occur. Displacement would be short term and effects relaxed after a unit is completed and activities move to another stand. Spring period timing restrictions would further reduce potential displacement to marten during denning. Prescribed fire is unlikely to result in marten mortality. Marten are a mobile species and capable of avoiding fire (Smith 2000).

### ROAD CONSTRUCTION, ROAD DECOMMISSIONING, STORAGE AND REALIGNMENT

Activities associated with road work may displace marten in the short term, however displacement would be temporary. Some marten habitat may be impacted by construction, realignment, or re-contouring. This amount would have a small impact relative to marten habitat throughout the project area or even within a home range. Decommissioning, storage and realignment would reduce total road density within the project area (all proposed roads are currently closed to public motorized access).

### PLANTING AND AQUATIC RESTORATION ACTIVITIES

Planting would decrease the return interval for mature trees to grow and provide marten habitat. Planting occurs primarily in low quality marten habitat and would be beneficial to marten in the long term. Aquatic restoration activities may displace marten when activities are occurring, however displacement would be short term. The majority of aquatic restoration activities (work in or around wetlands) would affect unlikely or non-potential marten habitat. Marten may be displaced in small areas adjacent to these habitats, however displacement would be short term and have negligible impacts.

## ALTERNATIVES 2 AND 3 – ACTION ALTERNATIVES CUMULATIVE EFFECTS

Past land management activities in the area, including timber management, road construction, residential development, and agricultural conversion, have decreased the amount of available old growth forest and have fragmented the patches of old growth that are left into smaller blocks (Project File Exhibit H-15). Timber harvest activities on PCTC lands and on NFS lands in the Upper Swan Valley peaked during the mid to late 1980s, although timber harvest has continued up to the present on all land ownerships. Fire suppression has occurred across the project area and has likely led to increased forest acres that have reached climax, have multiple stories, and high forest complexity possibly increasing marten habitat (Samson 2006).

Marten are managed as a furbearer species under MFWP. The Beaver Creek Project would not increase trapper access above the existing condition. Closed roads used for project activities would remain closed to public motorized access. Design Criteria for road decommissioning and road storage would likely decrease accessibility of hiker or snowmobile travel. Implementation of proposed activities in the winter months may increase access on existing open roads in Beaver Creek if they are plowed for log hauling or other activities. This increase is expected to be slight given that private property owners already plow parts of existing open roads during the winter months and the area is presently open to recreational over-the-snow vehicles.

A wood fiber agreement was created as part of the Montana Legacy Project. The Nature Conservancy's activities have occurred in the Beaver Creek Project Area including the Two Bears and the Beaver Highway Project. The Nature Conservancy's activities reduced available forest canopy, decreased mature trees, snags and down woody debris. These projects as well as other past vegetation management activities are reflected in the habitat baseline for marten. The Nature Conservancy's harvest is located on lands previously managed as industrial timberlands. All of the TNC harvest areas occurred in previously-treated stands. Outside of the riparian buffers, these stands do not typically contain the large-tree size, structurally-complex characteristics, snags or coarse woody debris found in high quality marten habitat.

Past residential development and timber harvest on other ownership lands has broken up the continuity of mature forest near and adjacent to old growth patches on NFS lands. The intermingled ownership pattern in the Swan Valley has presented challenges in the past in managing old growth habitat connectivity with patch sizes that occurred historically. It is anticipated that, in the future, this condition would improve due to the Montana Legacy Project that will create larger blocks of public land that can be managed in larger patch sizes.

Alternatives 2 and 3 would likely decrease the likelihood of a severe, stand replacing fire impacting large amounts of habitat across the Beaver Creek Project Area. Exact effects of severe fire are difficult to predict; however large, intense, severe wildfire has the potential to remove large amounts of quality marten habitat across the project area rendering habitat unsuitable until sufficient canopy and live trees regenerate. Alternatives 2 and 3 would decrease fuels and increase the probability of low intensity fire within the project area.

The Beaver Creek Project would reduce marten high and medium quality habitats to varying degrees based on each action alternative in the short term (up to 10 years). Activities would decrease snags and coarse woody debris across the project area and increase habitats avoided by marten. However, project treatments would retain large trees and project design criteria would retain coarse woody debris, snags, trees for snag recruitment providing fine scale marten denning resting habitat. Action alternatives would affect a small proportion of high quality habitat across the project area. Marten suitable habitat would remain well distributed at the project and home range scale. Without considering Fragstats calculations, project design criteria and spatial arrangement of treatments would still provide for a viable marten population under Alternatives 2 and 3. The Fragstats, calculations further support the conclusion that marten habitat would remain well-distributed, abundant, and connected with the implementation of the action alternatives and would continue to provide for viable marten populations.

# EFFECTS OF A FOREST PLAN AMENDMENT TO ASSIGN MANAGEMENT AREAS TO ACQUIRED LANDS

The Beaver Creek Project includes a Forest Plan Amendment to assign interim management areas (MAs) to approximately 5,457 acres of former PCTC lands acquired by the USDA Forest Service to be managed as part of the Flathead National Forest. These interim management areas would be in effect on acquired lands until the ongoing Forest Plan Revision effort is completed, anticipated in 2 years.

The effects of the Forest Plan Amendment to old growth associated species within the analysis area under Alternative 1 – No Action Alternative are minor because the standards and guidelines put forth in Amendment 21 of the Forest Plan apply standards and guidelines to old growth management across all lands managed by the Flathead National Forest even if management areas are not assigned. The effects of the Forest Plan Amendment under Alternatives 2 and 3 are also minor in scale because although they allow for timber management to occur on some lands they will maintain consistency with the forest-wide standards and guidelines that are in place to conserve old growth associated species. These MA assignments are consistent with the existing condition of these lands and the management direction assigned to adjacent lands and will not preclude future MA assignment under the Flathead Forest Plan Revision effort.

The cumulative effects of this forest plan amendment are very limited due to the geographic scope and expected duration of the amendment. At the Flathead National Forest scale, this amendment is only addressing management area direction on less than 1 percent of the NFS acreage on the Flathead National Forest. Additionally, the duration of this amendment is expected to be short-term since forest plan revision is ongoing with a decision expected in 2017. When the revision effort is completed, new management areas will be assigned across the entire Flathead National Forest, including the Beaver Creek project area, and will supersede any of the interim management areas proposed in this amendment. Reasonably foreseeable activities identified on the lands associated with the amendment is very limited as identified in Table 17 in Chapter 3 of this EA. If future land management activities occur on these lands they will be subject to forest-wide direction found in the Flathead National Forest Land and Resource Management Plan, federal and state laws, and other Forest Service regulations, as they are now, and will be guided by the proposed management area direction. Future land management activities such as timber harvest, road work, changes to public access etc. would be subject to site-specific NEPA analysis in the future.

# REGULATORY FRAMEWORK AND CONSISTENCY

The NFMA requires that the Forest Service "provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives." In addition, NFMA regulations state that "the overall goal of the ecological element of sustainability is to provide a framework to contribute to sustaining native ecological systems by providing ecological conditions to support diversity of native plant and animal species in the plan area." According to NFMA, "This will satisfy the statutory requirement to provide for diversity of plant and animal communities based on suitability and capability of the specific land area in order to meet multiple use objectives."

Forest Plan Amendment 21 was signed in January 1999. It has a goal to "maintain and recruit old growth forests to an amount and distribution that is within the 75 percent range around the median of the HRV. Where current conditions are below this amount, actively manage to recruit additional old growth." Amendment 21 further states that management actions within old growth stands should be limited to those actions that "maintain or restore old growth composition and structure consistent with native disturbance and succession regimes, or reduce risks to sustaining old growth composition and structure." The Beaver Creek project area has missed several natural fire intervals due to fire suppression (see Fire and Fuels section). Beaver Creek treatments are designed to replicate natural disturbance. Burning would be conducted outside of high severity conditions, when naturally ignited fire is currently most likely to occur. Wilderness prescribed fire would be implemented to achieve low to moderate fire severity and would likely maintain large diameter trees (PF Exhibit H-20).

Implementation of all alternatives would comply with the standards contained in the Forest Plan relative to old growth. Amendment 21 provides objectives and standards for live large trees, snags and coarse woody debris intended to provide for foraging and movement of wildlife species. Snag densities would be met where available and live replacement trees would be retained for future snag recruitment. Coarse woody debris in the largest pieces available would be maintained in compliance with Amendment 21 direction. Using FIA data, the Swan Valley is estimated to have 14.2 snags/acre greater than 9” DBH and 22.5 tons per acre coarse woody debris (greater than 3-inch DBH). These results suggest that across the Swan Valley, snag and coarse woody debris levels are consistent with Forest Plan management direction. Implementation of all alternatives would not contribute to the loss of viability of native species based on the rationale of this analysis and supporting information from the Forest-wide viability analysis (USDA 2015b).

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# MANAGEMENT INDICATOR SPECIES COMMONLY HUNTED BIG GAME

## INTRODUCTION

White-tailed deer, mule deer, and elk are Management Indicator Species (MIS) for commonly hunted big game species on the Flathead National Forest (USDA 2001a). Meeting the habitat needs for white-tailed deer, mule deer, and elk would indicate that the habitat needs for other commonly hunted big game species, such as black bear, mountain lion, and moose, would also be met. Habitat needs that each of these species has in common would include cover (hiding and thermal), forage, and security (Witmer et al. 1998).

Natural disturbances, such as fire or major insect infestations, and man-caused disturbances, including timber harvest, road construction, agricultural conversion, or residential development, alter the landscape, changing the amount and juxtaposition of cover and forage. These changes affect big game use patterns as they search out forage and cover, and can also affect habitat security.

## ANALYSIS AREA

### SPATIAL BOUNDS

The effects analysis area for direct, indirect, and cumulative effects to white-tailed deer, mule deer, and elk is the Beaver Creek Project Area. This area (approximately 34,962 acres) is large enough to be representative of the effects of fire, natural tree mortality, timber harvest, and road management across the landscape. Additionally, the project area represents a good cross-section of seasonal habitats used by big game species throughout the year (Project File Exhibit H-18). The actions proposed that could affect white-tailed deer, mule deer, or elk, are contained within this area. In addition, the area is sufficiently large enough to evaluate the ability of the habitat to support other big game species considered under the MIS umbrella.

### TEMPORAL BOUNDS

The length of time for activities proposed by the Beaver Creek Project is approximately 5 years. This is based on the probable contract length for the proposed project, and the timeframes for related activities. The length of time for direct, indirect, and cumulative effects is approximately 100 years. This is based on the length of time for natural forest processes to occur, snags to be created, forest vegetation to provide a variety of characteristics suitable for different sensitive species. Specific temporal bounds for different direct, indirect, or cumulative effects are discussed below.

## DATA SOURCES, METHODS, AND ASSUMPTIONS USED

Data used included open road densities, stand exam surveys, aerial photography, Vector Map (VMAP) data, project area field visits, research literature, and GIS and dataset information for features, such as riparian habitats, wet areas, old growth stand layers, white-tailed deer winter range, deer summer range, elk winter range, and general forest attributes like habitat type, forest type, elevation, and slope.

# MEASUREMENT INDICATORS

Important considerations for summer range habitat for deer and elk include moist sites or riparian habitat, hiding cover, forage, and general habitat security, especially during hunting season. These elements of deer and elk summer habitat, and the anticipated effects to these elements from project implementation, are the predominant measurement indicators used in this analysis. There is no designated white-tailed deer or elk winter habitat in the project area.

# AFFECTED ENVIRONMENT

## HABITAT

The Swan Valley has historically provided year-round habitat for deer and elk, as well as for other big game species covered under the MIS umbrella. White-tailed deer habitat consists of a mixture of various forested communities that provide cover, foraging habitat, and water within a reasonable distance. While elk and mule deer use similar habitats, white-tailed deer are more closely associated with riparian features than elk or mule deer. White-tailed deer exhibit a broad range of summer and fall habitat use, but are commonly associated with warm and moist mixed-species coniferous forest and lowlands interspersed with aquatic wetlands, meadows, and stream bottoms. The wetland complexes in the upper Swan Valley, including river and stream riparian zones, fens or peat lands, marshes, vernal pools, ponds, and lakes, are quite extensive (Swan Ecosystem Center 2004). Habitats favored by elk during the summer months include moist parks, meadows, and riparian areas, offering succulent forage and bedding sites. Elk remain on higher elevation summer ranges until forced down to lower elevations by snow and severe weather. Both elk and mule deer are also commonly associated with shrub, seedling, and sapling habitats. Mule deer have similar seasonal habitat and elevational range preference as elk. Like elk, mule deer elevational range is dictated by food availability and weather conditions.

Ungulate populations can fluctuate between mild winter and hard winter years. The use patterns of deer and elk have also shifted as a result of natural disturbances, such as wildfire, windfall, and insect infestations, which typically remove or alter hiding cover, thermal cover, and forage. Thermal cover describes the ability of a forested stand to intercept snow and provide winter protection for deer or elk (e.g., shallow snow depths, warmth). There is no winter range for white-tailed deer or elk within the project area. Hiding cover for both deer and elk refers to vegetation of sufficient size and density to conceal an animal from view at approximately 200 feet. Forage areas, as the name implies, are habitats that provide food for deer and elk.

Optimum summer range consists of patches of hiding cover for security from predators interspersed with openings that produce forb, grass and shrub forage species for big game. As mentioned previously, the pattern across the landscape of cover and forage naturally fluctuated in response to winter severity, wildfire, insect and disease, windstorms, etc.

The greatest change from historic to current conditions for deer and elk, throughout the Swan Valley, has been the change in human activity. The level of human activity in the Swan Valley has obviously increased over early settlement and pre-settlement conditions. The result of increased human activity has been an increase in the amount of timber harvest, road construction, recreational use (including hunting), residential development, grazing, and agriculture. Residential and agricultural developments have permanently altered potential deer and elk habitats. Timber harvest across the valley has altered the amount and juxtaposition of thermal cover, hiding cover, and forage. Regenerative timber harvest can remove big game cover and creates foraging areas by reverting forest succession to its earliest stage. Most ungulate species select for newly created forest openings when foraging, such as clearcuts or wildfire disturbance (Fisher et al. 2005; Patton 1976; Rempel et al. 1997). While forage can also be found in the understory of mature forested areas or in riparian areas, recently disturbed forest areas produce large pulses shrubs and grasses otherwise shaded out by mature forest canopy (Fisher et al. 2005). As these foraging areas go through succession and become reforested, they again begin to provide cover; first hiding and then thermal cover. Where cover exceeds forage by a wide margin, removal of cover may enhance deer and elk habitat by increasing edge, increasing diversity, and increasing forage.

The increase in open miles of road on NFS lands, largely a result of land management activities, has resulted in a decrease in security for deer and elk, especially during hunting season (Christensen et al. 1993; Hillis et al. 1991). Security was higher in the absence of road building and recreational hunting. In recent years, road closures for grizzly bear in the Swan Valley have undoubtedly benefited both deer and elk. Elk have been documented to avoid open roads (Christensen et al. 1993; McCorquodale 2013). Open roads can displace elk from nearby environments and serve as hunter access increasing elk, deer, and moose vulnerability to harvest during hunting season (Christensen et al. 1993; Hillis et al. 1991; Proffitt et al. 2013; Rempel et al. 1997). Hillis et al. (1991) defined elk security areas with hiding cover, greater than 0.5 miles from an open road and larger than 250 acres in size. Applying this definition, 42 percent of the Beaver Creek Project Area provides elk security (Project File Exhibit H-18). It is important to note that this analysis did not consider large areas in the Mission Mountains Wilderness as elk security because of lack of hiding cover. These remote areas functionally provide high elk security during the summer and early fall months due to difficulty of hunter access. With the inclusion of these remote wilderness areas, the elk security in the Beaver Creek Area is 76 percent (Project File Exhibit H-18). The high levels of security for elk exist primarily due to road access management direction for grizzly bears. Minimal open road access conditions exist in the Beaver Creek Project area. Within the Beaver Creek Grizzly Bear Subunit (see grizzly bear section), only 6 percent of the area exceeds 1 mile/square mile open motorized access. The MFWPs characterized Forest Service access management in the Bob Marshall Complex Elk Management Unit, which includes the Swan Valley and the project area, as creating conditions beyond MFWP's objectives for habitat security (Parks 2004).

Historically, prior to fire suppression management, many forested stands in the lower elevations, especially on the east side of the Swan River, experienced frequent underburns, and shrubs and grasses grew up under more open canopies. Results from Barrett (2008) indicate that fire intervals are longer than pre-fire suppression intervals in the Mission Mountains. Under existing conditions, many stands have become more grown in, and some stand conditions are no longer open; shrubs and other forage vegetation have declined and any wildfire at this point would probably be stand replacing instead of a lower intensity underburn or patchy mosaic (See Fire and Fuels Section of this EA for more information). More severe, stand-replacing wildfire within the project area has the potential to limit both cover and forage if conditions are severe enough to sterilize soil, creating longer regeneration times for early successional forage species or forest regeneration.The Beaver Creek Project Area contains summer range for white-tailed deer and contains MA15C, white-tailed deer summer range area designation. This management area provides direction for cover/forage areas,vegetation manipulation that maintains or enhances white-tailed deer summer habitat condition while emphasizing timber management, and apply road access restrictions to local roads to allow white-tailed deer optimum dispersal and use of summer range. Hiding cover is defined as sufficient trees or vegetation to conceal an animal from view at 200 feet (Project File Exhibit H-9). Within the Beaver Creek Project Area, available hiding cover is estimated at approximately 63 percent.

In 1986, the Flathead Forest Plan allocated approximately 12,000 acres of NFS land in the upper Swan Valley as white-tailed deer winter habitat (MA 9). The Forest Plan also allocated lands in the Swan Valley as elk and mule deer winter habitat (MA 13). There are no lands designated MA 9 or MA 13 within the Beaver Creek Project Area.

Within summer and fall months elk favor habitat that includes moist sites associated with particular forest habitat types as well as meadows and riparian areas. Moist sites are defined by Lyon et al. (Lyon et al. 1985). The Flathead Forest Plan includes direction that elk summer habitat will be managed "in accordance with moist site and security area recommendations from

Coordinating Elk and Timber Management, Final Report of the Cooperative Elk-Logging Study, 1970-1985" (Lyon et al. 1985). This report recommends high priority road closures for elk habitat through "wet meadows and moist areas." Moist areas defined by Lyon et al. (Lyon et al. 1985) include *Abies lasiocarpa/Clintonia uniflora, Picea Engelmanii/Clintonia uniflora, Abies lasiocarpa/Menziesia ferruginea and Abies lasiocarpa/Alnus sinuate* habitat. These moist sites occur primarily at the headwaters of drainages and at high to mid elevations in roadless and wilderness areas (Lyon et al. 1985). Moist areas in the project area are located away from roads and contain high elk security.

### POPULATION STATUS

Early surveys indicate that the white-tailed deer population in the Swan Valley ranged from approximately 4,000 to 8,000 animals in the 1930s, when surveys were first initiated, up to the 1990s. It was believed that white-tailed deer reached a population high in 1900 to 1915; however, there are few reliable historical estimates for elk or mule deer. Mundinger (Mundinger 1981) described the Swan Valley white-tailed deer population as one that is characterized by low and stable annual turnover and recruitment. He concluded that the population was stable, with an annual recruitment rate of 29 percent, and an annual survival rate of approximately 70 percent.

Exact numbers of deer and elk using the Upper Swan Valley, or specifically the Beaver Creek area, are not known. A 2014 report by MFWP describes the estimated population for white-tailed deer, mule deer, and elk in MFWP Region 1, which includes the Swan Valley. In Region 1, the estimated population for white-tailed deer in 2011 was 75,459 and had a 10-year average (2001-2010) of 77,817. The estimated population for mule deer in 2014 was 10,782, and had a 10-year average of 14,318 (Project File Exhibit H-16). Elk status and objectives are described in the 2014 report by hunting district (HD). The Swan Valley, more specifically the Beaver Creek Area, is located in HD 130. The most recent year that elk were counted in HD 130 was 2008. There were 203 elk counted; assuming that 80 percent of elk are observed, the estimated elk population in 2008 was 254 in HD 130. However, MFWP monitor elk population annually to evaluate harvest quota for sound population management. The 2014 MFWP Region One estimate for elk was 4,651. The Elk Plan Objective for HD130 is 225 elk; the status for elk in HD130 is "At Objective" (MFWP 2010b; Parks 2004) (Project Exhibit H-15).

Recruitment of young are also monitored within white-tailed deer populations. The Region 1 2012 White-tailed Deer Report (MFWP 2012) lists spring classifications for white-tailed deer for HD 130 or the Swan Valley. These spring classifications for 2012 observed 524 adults and 265 fawns yielding a fawn to 100 adult ratio of 51. The report lists the average fawn to 100 adult ratio as 48 from 1980 to 2012. The fawn to adult ratio for all of Region 1 averaged 44 fawns per 100 adults, higher than the previous 5 years. The ratio is thought to be the result of mild winter conditions across the region in the winter of 2011-2012 (Montana Dept. of Fish 2012).

## ENVIRONMENTAL CONSEQUENCES

The Beaver Creek Project consists of a No Action Alternative and two action alternatives. A cumulative effect considers and describes proposed activities in addition to the past, current, and reasonably foreseeable activities. Cumulative effects are discussed throughout this section under the specific alternatives. For a detailed discussion of all known past, present, and foreseeable activities see the Cumulative Effects Worksheet for MIS (Project File Exhibit H-14).

### ALTERNATIVE 1 - NO ACTION ALTERNATIVE
### DIRECT, INDIRECT, AND CUMULATIVE EFFECTS

There would be no proposed treatment under this alternative. The occurrence and abundance of forage and cover would fluctuate and change over time as the area progresses through various successional stages. There would be no direct effects to existing hiding cover and no direct effects to foraging habitat as a result of implementing the No Action Alternative. Security for white-tailed deer and elk/mule deer would remain the same. There would be no changes in the level of general motorized access, or hunting access. There would be no proposed road decommissioning with the No Action Alternative. Under Alternative 1, there would be no prescribed burning.

Indirectly, the likelihood of stand-replacement fires may be increased under Alternative 1 as compared to the action alternatives, with increased risk of cumulative effects to hiding cover. The occurrence of more severe fire could reduce forage and hiding cover under the right conditions. This reduction would depend on the severity and intensity of the fire. A severe, high-intensity fire could eliminate large amounts of cover and increase the return interval of forage species. The level of effects would depend on the size and intensity of the wildfire, which would depend on the actual location, intensity, moisture and weather conditions associated with a presently unknown future fire event.

Human activities including hunting, hiking, firewood cutting and special uses would continue in the project area. Private lands development may occur in the Beaver Creek Area; however impacts of development may be limited due to the relative small area of private land within the project boundary. Human occupancy of private lands in the Swan Valley is likely to increase, as is overall human activity in the Beaver Creek Area. This increase in human use would likely increase the potential for disturbance of deer and elk.

## ALTERNATIVES 2 AND 3 – ACTION ALTERNATIVES DIRECT AND INDIRECT EFFECTS

Comparing Alternatives 2 and 3, Alternative 3 would be more favorable to the needs of ungulate species in the Beaver Creek Project Area. Alternative 3 would retain more hiding cover within the project area and retain a higher degree of connectivity between untreated patches of forest vegetation.

### RIPARIAN HABITATS/WETLAND COMPLEXES

Riparian habitats are an important component of both deer and elk habitat. Riparian habitat would include rivers, streams, lakes, small wetlands, and ponds or potholes. There are management guidelines and BMPs in place (e.g., INFISH) that mitigate effects to riparian habitat. Riparian Habitat Conservation Areas restrict activities within a designated distance from streams, lakes, and wetlands (see Aquatics Section of this EA). Alternative 2 proposes approximately 110 acres of hand and mechanical treatment within RHCAs in the Beaver Creek Project Area (3 percent of RHCAs are in Beaver Creek). This work would occur outside of the Spring Period (April 1 to June 15). Work within RHCAs includes commercial thinning, daylighting, planting, pre-commercial thinning, and improvement cutting. Daylighting around large trees (>17-inches DBH) and leaving the thinned slash on site. Pre-commercial thinning would be done by hand and slash would be left on site. The work would occur in a small portion of the vegetation along riparian margins (RHCAs) throughout the low elevations of the project area (Project File Exhibit H-8). Commercial thinning and improvement cuts would be done mechanically, but no machine activity would occur within 50 feet of the water's edge. Treatments would increase irregular edge along riparian areas.

Displacement of ungulates may occur during activities; however hiding cover would remain prevalent adjacent to treated riparian areas and throughout the project area. Commercial treatments done mechanically may initially decrease understory plant forage species in RHCA units from machine disturbance for approximately 2 years. In the longer term, treatments (mechanical and hand) would increase browse in and around riparian areas by thinning forest conditions and releasing herbaceous or woody shrub forage species (Hayden et al. 2008). Proposed treatments would improve the abundance and quality of browse and forage species for big game within the project area.

The remaining RHCA areas would remain to provide hiding cover and protect important riparian habitats for deer and elk. There are no proposed treatments in Alternative 3 within RHCAs. Temporary roads proposed for alternatives would not be built in riparian habitats. Treatments for both Alternatives 2 and 3 are located in the lower elevations of the project area. Based on spatial forest stand habitat data, and field validations, no harvest treatments would occur in moist sites for elk as defined by Lyon et al. (Lyon et al. 1985).

### CALVING/FAWNING AREAS

Deer and elk are known to fawn and calve in the Beaver Creek Area. Calving/fawning occurs from May through June (Vore et al. 2001). Disturbance from human activity has been linked to disruption of reproductive potential in ungulate populations (Shively et al. 2005). Calving and fawning typically occurs away from disturbance. Activities under Alternatives 2 and 3 could displace calving and fawning ungulates within the area. Spring period timing restrictions for commercial activities for grizzly bears would largely decrease disturbance to calving/fawning elk and deer. Hiding cover and blocks of untreated stands would diminish potential for displacement from human activity. Design Criteria (Table 16) that retain hiding cover within commercial thin stands would also retain some cover calving/fawning security.

### HIDING COVER

Currently, approximately 62 percent of the Beaver Creek Project Area provides hiding cover for wildlife species. This percentage includes all lands within the project area boundary.

Both Alternatives 2 and 3 would decrease hiding cover within the Beaver Creek Project Area. Project File Exhibit H-9 discusses assumptions and analysis for effects to hiding cover on the proposed activities. Taking the variable prescriptions into account and the prescribed fire, Alternative 2 is estimated to decrease hiding cover within the Beaver Creek Project Area by approximately 1,899 acres. Alternative 3 is estimated to decrease hiding cover in the Beaver Creek Project Area by 878 acres (See Project File Exhibit H-9 for assumptions and analysis). In context to the entire Beaver Creek Project Area, Alternative 2 would have an approximate decrease of hiding cover from 62 to 53 percent, and Alternative 3 would decrease hiding cover from 62 to 58 percent. Hiding cover would take up to approximately 20 years to recover, depending on stand and growing site conditions.

Alternative 2 is proposing six regeneration units that are greater than 40 acres and Alternative 3 is proposing one unit greater than 40 acres. Regeneration harvest would likely increase available forage in these units in the long term relative to the existing condition. The shape and distribution of hiding cover would provide escape cover and security for big game species foraging in openings around these units and the area would remain suitable summer range.

Guidelines under the SVGBCA would diminish negative effects of proposed treatments to hiding cover. Vegetative screening would be retained along open roads in the project area and clearcut and seed tree units would retain cover such that no point in the unit is more than 600 feet from hiding cover. Additionally, when harvest units are located adjacent to natural or manmade openings, hiding cover would be maintained on approximately 75 percent of the openings' perimeter.

Comparing the action alternatives, both would leave hiding cover distributed throughout the project area; however, Alternative 3 would result in a spatial arrangement of treatments and cover that are better connected throughout the project area.

### FORAGE

Several studies in the Swan Valley and Salish Mountains have demonstrated that white-tailed deer forage consists mainly of conifer and shrub browse, with Oregon grape (*Berberis repens*) and Douglas-fir by far the most abundant items (MFWP 2006). Forbs, grasses and lichens are also important seasonal food sources (e.g., grasses in the spring). The mature and immature stands where vegetative treatments are proposed offer foraging opportunities for deer and elk (Hildebrand 1971; Mundinger 1982). The forest stands in the Beaver Creek Project Area have likely missed several natural fire intervals (Barrett 2008). Forage for ungulate species has been found to decline without natural disturbance (Hayden et al. 2008; Smucker et al. 2011). Although proposed vegetative treatments would initially decrease the amount of available forage due to mechanical ground disturbance, forage opportunities would increase again within 5 years. The additional sunlight reaching the forest floor would increase forage levels in some stands above existing forage amounts. Using a conservative analysis, the proposed prescribed fire activities (including wilderness burning) and proposed regeneration harvest activities would increase ungulate foraging abundance in the long term in the Beaver Creek Project Area over approximately for 2,412 or 2,040 acres for Alternatives 2 or 3 respectively.

### HABITAT SECURITY AND DISPLACEMENT

Displacement and disturbance of elk and deer may have negative consequences to local herds. Human activity has been documented to stress animals affecting available energy reserves. There is a potential for short-term displacement (approximately 5 years) of deer and elk from the immediate area during the proposed activities (e.g., mechanical treatment, helicopter activities, burning, commercial logging, machine thinning, hand thinning, planting crews, etc.) of either Alternative 2 or 3. Alternative 2 would have the greater potential for displacement and disturbance to ungulates and other big game species given the greater acreage of activities proposed. Project activities could occur during the winter months. There is no winter range within the project area and winter activities would not result in high levels of displacement from quality winter range; however winter distribution is often influence by snow depth throughout the season. Some individuals using the project area during periods of low snow may be displaced during winter months. Displacement effects would be small considering that forage is well distributed and abundant during the summer months, no winter range is present in the project area and spring timing restrictions would reduce potential for displacement when big game species may be transitioning between winter range and high elevation summer range. See the Grizzly Bear portion of the TES Section of this EA for more analysis on potential for displacement associated with project activities.

### HELICOPTER IGNITION AND BURNING ACTIVITIES

The proposed burning in the Mission Mountains Wilderness would include helicopter ignition activity for approximately 3 days. This helicopter activity may result in some displacement of ungulate species, but the displacement is likely to be small and short term (less than 5 days). Individuals respond differently to human disturbance like aircraft, motorized, or other associated human activity (Mitchell et al. 2014; Northrup et al. 2014; Stankowich 2008). Some ungulate individuals may not react at all to aircraft use where others may choose to move away from the disturbance. The fire ignition would occur in the fall and would not result in disruptive activities during the important calving/fawning periods in the spring. Stankowich (Stankowich 2008) found that ungulates reacted greatest to aircraft in open environments. Forest cover is plentiful in and around the prescribed fire areas and would provide ample opportunities for seclusion during short-term aircraft disturbance.

The proposed burning in the Mission Mountains Wilderness would include helicopter ignition activity for approximately 3 days. This helicopter activity may result in some displacement of ungulate species, but the displacement is likely to be small and short term (less than 5 days). Individuals respond differently to human disturbance like aircraft, motorized or other associated human activity (Mitchell et al. 2014; Northrup et al. 2014; Stankowich 2008). Some ungulate individuals may not react at all to aircraft use where others may choose to move away from the disturbance. The fire ignition would occur in the fall and would not result in disruptive activities during the important calving/fawning periods in the spring. Stankowich (Stankowich 2008) found that ungulates reacted greatest to aircraft in open environments. Forest cover is plentiful in and around the prescribed fire areas and would provide ample opportunities for seclusion during short-term aircraft disturbance.

## TEMPORARY ROAD CONSTRUCTION AND USE OF RESTRICTED ROADS

Existing open roads and closed roads would be used to conduct the proposed treatments under Alternatives 2 and 3. There would be a temporary increase in open road density during project activities, as hauling and other proposed activities occurred on restricted roads in the subunit (See Grizzly Bear portion of the TES Section of this EA for more information). Alternative 2 proposes use of a total of 50 miles of open and closed road for hauling activity, and Alternative 3 proposes the use of 42 miles. There would be temporary roads built under both alternatives (Alternative 2 proposes 7.5 miles and Alternative 3 proposes 5 miles). Temporary roads would be constructed to the minimum standards necessary for log hauling. Temporary roads would be reclaimed following use. The reclamation work would include the removal of any culverts, water bar placement, seeding, re-contouring, and the placement of woody debris on the reclaimed road so that the road can no longer function as a motorized route.

Big game species are most affected by open motorized routes that can result in displacement or result in higher vulnerability to hunters (Hillis et al. 1991; McCorquodale 2013; Rowland et al. 2005). Deer and elk use patterns would likely change slightly as the animals avoid areas of high human activity. In the Beaver Creek Project Area, there are large blocks of unroaded land and the Mission Mountains Wilderness that provide secure habitat for deer and elk. Outside of wilderness prescribed fire, no activities are proposed in grizzly bear security core. During the summer months, deer and elk would likely use the higher elevations of the project area extensively, and these areas would remain activity free. In the lower elevations of the project outside of wilderness or security core, hiding cover would remain well distributed across the project area. Additionally, MA 11c would retain 75 percent of the area in hiding cover. Additional hiding cover direction for grizzly bear would support the even and adequate distribution of hiding cover for ungulate security throughout the project area (see Grizzly Bear portion of TES Section of this EA). While contractors may be using closed roads, closed roads would remain closed to the public including during fall hunting seasons. The Beaver Creek Project Area has relatively little open motorized roads open to the public. The project would retain visual screening along these routes, which would benefit elk and deer security. Deer, elk, and other big game security would remain high during and after implementation of Alternatives 2 or 3.

In addition, Design Criteria (Table 16) in place for grizzly bear protection would benefit deer and elk and other big game species. For instance, in order to avoid the potential disturbance of grizzly bears in important spring habitat, management activities that are planned in spring habitat, which is generally defined as areas below 5,200 feet, would not occur within the Spring Period (April 1 through June 15). This timing restriction would minimize displacement effects to deer and elk during the spring season.

Some proposed logging activity may occur during the winter within the Beaver Creek Project Area. Snow depth during winter months influences ungulate selection of winter range areas at low elevations. The Beaver Creek Project does not contain any deer or elk winter range. Winter logging activity may displace some ungulate individuals during periods where winter snow depths may not be deep enough to influence winter range selection. The displacement effects would vary based on an individual's habituation to human activity. Displacement effects to individuals during the winter are expected to be minimal due to the absence of winter range in the project area.

Proposed road decommissioning, recontouring, and road storage work under Alternatives 2 and 3 would decrease total road density over the long term in the project area. All roads proposed for decommissioning are currently closed roads (gated or bermed) and do not receive high amounts of motorized activity (at most less than 10 vehicle trips/week). Decommissioning (including recontouring) and road storage would lower the probability of humans using these roads (administrative access, walking, bike riding, etc.) and provide some small benefit to the security of big game habitat within the Beaver Creek Project Area.

Proposed road decommissioning, recontouring, and road storage work under Alternatives 2 and 3 would decrease total road density over the long term in the project area. All roads proposed for decommissioning are currently closed roads (gated or bermed) and do not receive high amounts of administrative motorized activity (at most less than 6 vehicle trips/week). Over time, decommissioning (including recontouring) and road storage would lower the probability of humans using these roads (administrative access, walking, bike riding, etc.) and provide some small benefit to the security of big game habitat within the Beaver Creek Project Area.

### AQUATIC RESTORATION ACTIVITIES AND ASPEN PLANTING

Aquatic restoration activities proposed under Alternatives 2 and 3 would have little effect on big game habitat. Project activities may result in some displacement of ungulates or other big game species in the summer months; however, this displacement is expected to have little effect given the project's Design Criteria and discussion (above) about habitat security and use of restricted roads.

Aspen is a disturbance dependent forest tree species. Aspen stands have been found to have high habitat and browse value for deer and elk species. Aspen stands may be in a slow decline over much of the western United States, including northwestern Montana (Bartos 2000; Steed et al. 2010). Aspen planting would benefit big game hiding cover and forage availability for deer and elk over approximately 50 acres.

## ALTERNATIVES B AND C – ACTION ALTERNATIVES CUMULATIVE EFFECTS

There are part-year and yearlong residences in the area, as well as other past established human activities including road building, hiking, fire suppression, firewood cutting, hunting, trapping, and special uses. Private lands in the project area are more developed than these areas were historically. However the development of homes and logging/clearing on private lands is primarily distributed in the lower elevations of the project area. The Beaver Creek Project Area still maintains a mosaic of hiding cover and forage areas distributed through the elevations of the project area.

A wood fiber agreement was created as part of the Montana Legacy Project. Through this agreement, TNC retains the timber rights to transferred Legacy Lands until 2018. The Nature Conservancy's harvest activities have occurred in the Beaver Creek Project Area, including the Two Bear Harvest and the Beaver Highway Project. These projects included 544 acres of overstory removal and 111 acres of commercial thinning. Commercial thin units were thinned to 20-foot spacing (approximately 109 trees per acre) and overstory removal retained approximately 1 to 8 trees per acre greater than 10 inches DBH and regenerating vegetation in the understory. The Nature Conservancy's harvest activities reduced canopy cover and snag density on Legacy Lands within the project area. Snags that were retained in TNC harvest units. Both commercial thin and overstory removal treatments retained patches of regenerating forest vegetation that would serve as cover and create some continuity of forest canopy cover between patches of older forest stands. Opening up forest conditions can allow light to reach the forest floor and allow early successional species (grasses, sedges and shrubs) that ungulates select for browse to grow. However, the lands where TNC activities have occurred were previously managed as industrial timberlands and already had open conditions due to past harvest. The Nature Conservancy's harvest activities further decreased mature tree cover on Legacy Lands and likely decreased some forage through activities of heavy equipment. The forage in these areas is expected to return over the next 5 years. Tree regeneration would continue on Legacy Lands over the next 50 years, and the change would benefit numerous MIS species that associate with different forest structural stages through time.

Wildfire suppression activities would continue in the project area. Fire suppression has decreased fire disturbance in the project area and likely increased the amount of shade-tolerant species present in the understory of mature stands. Fire suppression activities have maintained existing mature cover in the project area, providing security for ungulates and other big game species. However, lack of fire disturbance may have decreased other habitat components like forage or aspen stands that typically regenerate after a fire has occurred. Prescribed fire and broadcast burning would increase the effects of fire disturbance to forest conditions in the project area.

Hunting would continue in the project area. Removal of hiding cover may contribute to a short-term increase big game vulnerability; however, the project would not increase motorized access to the public and would retain a mosaic of hiding cover and visual screening throughout the project area. Due to these conditions, the increase in vulnerability of deer and elk to hunters would likely be small. Forest conditions would grow over time and hiding cover and security would change as forest regeneration occurs.

The cumulative effect of past activities, the proposed activities of this project, and future activities, would not preclude deer or elk use of habitats in the area. There appears to be little risk of population loss, and species viability would be maintained. For additional information on the status of deer and elk on the Flathead National Forest, and the status at broader scales, please reference the document, Flathead National Forest Evaluation and Compliance with NFMA Requirements to Provide for Diversity of Animal Communities (USDA 2015b).

# EFFECTS OF A FOREST PLAN AMENDMENT TO ASSIGN MANAGEMENT AREAS TO ACQUIRED LANDS

The Beaver Creek Project includes a Forest Plan Amendment to assign interim management areas (MAs) to approximately 5,457 acres of former PCTC lands acquired by the USDA Forest Service to be managed as part of the Flathead National Forest. These interim management areas would be in effect on acquired lands until the ongoing Forest Plan Revision effort is completed, anticipated in 2 years.

Alternative 1- No Action Alternative proposes not to assign management areas to acquired lands although forest-wide standards and guidelines will continue to apply to all NFS lands on the Flathead National Forest. Alternative 2 and 3 proposes to assign 712 acres to MA 15C, which allows timber harvest but emphasizes white-tail deer summer range. This would be slightly beneficial to big game species in the project area but the lands across the project area also provide a variety of seasonal habitat regardless of MA designation. These MA assignments are consistent with the existing condition of these lands and the management direction assigned to adjacent lands and will not preclude future MA assignment under the Flathead Forest Plan Revision effort.

The cumulative effects of this forest plan amendment are very limited due to the geographic scope and expected duration of the amendment. At the Flathead National Forest scale, this amendment is only addressing management area direction on less than 1 percent of the NFS acreage on the Flathead National Forest. Additionally, the duration of this amendment is expected to be short-term since forest plan revision is ongoing with a decision expected in 2017. When the revision effort is completed, new management areas will be assigned across the entire Flathead National Forest, including the Beaver Creek project area, and will supersede any of the interim management areas proposed in this amendment. Reasonably foreseeable activities identified on the lands associated with the amendment is very limited as identified in Table 17 in Chapter 3 of this EA. If future land management activities occur on these lands they will be subject to forest-wide direction found in the Flathead National Forest Land and Resource Management Plan, federal and state laws, and other Forest Service regulations, as they are now, and will be guided by the proposed management area direction. Future land management activities such as timber harvest, road work, changes to public access etc. would be subject to site-specific NEPA analysis in the future.

# REGULATORY FRAMEWORK AND CONSISTENCY

The NFMA requires that Forest Plans "preserve and enhance the diversity of plant and animal communities" and that Forests manage for maintenance of "viable populations of existing native and desired non-native vertebrate species." The Beaver Creek Project would maintain viable populations of big game species.

Amendment 21 to the Forest Plan establishes a Forest-wide objective to "provide sufficient habitat to contribute to meeting objectives of Montana Department of Fish, Wildlife and Parks Management Plans" (Amendment 21, Appendix A, pg. 2). The MFWP has described elk, mule deer, and white-tailed deer as "at objective" in HD 130, which includes the project area (Project File Exhibit H-15). The Forest Plan does not have any standards for elk security. However, elk security is high in the project area and would remain high after project implementation. The project alternatives are consistent with maintenance and improvement of quality summer range for big games species. Cover/Forage areas are consistent with forest plan direction and road restrictions in the Beaver Creek Project area provide for high amounts of big game security and use of the project area. Big game populations are viable across the project area and the Flathead Forest and would remain so with the implantation of either of the action alternatives.

The Forest Plan has identified white-tailed deer, elk, and mule deer as Commonly Hunted Big Game MIS that use general forest habitat. Conditions favorable to these species would generally also benefit other big game species found within the project area, such as moose, black bear, and mountain lion, which are considered under the umbrella of MIS evaluation. Goals, objectives, and standards in the Forest Plan, specific to managing white-tailed deer, elk, and mule deer have been met in varying degrees in the preparation and analysis of the Beaver Creek Project.

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# SNAG AND DOWN WOOD ASSOCIATED SPECIES

## INTRODUCTION

Snags, broken-topped live trees, downed logs, and other woody material are required by a wide variety of species for nesting, denning, roosting, perching, feeding, and cover (Bull et al. 1997). Snags and down, dead, material are also used for communication purposes such as singing (songbirds), drumming (grouse and woodpeckers), calling (squirrels, jays, birds of prey), and sight recognition posts.

Small mammals and birds use standing and down dead material for food storage and for hunting. Downed logs and stumps are important for travel, both below the snow in the winter, and as travel cover throughout the year. It is estimated that about one-third of the bird and one-third of the mammal species that live in the Rocky Mountain forests use snags for nesting or denning, foraging, roosting, cover, communication, or perching. On the Flathead National Forest, at least 42 species of birds and 10 species of mammals are dependent on dead wood habitat for nesting, feeding, or shelter (USDA 1999b). The more mobile species that depend on dead wood habitat include black bears, Canada lynx, wolverine, marten, fisher, bats, woodpeckers, and small owls. Less mobile species that depend on dead wood include snowshoe hares (the primary prey of Canada lynx), red-backed voles (the primary prey of marten, fisher, boreal owl, and several other species), shrews, bryophytes, lichen, fungi, and protozoa. As down woody material further decays, it plays an important role in nutrient cycling, soil fertility, and erosion control.

Snags and their management have become a major conservation issue in managed forests across the western United States. Biologists have recognized for a long time that snags and down woody material provide important wildlife habitat, but only in the last decade or so have managers begun to understand that not only is tree decay an important ecological process that affects wildlife habitat (Bull et al. 1997), but snags and dead wood are an essential, important part of the larger ecosystem. An insufficient number of suitable snags may limit or eliminate populations of cavity-using species (Saab et al. 1998; Thomas et al. 1979).

Although various sizes of snags and down woody are used, larger birds and mammals require larger dead trees. The larger-diameter downed trees provide stable and lasting structure and offer better protection from weather extremes (Bull 2002). Longer down woody pieces provide better runways, shelter, and under-snow access.

Snag and down woody habitats are important to the boreal owl. The boreal owl is a cavity nester that uses a range of mature forest types above 4,200 feet elevation, including subalpine fir, spruce, lodgepole, mixed conifer, and Douglas-fir (Hayward et al. 1994). Approximately 94 percent of the Beaver Creek Project Area is above this elevation and can support these habitats, the existing situation for old growth and other late-seral forests and that for snag and downed wood habitat characterizes habitat for this small owl. Several other sensitive and threatened species that use snag and down woody habitats on the Flathead National Forest include the bald eagle, black-backed woodpecker, fisher, flammulated owl, and Townsend's big-eared bat. One of the TES species on the Flathead National Forest, the Canada lynx, has a strong habitat association with down woody material (denning).

Snags are essential habitat for at least 42 species of birds and 10 species of mammals in Montana. Table 95 displays specific habitat relationships and Montana National Heritage Program (MNHP) rankings for wildlife species in Montana that are associated with snags, "decayed" live trees showing wildlife use, or down woody habitat.

| **TABLE 95. SPECIES THAT USE SNAGS, "DECAYED" LIVE TREES, AND/OR DOWNED LOGS.** | | | | | |
|---|---|---|---|---|---|
| **SPECIES** | **GLOBAL & STATE RANKS (MNHP 2009)** | **SNAG DBH (INCHES)** | **SNAG HEIGHT (FEET)** | **DOWNED LOGS?** | **PROJECT AREA OCCURRENCE** |
| American Kestrel (N) | G5, S5B | 17 | 20 | | Known current |
| Bald Eagle (S) | G5, S3, SOC | 25 | 40 | | Known current |
| Barred Owl (former MIS) | G5, S4 | 25 | 30 | | Known current |
| Barrow's Goldeneye | G5, S4, potential SOC | 25 | 10 | | Known current |
| Big Brown Bat | G5, S4 | 17 | 20 | | Known current |
| Black-backed Woodpecker (S) | G5,S3 (SOC) | 17 | 10 | | Known current |
| Black-capped Chickadee | G5, S5 | 9 | 10 | | Known current |
| Bobcat | G5, S5 | - | - | yes | Known current |
| Boreal Chickadee | G5,S3 (SOC) | 9 | 10 | | Known current |
| Boreal Owl (former S) | G5, S4 | 17 | 10 | | Known current |
| Brown Creeper | G5, S3, SOC | 15 | 20 | | Known current |
| Bufflehead | G5, S5B | 17 | 10 | | Known current |
| Canada lynx (T) | G5, S3, SOC | - | - | yes | Known current |
| Chestnut-backed Chickadee | G5, S4 | 9 | 10 | | Known current |
| Common Goldeneye | G5, S5 | 25 | 10 | | Known current |
| Common Merganser | G5, S5B | 17 | 10 | | Known current |
| Dark-eyed junco | G5, S5B | - | - | yes | Known current |
| Downy Woodpecker | G5, S5 | 11 | 10 | | Known current |
| Fisher (S) | G5, S3, SOC | 25 | 30 | yes | Suspected current |
| Flammulated Owl (S, N)) | G4, S3B, SOC | 17 | 10 | | Known current |
| Great Horned Owl | G5, S5 | 25 | 30 | | Known current |
| Hairy Woodpecker | G5, S5 | 17 | 20 | | Known current |
| Harlequin Duck (S) | G4, S2B, SOC | - | - | yes | Known current |
| Hooded Merganser | G5, S4, potential SOC | 17 | 10 | | Known current |
| House Finch | G5, S5 | 15 | 10 | | Known current |
| House Sparrow | G5, undesired species | 15 | 20 | | Known current |
| House Wren (N) | G5, S5B | 15 | 10 | | Known current |
| Lewis' Woodpecker | G4, S2B (SOC) | 17 | 30 | | Known current |
| Little Brown Myotis | G5, S4 | 17 | 10 | | Known current |
| Long-eared Myotis | G5, S4 | 17 | 10 | | Known current |
| Long-legged Myotis | G5, S4 | 17 | 10 | | Known current |
| Long-tailed Weasel | G5, S5 | - | - | yes | Known current |
| Marten (former MIS) | G5, S4 | 17 | 20 | yes | Known current |
| Mountain Bluebird | G5, S5B | 15 | 10 | | Known current |
| Mountain Chickadee | G5, S5 | 9 | 10 | yes | Known current |

**TABLE 95. SPECIES THAT USE SNAGS, "DECAYED" LIVE TREES, AND/OR DOWNED LOGS.**

| SPECIES | GLOBAL & STATE RANKS (MNHP 2009) | SNAG DBH (INCHES) | SNAG HEIGHT (FEET) | DOWNED LOGS? | PROJECT AREA OCCURRENCE |
|---|---|---|---|---|---|
| Northern Alligator Lizard | G5,S3 (SOC) | - | - | yes | Known current |
| Northern Flicker | G5, S5 | 17 | 10 | | Known current |
| Northern Flying Squirrel | G5, S4 | 17 | 20 | | Known current |
| Northern Goshawk (former S) | G5,S3 (SOC) | - | - | yes | Known current |
| Northern Hawk Owl | G5, S4, potential SOC | 25 | 10 | | Known current |
| Northern River Otter | G5, S4 | - | - | yes | Known current |
| Northern Waterthrush (N) | G5, S5B | - | - | yes | Known current |
| Osprey | G5, S5B | 17 | 40 | | Known current |
| Painted Turtle | G5, S4 | - | - | yes | Known current |
| Pileated Woodpecker (former MIS) | G5,S3 (SOC) | 25 | 60 | | Known current |
| Pygmy Nuthatch | G5, S4 | 17 | 30 | | Known current |
| Pygmy Owl | G5, S4 | 17 | 30 | | Known current |
| Raccoon | G5, S5 | 25 | 10 | | Known current |
| Red-breasted Nuthatch | G5, S5 | 17 | 20 | | Known current |
| Red-naped Sapsucker (N) | G5, S4B | 17 | 20 | | Known current |
| Rubber Boa | G5, S4 | - | - | yes | Known current |
| Ruffed Grouse | G5, S4 | - | - | yes | Known current |
| Saw-whet Owl | G5, S4 | 17 | 20 | | Known current |
| Silver-haired Bat | G5, S4, potential SOC | 17 | 20 | | Known current |
| Southern Red-backed Vole | G5, S4 | - | - | yes | Known current |
| Spruce Grouse | G5, S4 | - | - | yes | Known current |
| Striped Skunk | G5, S5 | - | - | yes | Known current |
| Swainson's Thrush (N) | G5, S5B | - | - | yes | Known current |
| Tailed Frog | G5, S4 | - | - | yes | Known current |
| Three-toed Woodpecker | G5, S4 | 17 | 20 | | Known current |
| Tree Swallow (N) | G5, S5B | 15 | 20 | | Known current |
| Vaux's Swift (N) | G5, S4B | 25 | 40 | | Known current |
| Violet-Green Swallow | G5, S5B | 15 | 20 | | Known current |
| Western Bluebird | G5, S4B | 15 | 10 | | Known current |
| Western Jumping Mouse | G5, S4 | - | - | yes | Known current |
| Western Screech Owl | G5, S3, potential SOC | 17 | 20 | | Known current |
| Western (Townsend's) Big-eared Bat (S) | G4, S2 (SOC) | ? | ? | | Known current |
| White-breasted Nuthatch | G5, S4 | 17 | 20 | | Known current |
| Williamson's Sapsucker (N) | G5, S4B | 17 | 20 | | Known current |
| Wilson's Warbler (N) | G5, S5B | - | - | yes | Known current |
| Wolverine (S) | G4, S3* | - | - | yes | Known current |
| Wood Duck | G5, S5B | 25 | 10 | | Known current |

**TABLE 95. SPECIES THAT USE SNAGS, "DECAYED" LIVE TREES, AND/OR DOWNED LOGS.**

| SPECIES | GLOBAL & STATE RANKS (MNHP 2009) | SNAG DBH (INCHES) | SNAG HEIGHT (FEET) | DOWNED LOGS? | PROJECT AREA OCCURRENCE |
|---|---|---|---|---|---|
| Yuma Myotis | G5, S3, potential SOC | 17 | 10 | | Known current |

*=Proposed for Threatened listing; T=Threatened; S=Sensitive Species; N-Neotropical migratory bird; Natural Heritage Program Rank: G=species range-wide (global); S=state wide; 2=At risk because of very limited and/or declining numbers, range, and/or habitat, making it vulnerable to global extinction or extirpation in the state. 3=Potentially at risk because of limited and/or declining numbers, range, and/or habitat, even though it may be abundant in some areas. 4=Uncommon but not rare (although it may be rare in parts of its range), and usually widespread. Apparently not vulnerable in most of its range, but possibly cause for long-term concern. 5=Common, widespread, and abundant (although it may be rare in parts of its range). Not vulnerable in most of its range. B=State rank modifier indicating breeding for a migratory species. SOC=Montana Species of Concern.

# ANALYSIS AREA

## SPATIAL BOUNDS

The Beaver Creek Project Area was considered for the evaluation of direct, indirect, and cumulative effects on migratory bird species. This approximately 34,962-acre area is large enough to include the home ranges of several individuals or pairs of a species, and is representative of the effects of fire, natural tree mortality, timber harvest, and road management across the landscape. Additionally, the project is not so large as to dilute the effects of the proposed activities. The actions proposed in the alternatives that could directly or indirectly affect snag or down woody associated wildlife species are contained within this area. Cumulative effects were considered throughout the Beaver Creek Project Area. A multi-scale assessment was also conducted to address population viability concerns for dead tree dependent species (USDA 2015b).

## TEMPORAL BOUNDS

The length of time for the activities associated with the proposed fuels reduction and forest health treatments is approximately 5 years. This is based on the probable contract length for the proposed project, and the timeframes for related activities. The temporal scale of the effects analysis extends 100 years into the future, enough time for some mature stands to develop into old growth habitat and for some snag and downed wood habitat to develop, as well.

# DATA SOURCES, METHODS, AND ASSUMPTIONS USED

Data used included field surveys of snags and downed logs, project area field visits, research literature, and GIS and dataset information for features, such as general forest attributes, habitat type, and forest type.

# AFFECTED ENVIRONMENT

## HISTORICAL CONDITION

Forest ecosystems in the western United States have adapted in response to disturbances, such as wildfire, insects, disease, and windstorms. Snags and down woody material have always occurred on the landscape, a direct result of these disturbance factors, either on a large scale, or on a very small scale, as individual trees grow old and die. Ritter et al. (2000) have described snag populations as occurring in either "pulses" of snags following a large disturbance event, or as "continuous" populations of scattered individuals.

Historically, in the Swan Valley, snag habitat and down woody material, although always present in varying amounts, experienced greater "pulses" across the landscape and in localized areas as a result of natural disturbances. Warmer and drier areas historically underwent more frequent, lower-intensity fires, and typically supported fewer snags and large down logs than cooler and moister environments like the Beaver Creek Project Area, where the stands reached climax conditions before experiencing stand-replacing or mixed-severity fire.

# EXISTING CONDITION

Region 1 of the Forest Service estimated snag densities for western Montana forests by using FIA data to explore the density and distribution of snags within and outside of wilderness/roadless areas. Snag densities were inventoried and estimated by habitat type groups, dominance groups, and seral stages. The analysis took into consideration recent findings on the effect of timber harvest and human access on snag density; how snag density relates to stand succession and disturbances; and the spatial pattern of snags. Table 96 displays mean snag densities for the Flathead National Forest. The total primary sampling units (PSUs) are the number of FIA plots within the domain of interest, such as wilderness/roadless. The number of forested PSUs is the number of FIA grid locations that have at least a portion of the PSU with a "forested" condition. Estimates of mean snag density from FIA data are displayed with their respective 90 percent confidence intervals, which provide an indication of the reliability of the estimate. At a confidence level of 90 percent, unless a 1 in 10 chance has occurred, the true population mean is within this interval.

It should be noted that the three diameter classes for snags are not mutually exclusive; e.g., all snags 15.0-inches DBH and larger are included in the estimate of snags 10.0-inches DBH and larger, and all snags 20.0-inches DBH and larger are included in the estimate of snags 15.0-inches DBH and larger.

This evaluation of snag densities on the western Montana Forests of Region 1 used a hierarchical approach. Snag densities within and outside of wilderness and roadless areas were looked at, with the goal of obtaining information on natural snag abundance and distribution compared to snag densities in areas where there has been a history of timber harvest and human access. As would be expected, access and forest management activities could have a substantial effect on snag density and longevity (Russell et al. 2001; Wisdom et al. 2008). It is acknowledged that there is some uncertainty about how climate, a period of cool and moderate precipitation, and fire suppression from 1930 through 1985 has affected snag density and distribution in wilderness and roadless areas. However, even with some degree of uncertainty, it is probably the best quantitative data available to represent natural forested systems.

Timber harvest and human access can have substantial effects on snag density and longevity (Russell et al. 2006; Wisdom et al. 2008). Exploring the density of snags in wilderness and roadless areas can provide insight to natural snag abundance and distribution on a Forest. These can be compared to paired field plots outside wilderness/roadless to help to understand differences between areas that have been influenced by management and unmanaged areas (Bollenbacher et al. 2009). As shown in Table 96, there are fewer snags in each of the diameter classes outside of wilderness and roadless areas for the western Montana portion of Region 1 in general, and for all of the Forests.

Large snags are valuable to snag associated species. Large snags are typically less common due to less trees living to an older age, as trees age, they grow slower never reaching very-large diameters, and the inability of systems to contain large old trees and snags due to various types of disturbance agents which kill and remove them over time. When comparing large snag densities between a managed landscape (outside Wilderness/Roadless) and an unmanaged landscape (Wilderness/Roadless), the data shows the Flathead has maintained nearly the same densities of large (20-inches+ DBH) snags in managed areas.

**TABLE 96. MEAN SNAG DENSITIES WITH 90 PERCENT CONFIDENCE INTERNAL (CI), BY DIAMETER CLASSES, INSIDE AND OUTSIDE OF ROADLESS/WILDERNESS AREAS FOR EACH WESTERN MONTANA FOREST.**

| AREA | WILDERNESS/ ROADLESS | SNAGS PER ACRE 10+- INCHES | | | SNAGS PER ACRE 15+ INCHES | | | SNAGS PER ACRE 20+ INCHES | | | TOTAL NO. PSUs | NO. FORESTED PSUs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MEAN | 90% CI- LOWER BOUND | 90% CI – UPPER BOUND | MEAN | 90% CI- LOWER BOUND | 90% CI – UPPER BOUND | MEAN | 90% CI- LOWER BOUND | 90% CI – UPPER BOUND | | |
| Western Montana | In | 11.4 | 10.1 | 12.9 | 3.5 | 3.0 | 3.9 | 1.0 | 0.8 | 1.2 | 625 | 625 |
| Bitterroot | In | 13.1 | 10.3 | 16.2 | 4.1 | 3.0 | 5.3 | 1.1 | 0.7 | 1.5 | 159 | 159 |
| Flathead | In | 10.0 | 7.8 | 12.4 | 2.8 | 2.2 | 3.5 | 0.9 | 0.6 | 1.1 | 214 | 214 |
| Kootenai | In | 12.6 | 9.5 | 16.1 | 3.9 | 2.8 | 5.0 | 1.1 | 0.7 | 1.6 | 108 | 108 |
| Lolo | In | 10.9 | 8.6 | 13.4 | 3.4 | 2.5 | 4.4 | 1.0 | 0.6 | 1.4 | 144 | 144 |
| Western Montana | Out | 8.1 | 7.0 | 9.1 | 2.3 | 2.0 | 2.7 | 0.8 | 0.7 | 1.0 | 618 | 618 |
| Bitterroot | Out | 2.7 | 1.3 | 4.2 | 0.8 | 0.3 | 1.4 | 0.6 | 0.2 | 1.1 | 67 | 67 |
| Flathead | Out | 9.8 | 7.4 | 12.5 | 2.6 | 1.8 | 3.4 | 1.1 | 0.7 | 1.6 | 124 | 124 |
| Kootenai | Out | 0.8 | 8.1 | 11.5 | 2.4 | 1.9 | 3.0 | 0.8 | 0.6 | 1.2 | 244 | 244 |
| Lolo | Out | 6.6 | 4.9 | 8.4 | 2.6 | 1.9 | 3.4 | 0.8 | 0.5 | 1.1 | 183 | 183 |

Within the project area, down woody material and standing dead snags exist at variable levels throughout most stands. Both down woody material and snags are the result of tree mortality. Tree mortality factors, such as insects, pathogens, fire, wind, and other disturbances, all contribute to the pool of dead trees available as snags and eventually down woody material. Estimates from FIA Data collected throughout the Swan River Valley were assumed to approximate snag and down woody material conditions within the project area (See Vegetation Section of this EA for more information). The FIA Data estimated 14.2 standing dead snags per acre (90 percent CI: 9.1 to 20 snags per acre-greater than 9-inches DBH) and 22.5 tons/acre coarse woody debris greater than 3 inches DBH (90 percent CI: 15.2 to 30.7 snags per acre). Based on this information, snag and down woody debris densities are approximate the densities quantified at the forest level.

# ENVIRONMENTAL CONSEQUENCES

The Beaver Creek Project consists of a No Action Alternative and two action alternatives. A cumulative effect considers and describes proposed activities in addition to the past, current, and reasonably foreseeable activities. Cumulative effects are discussed throughout this section under the specific alternatives. For a detailed discussion of all known past, present, and foreseeable activities see the Cumulative Effects Worksheet for Snag and Down Woody Associated Species (Project File Exhibit H-11).

## ALTERNATIVE 1 - NO ACTION
## DIRECT, INDIRECT, AND CUMULATIVE EFFECTS

Under this alternative, there would be no reduction of snags as a result of proposed fuels reduction or forest health activities and no reduction of down woody logs or debris. New snags created as a result of insects or disease would not be cut down as a result of harvest treatment and existing snags would eventually fall over and add to the down woody material in the area. Dead trees would be retained and continue to provide habitat for wildlife species associated with snag or down woody material. There would be less potential for displacement of wildlife species from snag/down woody habitats under this alternative.

No direct effects to wildlife that depend on snag or down woody material for all or part of their habitat needs are anticipated as a result of implementing Alternative 1. Indirectly, there could be an increased likelihood under the No Action Alternative of more intense, stand-replacing fires in some habitats within the Beaver Creek Project Area due to the increased amount of potential fuels on the ground and within the stands. The potential of high-intensity, high-severity fires would have the effect of greatly increasing the amount of snag habitat and reducing the amount of down woody debris (at least short term) compared to current conditions. Tree mortality would also continue due to insect and disease activity that is currently occurring in the area. Insect and disease mortality would create snag habitat in the future as infestations affect live forest vegetation. For more information see the Vegetation Section of this EA.

There would be no broadcast burning, prescribed fire, planting, aquatic restoration activities, road decommissioning, road realignment, or road storage activities under Alternative 1.

In the past, human-caused threats to snag and down woody associated species have included timber management, road building, agricultural conversion, residential development, firewood cutting, fire suppression, and disease control and these activities would continue across the Upper Swan Valley Firewood cutting would continue along open roads in the Beaver Creek Project Area. No future TNC harvest activities are planned or proposed in the project area. The Nature Conservancy's harvest in the Two Bears and Beaver Highway Projects have decreased snag and down wood availability on Legacy Lands.

## ALTERNATIVES 2 AND 3 – ACTION ALTERNATIVES DIRECT AND INDIRECT EFFECTS

These alternatives are discussed together due to the similarity of their effects on snag and down woody dependent wildlife species. Alternative 2 has the most potential to impact snag and down woody dependent wildlife species because the alternative has the most acreage treatment overall and includes treatment in some RHCAs.

### COMMERCIAL TREATMENTS

Proposed commercial treatments would include clearcut, seed tree, shelterwood, commercial thin, improvement cut, and group selection treatments. Commercial harvest activities proposed under Alternative 2 would reduce the amount of snags and down woody material on 2,351 acres. Under Alternative 3, snag and down woody material would be reduced on 1,586 acres. Wisdom and Bate (Wisdom et al. 2008) found that snag densities were 19 times higher in unharvested stands compared to harvested stands. Although snags are not targeted for removal, they are sometimes removed inadvertently to increase logging efficiency, or if they are deemed a hazard to the woods workers, they are removed for safety reasons. If snags are recently dead, they could be removed for commercial reasons. In cutting units near private property, where the main purpose is fuel reduction, snags could be removed to meet the objective of reducing the potential fuels in an area. Down woody material suitable for wildlife use would usually be reduced during logging activity as a result of heavy equipment use, purposeful removal to reduce fuels, or removal to facilitate reforestation. The effect to snag and down woody dependent species would be an immediate decrease in available habitat. Over time, this could be 50 to 100 years or more, depending on existing snag/down woody habitat and disturbance vectors (fire/insects/disease), the amount and condition of snags and down woody material would be expected to return to pre-harvest levels.

Proposed slash treatment consists of a variety of methods, including the scattering of slash where fuel loads are lighter, mechanical piling of slash and burning piles.

As mitigation for snag and down woody associated wildlife species, snags and down woody material would be retained in all cutting units (See Design Criteria). The prescriptions for treatment would be designed to retain a minimum average of 6 snags per acre that are 12 to 20-inches DBH; all snags greater than 20-inches DBH would be left. If existing snag densities are below these densities, substitute live trees would be left. All standing dead western larch, ponderosa pine, and Douglas-fir trees 16-inches DBH or greater would be retained. Generally, snags to be left would be further than 150 feet from open roads and private land boundaries. Snags that pose a safety hazard to the contractor's operation would be removed. In addition to these snag retention criteria, the minimum retention for down woody material would be approximately 10 tons per acre, where available. To achieve the tonnage required, down woody material, which includes the longest material available (i.e., 16-feet long or longer) with the largest diameters (i.e., 15-inches DBH or greater), would be retained, in sufficient amounts to achieve the required tons per acre where available.

## NON-COMMERCIAL TREATMENTS

Non-commercial treatment would consist of pre-commercial thinning, daylighting, and fill planting. Under Alternative 2, the amount of non-commercial treatment proposed would be approximately 1,293 acres. Under Alternative 3, the amount of non-commercial treatment proposed would be approximately 952 acres. Direct and indirect effects to snags and down woody debris from the proposed non-commercial treatments would be minimal. Pre-commercial thinning would occur in young stands where past disturbance has occurred (i.e., logging, fire). These stands are generally young and do not have high amounts of standing large snags or high amounts of down woody debris. Daylighting would remove understory vegetation around larger preferred tree species. These activities could move or remove some large pieces of down woody debris, but would generally have very small impacts on snags or down woody debris within the stand. Fill planting would not affect snags or down woody debris. In the long term, the effects of the proposed treatment could be beneficial to wildlife species dependent on snag and down woody habitats; because the removal of excess trees would reduce growth stagnation and enable the retained trees to grow more vigorously. Vigorous growth would increase stand maturity, and aide large snag recruitment and increase down woody debris over the next 100 years.

## OLD GROWTH AND RIPARIAN HABITAT

Old growth habitats and riparian habitats are very important to snag and down woody dependent wildlife species. These habitats frequently have an abundance of larger snags and down woody material. Wisdom and Bate (Wisdom et al. 2008) found a strong relationship between snag density and seral stage; snag density was highest in late-seral stands. Neither Alternative 2 nor 3 propose treatment in verified old growth stands. For more information on Old Growth Associated Wildlife Species, refer to that section of this EA. Alternative 2 proposes harvest activities in RHCAs (approximately 110 acres). For harvest activities in RCHAs, there would be no mechanical treatments within 50 feet of the water. Design Criteria would keep large pieces of down woody debris, high stumps, some tree tops and snags within RHCAs that are treated. High stumps within the RHCA area would serve snag recruitment and provide microhabitat features for cavity nesting species. As stated above, vegetation along the margins of riparian areas (lakes, streams, wetlands) typically has higher snags and down woody debris. Slash left on sight would benefit down woody debris in proposed harvest areas. An estimate of total riparian vegetation was computed using RHCA areas in the Beaver Creek area (Project File Exhibit H-8). Alternative 2 proposes harvest in approximately three percent of the total RHCA area in the Beaver Creek area. This calculation includes all lands in the Beaver Creek Project Area, but does not include the area encompassed by open water. Alternative 3 does not propose any vegetation treatment in RHCAs except for units 460 and 491, where the road is already constructed within the RHCA and these treatments occurring on the upslope will not further affect the RHCA.

## TEMPORARY ROADS, ROAD RECONTOURING, DECOMMISSIONING, AND STORAGE

There would be approximately 7.5 miles of temporary road constructed under Alternative 2 and approximately 5.0 miles of temporary road constructed under Alternative 3. Snags that are located within the temporary road right-of-way would be cut down. If they are non-merchantable, they would be left on the ground as down woody debris. Temporary roads would be rehabilitated after completion of project activities.

Alternatives 2 and 3 propose to store, recontour, and decommission roads within the project area. Active decommissioning and road storage would include the same activities on the ground; however, stored roads would remain on the road system, while decommissioned roads would be removed from the roads database. Road recontouring would include using heavy equipment to return the road prism to the adjacent hillslope. The proposed roads for storage, recontouring and decommissioning are all currently closed to the public. These activities would have little effect on snags; however, some roadside snags may be removed if there is a safety hazard to contractors.

## SECURITY/MORTALITY RISK

Under Alternatives 2 and 3, it is possible that project implementation would directly affect snag or down woody dependent wildlife species through disturbance or incidental mortality. During sale activities, both open and closed roads would be used. In addition, as mentioned above, temporary roads would be constructed. In their snag density research, Wisdom and Bate (Wisdom et al. 2008) found that stands without a road adjacent to them had 3 times the density of snags, in contrast to stands along an open road. They also found that snag density was 40 percent lower along transects within 164 feet of an adjacent road compared to those transects greater than 164 feet. Activity conducted along an open road would not be a change from the existing condition; however, opening closed roads and constructing temporary roads has the potential to increase access for firewood cutters. Design Criteria (Table 16) under all action alternatives would require that temporary roads be reclaimed; public use of closed roads would not be permitted, reducing the risk of losing potential snag tree habitat to firewood cutters.

## PRESCRIBED FIRE

Both Alternative 2 and 3 propose 1,104 acres of prescribed burning in the Mission Mountains Wilderness. These activities would create snags and create down woody debris within the proposed fire area and potentially within the maximum allowable burn area. The fire would burn at different intensities in a mosaic pattern. Areas within the fire perimeter may burn at hotter temperatures resulting in higher tree mortality, while other areas of the burn may burn just along the ground consuming fine woody debris, shrubs, grasses, etc. Monitoring of the Mission Upland Burn, a burn implemented on a similar aspect in the Mission Mountains, documented results of a mosaic of fire conditions throughout the fire area (Project File Exhibit H-20). The wilderness burn may decrease live tree canopy, create forest openings and remove ground cover in the short term (approximately 2 years). Large diameter snags and down woody debris would likely burn partially, but would still persist providing important habitat features for associated species. Over the longer term, wilderness burning would benefit snag associated species by increasing the amount of snags and down woody debris for cavity-nesting birds or denning/resting habitat for species like marten.

Prescribed fire outside the wilderness would also create snags, but not to the same degree. Broadcast burning would occur after forest fuels are removed mechanically and result in a light-intensity ground fire that has more homogenous effects to forest vegetation throughout the proposed burn areas. Broadcast burning would consume some slash, shrubs and grasses on the ground, but would not result in a large degree of tree mortality. Some mature trees may die from fire mortality creating snags. Snags and coarse woody debris exist within the proposed broadcast units. Light intensity fire may burn snag and coarse woody habitat features, but it is unlikely that this fire would burn hot enough, for long enough to consume these existing habitat features. The consumption of these features from fire would depend on their size. From past monitoring of broadcast burning, this analysis assumes that snags and coarse woody debris larger than 8-inches DBH would not be completely burned and would still provide habitat for associated species after broadcast burning occurred (Project File Exhibit H-20).

### AQUATIC RESTORATION AND PLANTING ACTIVITIES

Planting of trees would not directly affect snags and down woody debris. However, planting would increase trees within the project area for future snag recruitment. Aquatic restoration activities proposed under both Alternatives 2 and 3 may remove several snags during mechanical activities especially if these snags are judged to be a hazard to safety; however, this removal would be minimal relative to snag presence and abundance throughout the project area.

## ALTERNATIVES 2 AND 3 – ACTION ALTERNATIVES CUMULATIVE EFFECTS

Human-caused threats to snag and down woody associated species include activities that reduce the availability or use of snag/down woody habitat. Activities that have reduced dead tree habitat in the Beaver Creek Project Area, and throughout the Swan Valley, are vegetation management, road building, agricultural conversion, residential development, firewood cutting, fire suppression, and insect and disease control.

A wood fiber agreement was created as part of the Montana Legacy Project. Through this agreement, TNC retains the timber rights to the donated Legacy Lands until 2018. The Nature Conservancy's harvest projects, Beaver Highway and Two Bears, have occurred within the project area. Harvest by TNC created activity that would reduce down woody debris and snags. Snags that are not hazard trees would be retained in TNC harvest units. Treatments retained patches of regenerating forest vegetation that would serve as hiding cover and create some continuity of forest canopy cover between patches of older forest stands. None of these harvest activities occurred within riparian habitats.

The Nature Conservancy's harvest is located primarily in previously-owned industrial timberlands. All of the TNC harvest areas occur in previously treated stands. Outside of the riparian buffers, due to past management activities these stands do not typically contain large tree size, structurally complex characteristics, or high levels of snag or coarse woody debris that would describe quality habitat for snag and down woody associated species.

Firewood cutting is ongoing within the Beaver Creek Project Area. By regulation, dead and downed woody debris could be skidded up to 100 feet from an open road and is prohibited 150 feet from any running stream, pond, lake, marshy, or wet area. In their snag density research, Wisdom and Bate (Wisdom et al. 2008) found that stands without a road adjacent to them had 3 times the density of snags in contrast to stands along an open road. They also found that snag density was 40 percent lower along transects within 164 feet of an adjacent road compared to those transects greater than 164 feet. Fewer snags would be present even beyond 164 feet as firewood cutters are using cable systems to cut and move snags at longer distance from roads (Wisdom et al. 2008) (Flathead National Forest employee observations). The Beaver Creek area has relatively low open road density in comparison to other areas in the Swan Valley (6 percent - see Grizzly Bear Section of this EA and Project File Exhibit U-28). Public access in the Beaver Creek area is very limited due to road closures under Amendment 19. Limited public access in the Beaver Creek access has limited reductions in snags due to firewood cutting.

Recently, large fires in Montana have created a "pulse" of snag habitat across the landscape. Fires within the last 10 years within stands greater than 9-inches DBH (trees large enough to provide a potentially suitable snag) have occurred at 125.5 percent of the average historic conditions (Hillis, Pengeroth, et al. 2003). In the Swan Valley, the Crazy Horse Fire (over 11,000 acres) burned in the late summer of 2003 creating a large amount of snags, many of which were not harvested. In 2006, the Holland Peak Fire burned over 1,800 acres east of the project area; again, most standing snags were not cut down. The Condon Mountain Fire recently burned 5,501 acres across the valley from the project area in 2013. None of these fires occurred within the Beaver Creek Project Area. Recent wildfires have been managed for full suppression and have been kept to less than 100 acres, with the majority being less than 10 acres. Prescribed burning in the Mission Mountains Wilderness in the Beaver Creek Project would benefit snag and down woody abundance. Mountain pine beetle is present within the project area and has resulted in tree mortality creating snags throughout the project area. Within the project area and throughout the valley, mountain pine beetle and disease have produced a pulse of snags in the past 6 years (USDA 2015b). Based on past disturbance, TNC projects, the project alternatives, and snag distribution throughout the project area, no adverse cumulative effects would be expected and impact to snags and down woody debris would be minimal.

# EFFECTS OF A FOREST PLAN AMENDMENT TO ASSIGN MANAGEMENT AREAS TO ACQUIRED LANDS

The Beaver Creek Project includes a Forest Plan Amendment to assign interim management areas (MAs) to approximately 5,457 acres of former PCTC lands acquired by the USDA Forest Service to be managed as part of the Flathead National Forest. These interim management areas would be in effect on acquired lands until the ongoing Forest Plan Revision effort is completed, anticipated in 2 years.

Alternative 1 - No Action Alternative proposes not to assign management areas to acquired lands although forest-wide standards and guidelines would continue to apply to all NFS lands on the Flathead National Forest.

Alternative 2 proposes to assign 55 acres of acquired lands to MA 2, 8 acres of acquired lands to MA 5, 2,312 acres to MA 11C, 320 acres to MA 12, 2,033 acres to MA 15, 712 acres to MA 15C, and 17 acres to MA 17. These proposed MA assignments were made in consideration of the characteristics of the acquired parcel and the management direction on surrounding lands. Table 11 describes the management emphasis for each of these MAs, but lands assigned to MA 5, MA 11C, MA 15, MA 15C, and MA 17 are considered suitable for timber production, while MA 2 and MA 12 are considered unsuitable for timber production although management activities may occur to benefit other resources.

Alternative 3 proposes different management area assignments to reflect public concern about the scenic integrity of lands on the east side of Lindbergh Lake. To accomplish this, Alternative 3 assigns MA 5 instead of MA 15 on approximately 502 acres of acquired land on the east side of Lindbergh Lake to maintain or enhance the scenic quality of these lands when viewed from Lindbergh Lake. Although MA 5 would allow for timber harvest to occur on these lands, it would emphasize the maintenance of a natural appearing landscape where management activities are not evident.

The effects of the Forest Plan Amendment to snags and down woody debris associated species within the analysis area under Alternative 1 – No Action Alternative are minor because the Forest Plan standards apply to all lands managed by the Flathead National Forest even if management areas are not assigned. The effects of the Forest Plan Amendment under Alternative 2 and 3 are also minor in scale because although they allow for timber management to occur on some lands they will maintain consistency with the forest-wide standards and guidelines that are in place to conserve snags and down woody debris over time. Alternative 3 might be slightly more beneficial to snag and down woody species because there will be less potential for future harvest activities to occur on the 502 acres designated as MA5. These MA assignments are consistent with the existing condition of these lands and the management direction assigned to adjacent lands and will not preclude future MA assignment under the Flathead Forest Plan Revision effort.

The cumulative effects of this forest plan amendment are very limited due to the geographic scope and expected duration of the amendment. At the Flathead National Forest scale, this amendment is only addressing management area direction on less than 1 percent of the NFS acreage on the Flathead National Forest. Additionally, the duration of this amendment is expected to be short-term since forest plan revision is ongoing with a decision expected in 2017. When the revision effort is completed, new management areas will be assigned across the entire Flathead National Forest, including the Beaver Creek Project Area, and will supersede any of the interim management areas proposed in this amendment. Reasonably foreseeable activities identified on the lands associated with the amendment is very limited as identified in Table 17 in Chapter 3 of this EA. If future land management activities occur on these lands they will be subject to forest-wide direction found in the Flathead National Forest Land and Resource Management Plan, federal and state laws, and other Forest Service regulations, as they are now, and will be guided by the proposed management area direction. Future land management activities such as timber harvest, road work, changes to public access etc. would be subject to site-specific NEPA analysis in the future.

## REGULATORY FRAMEWORK AND CONSISTENCY

The Forest Service is required by the NFMA, to "provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives." A wide variety of wildlife species are dependent on the existence of standing snags and down woody material. Forest Plan Amendment 21 (USDA 1999b) provides the current direction for snags and down woody material. Sufficient vegetation structure is to be retained, including large diameter trees, in timber harvest areas. To comply with Amendment 21, the retention amount must be consistent with native disturbance and succession regimes and provide for long-term snag and coarse woody debris recruitment, essential soil processes, species habitat (including feeding and dispersal habitat for small mammals and birds), and long-term structural diversity of forest stands. In the absence of a site-specific landscape analysis to derive snag retention levels, minimum retention levels have been established as the standard.

Amendment 21 provides direction to maintain snag densities based on Dry, Cold and Moist PVGs and, if snag densities are below the prescribed minimum densities, to substitute live trees where possible. The prescriptions for treatment would be designed to retain a minimum average of 6 snags per acre that are 12 to 20-inches DBH; all snags greater than 20-inches DBH would be left. If existing snag densities are below these densities, substitute live trees would be left for future snag recruitment. For stands where large snag densities (>20 inches DBH) are below forest direction (1 or 2 per acre depending on PVG type), 5 live replacement trees (>12 inches DBH) for each large snag would be substituted. All standing dead western larch, ponderosa pine, and Douglas-fir trees 16-inches DBH or greater would be retained.

Where available, the minimum retention for down woody material would be approximately 10 tons per acre, left in the longest and biggest pieces available. All of Beaver Creek Project alternatives would comply with standards in the Forest Plan for snag and down woody habitat and associated wildlife species.

# MIGRATORY BIRDS

## INTRODUCTION

Neotropical migratory birds (NTMB) are defined as those birds that regularly winter south of the Tropic of Cancer and summer in North America. In 1988, an amendment to the Fish and Wildlife Conservation Act mandated the USFWS to "identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act of 1973." The report, Birds of Conservation Concern (2002), identified the migratory and non-migratory bird species (beyond those already designated as Federally threatened or endangered) that represent the highest conservation priority. In the report, the United States is broken down into Bird Conservation Regions (BCR), with bird species of conservation concern identified for each region. The Swan Valley is located in BCR 10. The bird species of conservation concern for the Beaver Creek Project Area are listed below in Table 97.

**TABLE 97. NORTHERN ROCKIES "BIRDS OF CONSERVATION CONCERN" (USFWS 2008).**

| BIRD NAME | GENERAL HABITAT SUMMARY | RELATIVE OCCURRENCE ON THE FLATHEAD NATIONAL FOREST |
|---|---|---|
| Flammulated Owl | Open ponderosa pine; mixed forest. | Rare |
| Lewis's Woodpecker | Open or park-like ponderosa pine; areas w/ scattered trees. | Occasional |
| Loggerhead Shrike | Open country with scattered shrubs or small trees. | Occasional |
| Long-billed Curlew | Moist to dry grasslands and meadows. | Uncommon |
| McCown's Longspur | Dry, short grass prairie. | N/A |
| Olive-sided Flycatcher | Logged or burned forests | Occasional |
| Peregrine Falcon | Open country with rocky cliffs and ledges near water. | Rare |
| Sage Thrasher | Sagebrush obligate in Montana | Uncommon |
| Sage Sparrow | Barren sagebrush deserts | N/A |
| Swainson's Hawk | Plains, prairies; open pine-oak woodlands; cultivated lands. | Rare |
| Upland Sandpiper | Open grasslands. | Rare |
| White-headed Woodpecker | Open Ponderosa pine forests | Rare |
| Williamson's Sapsucker | Pine forests; higher elevations. | Uncommon |
| Willow Flycatcher | Spruce-fir, Douglas fir, lodgepole pine, ponderosa pine and mixed deciduous-coniferous forest with quaking aspen | Uncommon |
| Yellow-billed Cuckoo | Woods and brush. | N/A |

Table 98 displays the NTMB species that use the Flathead National Forest for their breeding habitat. Table 98 includes information on global and state rankings, as well as habitat distribution information.

| TABLE 98. NEOTROPICAL MIGRATORY BIRDS THAT UTILIZE BREEDING HABITAT ON THE FLATHEAD NATIONAL FOREST (USDA 2006). | | | | | |
|---|---|---|---|---|---|
| **COMMON NAME (AND STATUS)** | **GLOBAL, STATE RANKS (MTNHP 2011) *** | **OLD GROWTH** | **SNAG/DOWN WOOD** | **RIPARIAN** | **GRASSLAND** |
| American Kestrel | G5, S5B | | X | | X |
| American Redstart | G5, S5B | | | X | |
| American Robin | G5, S5B | | | | X |
| Bank Swallow | G5, S5B | | | X | X |
| Barn Swallow | G5, S5B | | | X | X |
| Belted Kingfisher | G5, S5B | | | X | |
| Black Swift (SOC) | G4, S1B | | | X | |
| Black-chinned Hummingbird | G5, S4B | | | | X |
| Black-headed Grosbeak | G5, S5B | | | | |
| Bobolink (SOC) | G5, S3B | | | | X |
| Brewer's Blackbird | G5, S5B | | | X | |
| Brewer's Sparrow (SOC) accidental | G5, S3B | | | | X |
| Brown-headed Cowbird | G5, S5B | | | X | X |
| Calliope Hummingbird | G5, S5B | | | | |
| Cassin's Vireo | G5, S4B | | | | |
| Cedar Waxwing | G5, S5B | | | X | |
| Chipping Sparrow | G5, S5B | | | | |
| Clay-colored Sparrow. | G5, S4B | | | X | X |
| Cliff Swallow | G5, S5B | | | X | X |
| Common Nighthawk | G5, S5B | | | X | X |
| Common Yellowthroat | G5, S5B | | | X | X |
| Cordilleran Flycatcher | G5, S4B | | | X | |
| Dusky Flycatcher | G5, S5B | | | X | |
| Eastern Kingbird | G5, S5B | | | | X |
| Flammulated Owl (SOC, Sens, MIS) | G4, S3B | X | X | | X |
| Grasshopper Sparrow (SOC) | G5, S3B | | | | X |
| Gray Catbird | G5, S5B | | | | X |
| Hammond's Flycatcher | G5, S4B | X | | | |
| Hermit Thrush | G5, S5B | X | | X | |
| House Wren | G5, S5B | | X | | |
| Lazuli Bunting | G5, S4B | | | | |
| Least Flycatcher | G5, S5B | | | X | |
| Lincoln's Sparrow | G5, S5B | | | X | |
| MacGillvray's Warbler | G5, S5B | | | X | |
| Merlin | G5, S4 | | | X | X |
| Nashville Warbler | G5, S5B | | | X | |
| Northern Oriole | G5, S5B | | | | |
| Northern Rough-winged Swallow | G5, S5B | | | X | X |

**TABLE 98. NEOTROPICAL MIGRATORY BIRDS THAT UTILIZE BREEDING HABITAT ON THE FLATHEAD NATIONAL FOREST (USDA 2006).**

| COMMON NAME (AND STATUS) | GLOBAL, STATE RANKS (MTNHP 2011) * | OLD GROWTH | SNAG/DOWN WOOD | RIPARIAN | GRASSLAND |
|---|---|---|---|---|---|
| Northern Waterthrush | G5, S5B | | X | X | |
| Olive-sided Flycatcher | G4, S4B | | | X | X |
| Orange-crowned Warbler | G5, S5B | | | X | |
| Osprey | G5, S5B | | X | X | |
| Peregrine Falcon (SOC, Sens, MIS) | G5, S3 | | | X | X |
| Purple Martin | G5, SNA | | X | X | X |
| Red-eyed Vireo | G5, S4B | | | | |
| Red-naped Sapsucker | G5, S4B | | X | X | |
| Red-winged Blackbird | G5, S5B | | | X | X |
| Rose-breasted Grosbeak | G5, SNA | | | | |
| Ruby-crowned Kinglet | G5, S5B | | | | |
| Rufous Hummingbird (PSOC) | G5, S4B | | | | X |
| Savannah Sparrow | G5, S5B | | | | X |
| Say's Phoebe | G5, S5B | | | | X |
| Swainson's Hawk (PSOC) | G5, S4B | | | | X |
| Swainson's Thrush | G5, S5B | X | X | | |
| Tennessee Warbler (PSOC) | G5, S3B | | | X | X |
| Townsend's Warbler | G5, S5B | X | | X | |
| Tree Swallow | G5, S5B | | X | X | X |
| Turkey Vulture | G5, S4B | | | | X |
| Vaux's Swift | G5, S4B | X | X | | X |
| Veery (SOC) | G5, S3B | | | X | |
| Vesper Sparrow | G5, S5B | | | | X |
| Violet-green Swallow | G5, S5B | | X | X | X |
| Warbling Vireo | G5, S5B | | | X | |
| Western Kingbird | G5, S5B | | | X | X |
| Western Tanager | G5, S5B | | | | |
| Western Wood-Pewee | G5, S5B | | | X | |
| White-throated Swift | G5, S5B | | | X | X |
| Williamson's Sapsucker | G5, S4B | | X | | |
| Willow Flycatcher | G5, S4B | | | X | |
| Wilson's Warbler | G5, S5B | | X | X | |
| Yellow Warbler | G5, S5B | | | X | |
| Yellow-breasted Chat | G5, S5B | | | X | |
| Yellow-headed Blackbird | G5, S5B | | | X | X |

*Sens = R1 Sensitive Species; MIS = Flathead National Forest Management Indicator Species; X = associated habitat component; SOC = Montana Species of Concern; PSOC = Montana Potential Species of Concern.

**TABLE 98. NEOTROPICAL MIGRATORY BIRDS THAT UTILIZE BREEDING HABITAT ON THE FLATHEAD NATIONAL FOREST (USDA 2006).**

| COMMON NAME (AND STATUS) | GLOBAL, STATE RANKS (MTNHP 2011) * | OLD GROWTH | SNAG/DOWN WOOD | RIPARIAN | GRASSLAND |
|---|---|---|---|---|---|
| Montana Natural Heritage Program Ranks: G = species range-wide (global); S = statewide; 1 = At high risk because of extremely limited and/or rapidly declining numbers, range, and/or habitat, making it highly vulnerable to global extinction or extirpation in the state; 2 = At risk because of very limited and/or declining numbers, range, and/or habitat, making it vulnerable to global extinction or extirpation in the state; 3 = Potentially at risk because of limited and/or declining numbers, range, and/or habitat, even though it may be abundant in some areas; 4 = Uncommon but not rare (although it may be rare in parts of its range), and usually widespread. Apparently not vulnerable in most of its range, but possibly cause for long-term concern; 5 = Common, widespread, and abundant (although it may be rare in parts of its range). Not vulnerable in most of its range; B = State rank modifier indicating breeding for a migratory species; SNA = A conservation status rank is not applicable because either the taxa is of hybrid origin, is exotic, introduced, or accidental, it is not confidently present in the state. | | | | | |

Two habitats found in the Beaver Creek Project Area that are especially important to bird species (USDA 2015b) are:

1. Riparian habitat, because of the availability of water and the variety of plant communities, and
2. Old growth and other late seral habitats, which has the highest density and diversity of birds nesting in tree cavities.

In addition, snags, broken-topped live trees, downed logs, and other woody material, are an important habitat characteristic because they are required by a wide variety of bird species for nesting, roosting, perching, feeding, and cover.

Although grassland habitats are a key habitat component for some bird species, grassland habitat is not common in the Beaver Creek Project Area and would not be affected by the proposed project.

# ANALYSIS AREA

### SPATIAL BOUNDS

The Beaver Creek Project Area was considered for the evaluation of direct, indirect, and cumulative effects on migratory bird species. This project area is large enough to include the home ranges of several individuals or pairs of a species, and is representative of the effects of fire, natural tree mortality, timber harvest, and road management across the landscape. Additionally, the project is not so large as to dilute the effects of the proposed activities. The actions proposed in the alternatives that could directly or indirectly affect migratory bird species are contained within this area.

## TEMPORAL BOUNDS

The length of time for the activities associated with the proposed fuels reduction and forest health treatments is approximately 5 years. This is based on the probable contract length for the proposed project, and the timeframes for related activities. The temporal scale of the effects analysis extends 100 years into the future, enough time for some mature stands to develop into old growth habitat and for some snag and downed wood habitat to develop as well.

# DATA SOURCES, METHODS, AND ASSUMPTIONS USED

Data used included aerial photography, Vector Map (VMAP) data, field surveys of snags, old growth surveys, project area field visits, research literature, and GIS and dataset information.

# AFFECTED ENVIRONMENT

## HISTORICAL CONDITION

Forest ecosystems in the western United States have historically adapted in response to disturbances, such as wildfire, insects, disease, and windstorms. A wide diversity of habitats existed across the landscape, providing habitat for a diverse suite of NTMBs.

Historically, some habitats may have occurred in greater abundance on the landscape than now (e.g., old growth habitat or aspen stands). Without fire suppression and protection for private landowners bordering NFS lands, fire likely burned across a large spectrum of intensity and severity in the Beaver Creek Project Area resulting in highly variable habitat variability for differing bird species. The result was likely pulses of different habitats following fire events and subsequent forest regeneration. Population trends for different bird species have generally followed the distribution and amounts of the different preferred habitats. For example, the olive-sided flycatcher and Cassin's finch are associated with post-fire habitats and would have been abundant in areas where there was a large, stand-replacing fire event. Species associated with open forests, such as the western tanager, Vaux's swift, chipping sparrow, yellow-rumped warbler, and western wood pewee, would have been found more in areas that experienced frequent, low-intensity fires that re-initiated the understory but did not consume all of the large trees. Birds associated with dense forests, such as the sharp-shinned hawk, Cooper's hawk, or ruby-crowned kinglet, would have preferred older, closed canopy forest habitats.

# EXISTING CONDITION

Generally, bird populations that breed in the western United States appear to be suffering from forest fragmentation in breeding habitat (Hejl et al. 1995). Timber harvest has occurred within the Beaver Creek Project Area, most recently on lands that formerly belonged to PCTC. Timber harvest and excessive tree mortality could contribute to short-term fragmentation (Hejl et al. 2002; Rotenberry et al. 1995). Problems associated with forest fragmentation include overall habitat loss, an increase in edge habitat and edge effects, isolation effects, and increased vulnerability to predators (Finch 1991). Fire suppression became increasingly effective in the northern Rockies from the 1930s onward (Barrett et al. 1991). Other lands in the Beaver Creek Project Area are composed of mixed-severity fire regime and fire suppression over the past 90+ years has converted a mosaic of forest stands from a variety of age classes into a more homogeneous expanse of mid-successional mature forest (Hann et al. 1997). Aspen stands, old-growth ponderosa pine and larch, meadows, and patches of standing-dead timber are important wildlife habitats that have been reduced by fire suppression.

Numerous forest insects and diseases occur within the project area, and Upper Swan Valley, at endemic levels. They have been contributing to forest vegetative structure for some time. Historically, endemic levels of insects have occasionally turned into epidemic outbreaks in the Swan Valley. Mountain pine beetle outbreaks are known to have occurred in the Swan Valley throughout the 1980s; and although mountain pine beetle populations have been high in the past 5 years, species population dynamics suggest that it is likely that a similar increase has historically occurred at some time in the past.

The Beaver Creek Project Area spans a diverse amount of habitats and elevations. The low elevations of the project area contain diverse riparian environments, including stream channels and wetland complexes. The mid-elevations contain mixed-conifer forests and the upper elevations of the project area are dominated by sub-alpine and whitebark pine habitats.

The Flathead National Forest participates in two projects that included monitoring populations of migratory birds;

1. The Northern Region Landbird Monitoring Program, which looks at habitat relationships of landbirds that breed in the Northern Rocky Mountains, and
2. The Monitoring Avian Productivity and Survivorship (MAPS) Program, which was a cooperative effort with the Institute for Bird Populations (Point Reyes Station, California) with the objective of providing broad scale data on productivity and survivorship (USDA 2015).

Both of these programs were important to landscape and regional distributional and trend information. Table 99 displays some of the population information obtained from these and other local monitoring/inventory projects. A table of detected bird species within and around the Beaver Creek Project area is located in Project File Exhibit H-1.

**TABLE 99. OBSERVATIONS ON FLATHEAD NATIONAL FOREST OF NEOTROPICAL MIGRATORY BIRDS LISTED THAT HAVE CONSERVATION CONCERNS.**

| COMMON NAME (AND STATUS) | SOC, TES | GLOBAL & STATE RANKS [A] | R1 LANDBIRD PROGRAM ON FNF 1994 TO 2004 [B] | | MAX. ¼ W/OBS. WITH DIRECT EVIDENCE OF BREEDING, PAST 5 YEARS [C] | MAPS ON FNF [D] | FNF LANDS VIA FWP TRACKER BUT NOT LANDBIRD NOR MAPS |
|---|---|---|---|---|---|---|---|
| | | | ABUND. | YEARS | | | |
| Black Swift | SOC | G4, S1B | 0 | -- | 1-5 | Hilary Meadow and 6-mile Creek | 1996 (several in Glacier NP) |
| Black-chinned Hummingbird | | G5, S4B | 2 | 1 | 25+ | -- | -- |
| Bobolink | SOC | G5, S3B | 0 | -- | 1-5 | (Not expected) | 1991 (several in Flathead Valley) |
| Brewer's Sparrow | SOC | G5, S3B | 0 | -- | 1-5 | -- | -- |
| Cassin's Vireo (Solitary Vireo in 1991) | | G5, S4B | 367 | 7 | 30+ | -- | Abundant and widespread |
| Clay-colored Sparrow | | G5, S4B | 0 | -- | 6-10 | -- | 1991 (some SE of Flathead Lake) |
| Cordilleran Flycatcher | | G5, S4B | 8 | 3 | 1-5 | -- | -- |
| Flammulated Owl | Sens, SOC | G4, S3B | 0 | -- | 1-5 | (Not expected) | -- |
| Grasshopper Sparrow | SOC | G5, S3B | 2 | 1 | 1-5 | -- | (many SE of Flathead Lake) |
| Gray Catbird | | G5, S5B | 2 | 1 | 1-5 | -- | 1989, 2001, 2005, 2007, 2008 |
| Hammond's Flycatcher | | G5, S4B | 165 | 7 | 10+ | -- | 1994, 1998, 2008 |
| Lazuli Bunting | | G5, S4B | 34 | 5 | 1-7 | -- | 1998, 2005 |
| Merlin | | G5, S4 | 0 | -- | 1-10 | -- | 1991, 1998 |
| Olive-sided Flycatcher | | G4, S4B | 511 | 7 | 35+ | -- | 1991, 1993, 1994, 1996 thru 2009 |
| Peregrine Falcon | Sens, SOC | G5, S3 | 0 | -- | 14-18 | (Not expected) | 2 eyries on FNF |

**TABLE 99. OBSERVATIONS ON FLATHEAD NATIONAL FOREST OF NEOTROPICAL MIGRATORY BIRDS LISTED THAT HAVE CONSERVATION CONCERNS.**

| COMMON NAME (AND STATUS) | SOC, TES | GLOBAL & STATE RANKS [A] | R1 LANDBIRD PROGRAM ON FNF 1994 TO 2004 [B] | | MAX. ¼ W/OBS. WITH DIRECT EVIDENCE OF BREEDING, PAST 5 YEARS [C] | MAPS ON FNF [D] | FNF LANDS VIA FWP TRACKER BUT NOT LANDBIRD NOR MAPS |
|---|---|---|---|---|---|---|---|
| | | | ABUND. | YEARS | | | |
| Red-eyed Vireo | | G5, S4B | 29 | 5 | 5-8 | -- | 1990 thru 95, 1999, 2000 |
| Red-naped Sapsucker | | G5, S4B | 261 | 7 | 22-30 | -- | 1999 (commonly seen & not reported) |
| Rufous Hummingbird | PSOC | G5, S4B | 107 | 7 | 9-12 | -- | 1990, 1993, 1994, 1999, 2001, 2005, 2008 |
| Swainson's Hawk | PSOC | G5, S4B | 0 | -- | 1-5 | (Not expected) | 1985, 1997 |
| Tennessee Warbler | PSOC | G5, S3B | 0 | -- | 4+ | -- | 1994, 2010 |
| Turkey Vulture | | G5, S4B | 4 | 3 | 4-6 | (Not expected) | (commonly seen & not reported) |
| Vaux's Swift | | G5, S4B | 40 | 7 | 9-16 | -- | 1991, 1993, 1994, 1998, 2000, 2008 |
| Veery | SOC | G5, S3B | 2 | 1 | 10-16 | Hilary Meadow, Swan Oxbox2, and Simpson Creek | 1995 |
| Williamson's Sapsucker | | G5, S4B | 43 | 6 | 1-4 | -- | 1989, 1994 |
| Willow Flycatcher | | G5, S4B | 8 | 4 | 9-16 | -- | 1990 thru 95 1995, 2001, 2005, 2008 |

a = See Table 2 above for explanations of rankings and status. b = Avian Science Center's Northern Region Landbird Monitoring Program, University of Montana (http://avianscience.dbs.umt.edu/data_portal/data_portal.php). c = MDFW&P and Montana NHP online "Field guide" as of 9/2010, maximum density in a quarter lat/long area (http://fieldguide.mt.gov/default.aspx). d = Monitoring Avian Productivity and Survivorship (MAPS) Program as of 9/2010, (http://www.birdpop.org/nbii/nbiihome.asp). e = MDFW&P and Montana NHP online observation "Tracker" as of 9/2010, (http://mtnhp.org/Tracker/NHTMap.aspx).

In 2010, Rocky Mountain Bird Observatory, in conjunction with its partners, conducted landbird monitoring in several BCRs, including BCR 10 (Northern Rockies). This project used a spatially balanced sampling design and a survey protocol implemented as part of a program titled "Integrated Monitoring in Bird Conservation Regions" (IMBCR). The IMBCR design allows inferences to avian species occurrence and population sizes from local to BCR scales (Van Lanen et al. 2014).

The Upper Swan Valley provides a considerable diversity of habitats for NTMBs, including riparian areas, old growth habitat, and snag habitat. For more information on the existing condition of old growth habitats and snag habitat in the project area, refer to those separate wildlife sections. For more information about wildlife habitat conditions across the Flathead National Forest relevant to many Neotropical migrants, see the Final EIS for Forest Plan Amendment 21 (USDA 1998).

# ENVIRONMENTAL CONSEQUENCES

The Beaver Creek Project consists of a No Action Alternative and two action alternatives. A cumulative effect considers and describes proposed activities in addition to the past, current, and reasonably foreseeable activities. Cumulative effects are discussed throughout this section under the specific alternatives. For a detailed discussion of all known past, present, and foreseeable activities see the Cumulative Effects Worksheet for Migratory Birds (Project File Exhibit H-13).

## ALTERNATIVE 1 - NO ACTION
## DIRECT, INDIRECT, AND CUMULATIVE EFFECTS

Under this alternative, there would be no fuels reduction, no forest health treatments, no wilderness or prescribed burning, no planting, no road decommissioning or other proposed treatments. There would be no direct effects to migratory birds.

A possible indirect effect of Alternative 1 would be an increased likelihood of a more intense wildfire event in the Beaver Creek area. Indirectly, taking no action to reduce fuel buildups could increase the potential for a loss of riparian, old growth or late-seral forest in the vicinity of the project area. Wildfire has been suppressed for the last century. Without frequent low intensity fire, vegetation has grown increasing high-severity forest fuel conditions in the Beaver Creek area (See Fire and Fuels Section of this EA). However, the level of effects would depend on the size and intensity of the wildfire, which would depend on the actual location, intensity, moisture and weather conditions associated with a presently unknown future fire event. An increase in wildfire potential would benefit bird species that are associated with open conditions or snag habitat. On the other hand, an increase in the potential for large, stand-replacement fires would be negative for bird species that are associated with mature forest or closed canopy conditions. Overall, a large, severe fire event would likely reduce the diversity of habitats within the Beaver Creek area thereby reducing the overall bird species diversity that take advantage of different habitats or different forest successional stages.

Alternative 1 – No Action Alternative would leave habitats across the project area to continue with natural vegetative processes. Where lodgepole pine is the dominant tree species, mountain pine beetle affected trees would die and fall over, leaving a more open forest stand. This would be beneficial for some migratory birds and not beneficial for others, just as the presence of bug-killed trees would be beneficial for some birds, and not for others. Forest succession would continue to occur and without fire or other ecological disturbance, aspen stands would continue to be crowded out by more shade-tolerant conifers.

Riparian areas and older forest stands with mixed tree species would continue to provide important habitat for migratory birds, and there would be no direct reduction in the amount of down woody habitat or snags as a result of management activities. A wide variety of habitats would be available across the Upper Swan Valley to support multiple species of NTMBs.

Fragmentation of forested habitats on private lands in the area would probably continue. Many of these lands have been acquired by the Forest Service or sold under conservation easements, which will help to decrease further fragmentation in the area.

## ALTERNATIVES 2 AND 3 – ACTION ALTERNATIVES
## DIRECT AND INDIRECT EFFECTS

### CANOPY COVER

In Alternatives 2 and 3, there are 777 acres and 220 acres, respectively, of regeneration treatment proposed. Under regeneration treatment (clearcut/seed tree/group selection) nearly all of the existing overstory trees would be removed. For group selection treatments, patches or group of trees would be removed within the stand and, therefore, there would be remaining forest canopy cover in the matrix surrounding the harvested patches. Based on FSVeg analysis, canopy cover in group selection units would range from 0 to 70 percent and average 30 percent (Project File Exhibit H-10). The direct effect of regeneration treatments may be beneficial to bird species that prefer non-forested habitats; it would be a negative effect for bird species that are associated with forested conditions, especially for birds that prefer older forests with closed canopies. It should be noted that in many of the regeneration units, under each alternative, the characteristics of closed canopy versus open canopy are being affected by mountain pine beetle, regardless of the proposed project. The regeneration units would not provide significant canopy cover for up to approximately 100 years depending on site conditions.

In Alternative 2, there would also be 1,574 acres of intermediate treatments where overstory trees would be retained. In Alternative 3, there are 1,366 acres of commercial thinning proposed. Thinning the overstory, understory, or both, in forested stands, would have a negative effect on some bird species and a positive effect on other bird species. As an example, there would be immediate negative effects to the ruby-crowned kinglet, which prefers closed canopy conditions. Opening up the overstory, however, would produce positive effects for the yellow-rumped warbler and the western tanager.

Under Alternatives 2 and 3, there are 882 and 552 acres of pre-commercial thinning proposed, respectively; these units are mostly sapling stands that do not provide true overstory canopy cover. There would be no direct effect to canopy cover across the project area as result of the proposed pre-commercial treatments. Daylighting treatments would remove small sized understory trees around large mature trees (82 acres in Alternative 2; 70 acres in Alternative 3). Daylighting would reduce overall canopy cover within a stand, but canopy cover would remain high in these treatment units (40 to 65 percent; average of 50 percent). Fill planting would increase forest tree regeneration in natural and manmade openings. Planting would increase mature forest canopy cover over the next 50 years.

## OLD GROWTH HABITAT

Old growth habitats are known to contain some of the highest density and greatest diversity of bird species. There is no treatment proposed in old growth habitat under any of the action alternatives. There would be no direct effects on existing old growth habitat with implementation of the Beaver Creek Project. For discussion of possible indirect effects, (e.g., creation of high contrast edge, etc.) refer to the Old Growth Associated Wildlife Species Section of this EA.

## PRESCRIBED FIRE

Both action alternatives include prescribed burning. Prescribed fire would occur within proposed units after mechanical treatments have occurred. Prescribed fire would result in some mature tree mortality within prescribed burn areas. These activities would recruit snags and maintain opening and open forest habitats that benefit species like Hammond's flycatcher and hermit thrush. Prescribed fire proposed in the Mission Mountains Wilderness would occur in "spring-like" conditions where fire would have moderate severity and mixed effects across the fire area. These prescribed burns would decrease both overstory and understory density and create a large number of snags across the fire area. Prescribed fire would be beneficial to species like black-backed woodpecker, three-toed woodpecker, Lewis's woodpecker, and brown creeper. Indirectly, burning may benefit whitebark pine at higher elevations within the Mission Mountains Wilderness and improve habitat for Clark's nutcracker.

## RIPARIAN HABITAT

Potential effects to important riparian habitats would be greatly minimized through forest management standards and Design Criteria associated with INFISH and RHCAs. Refer to the Table 16 of this EA for Design Criteria for stream buffers, etc. Alternative 2 proposes approximately 110 acres of commercial thinning, improvement cuts, daylighting, pre-commercial thinning, and fill planting activities within RHCAs. These activities would be designed to maintain and protect large trees by reducing tree density within these units from future severe wildfire events. These activities would alter riparian forest over a small portion of riparian habitat available in the Beaver Creek area. The harvest activities would create open forest conditions favorable to species like Cassin's finch and chipping sparrow, while reducing closed understory habitats. In Alternative 3 only three treatment activities are proposed in RHCAs. In Unit 460 and 461 intermediate harvest will occur in an area where an existing road bisects the RHCA, these uphill units will not have additional affects to the RHCA area. Unit 4222 proposes an acre of planting in a degraded area within the RHCA and is determined to have beneficial effects to the RHCA. There would be no significant effects to potential NTMB habitat in existing riparian areas as a result of the proposed treatments.

## SNAG/DOWN WOODY HABITAT

Reducing the amount of snags or down woody material can remove habitat features that are essential or very important to many bird species (Bull et al. 2005). Research suggests that retaining the bulk of the largest material may decrease these effects (Bull et al. 1999; Porter et al. 2005). Although a proportion of snags and downed wood would be retained under each of the action alternatives, there would still be a decrease in the amount of snags and down woody material from the existing condition. The negative effects to snag/down woody habitat and migratory birds associated with this habitat would be greatest with implementation of Alternative 2 due to the difference in overall acres treated and harvest activities proposed in RHCAs, which typically have higher amounts of snags and downed woody debris. For more information on potential effects to snag/downed wood associated species, refer to the Snag and Down Wood Associated Wildlife Species Section of this EA.

## HABITAT DISPLACEMENT/MORTALITY

It is possible, under Alternative 2 or 3, that project implementation would directly affect NTMB through disturbance and/or occasional mortality associated with project activities. There is the potential that fuels reduction activities may disrupt nesting activity and foraging activity, or that proposed activities would directly contribute to nest failure. Displacement of bird species would be short-term, up to 5 years (seasons) or less in the various parts of the Beaver Creek Project Area where work would occur.

Existing open roads and closed roads would be used to conduct the proposed vegetative treatments and burning. Use of open roads would not be a change from the existing condition. Vegetative screening would be maintained along open roads. This would help to provide habitat security for a variety of wildlife species, including birds. Roads that are currently closed, but that would be used for proposed activities, would be closed to the general public during the time that they are utilized for timber management activities. Use of these roads that are normally closed would increase the potential for displacement of migratory birds while harvest activities are occurring along the roads. Spring habitat timing restrictions for grizzly bears would benefit nesting birds by restricting commercial activities until after June 15.

The potential for displacement or mortality would increase with the size and duration of the proposed activity; based on this rationale, Alternative 2 would have the greatest potential for displacement or mortality of NTMB.

## TEMPORARY ROAD CONSTRUCTION AND ROAD REALIGNMENT

Temporary road construction may remove site-specific bird habitat (e.g., trees, brush), or displace birds from the area during the actual construction or use of the temporary road. There would be greater potential for removal of site-specific habitat in Alternative 2 (7.5 miles proposed) than in Alternative 3 (5 miles). Both alternatives propose to realign 0.15 miles of road. This realignment would decrease the overall mileage of the existing transportation system in the Beaver Creek Project Area.

### ROAD STORAGE AND ROAD DECOMMISSIONING

In Alternatives 2 and 3, there are 4.5 miles of road decommissioning proposed. Further, both action alternatives propose 12.58 miles of ISS road treatments in the project area. These roads would have the same treatments as decommissioned roads including culverts removed, water bars installed, slash put on the road surface and re-seeding of the road bed. The entrances of these roads would be treated so that they would be impassable to motorized vehicles (such as re-contour for the first several hundred feet). On the ground, the ISS road treatments would not differ from decommissioned roads, except the ISS roads would remain on the road system and within the database, where the decommissioned roads would not. Both decommissioning and ISS treatments would increase habitat security for migratory birds by decreasing human access.

### SLASH TREATMENT

Proposed slash treatment consists of a variety of methods, including the scattering of slash where fuel loads are lighter, chipping of woody material, piling slash and burning the piles, and broadcast burning following logging activity. There is a potential for any of the proposed slash treatment methods to disrupt nesting activity and foraging activity, or to directly contribute to nest failure through disturbance or displacement. The spring habitat timing restriction would decrease disturbance to spring nesting activity. Potential for disruption of nesting activities would be greatest with implementation of Alternative 2 due to the greater acreage of proposed harvest activities.

### AQUATIC RESTORATION AND PLANTING ACTIVITIES

Both action alternatives would replace a culvert on NFS road #906 with the objective of preventing future failure of the existing culvert. The roadway and existing culvert are presently acting as a dam and have backed up a large wetland area to the south. Drainage of the wetland to natural levels would reduce the standing water and alter the extent of the riparian vegetation surrounding the wetland. This drainage may result in a minimal decrease in riparian vegetation in the short term, but vegetation (i.e., willow, dogwood) would regrow at the margins of the wetland boundary and riparian habitat would remain largely unchanged.

The proposed work for fish barriers in Alternative 2 and 3 may displace bird species. The barrier proposed in Alternative 2 on NFS road #91202 would have greatest potential for disturbance as work is estimated to take 6 to 8 weeks to complete. The work would occur outside of the spring season, which would minimize impacts to nesting activities. In total, the aquatic restoration activities would have little impact on migratory birds that use riparian habitats, given the relatively small area where activities are proposed compared to the total riparian habitat in the Beaver Creek Project Area.

Planting activities would promote forest conditions in proposed units. Over the next 50 years, these areas would become more forested to the benefit of species that select for mixed coniferous forest habitat. Aspen planting would benefit bird species, such as the ruffed grouse, flycatchers, or sapsuckers, in the project area over the next 30 years. Whitebark pine planting would increase whitebark pine in the project area and benefit Clark's nutcracker.

## ALTERNATIVES 2 AND 3 – ACTION ALTERNATIVES CUMULATIVE EFFECTS

There are seasonal and yearlong residences in the area, as well as other past established human activities, including road building, hiking, fire suppression, firewood cutting, hunting, trapping, and special uses. Private lands in the project area are more developed than these areas were historically. However, the development of homes and logging/clearing on private lands is primarily distributed in the lower elevations of the project area. The Beaver Creek Project Area still maintains a mosaic of bird habitats distributed through the elevations of the project area.

A wood fiber agreement was created as part of the Montana Legacy Project. Through this agreement, TNC retains the timber rights to donated Legacy Lands until 2018. The Nature Conservancy's harvest activities have occurred in the Beaver Creek Project Area, including the Two Bear Harvest and the Beaver Highway Project. These projects included 544 acres of overstory removal and 111 acres of commercial thinning. Commercial thinning units were thinned to 20-foot spacing (approximately 109 trees per acre) and overstory removal treatments retained approximately 1 to 8 trees per acre greater than 10-inches DBH and regenerating vegetation in the understory. The Nature Conservancy's harvest activities reduced canopy cover and snag density on Legacy Lands within the project area. Snags were retained in TNC harvest units. Both commercial thinning and overstory removal treatments retained patches of regenerating forest vegetation that would serve as cover and create some continuity of forest canopy cover between patches of older forest stands. None of these harvest activities occurred within riparian habitat buffers. These harvest activities have likely improved conditions for bird species that prefer open habitats, such as mountain bluebird or MacGillivray's warbler. Tree regeneration would continue on Legacy Lands over the next 50 years, and the change would benefit numerous bird species that associate with different forest structural stages through time.

The intermingled ownership pattern in the Swan Valley has made it difficult in the past to manage habitat connectivity with patch sizes that occurred historically. It is anticipated that, in the future, this condition would improve due to the acquisition of former PCTC lands. Most of the PCTC sections in the Upper Swan Valley have been conveyed to the Forest Service. This land conveyance has created larger blocks of public land that can be managed in larger patch sizes.

While factors outside of the Forest Service's control (e.g., deforestation of tropical wintering grounds, drought, exotic species, parasitic species) may have negative effects on neotropical migrants, the actions taken under any of the alternatives proposed with the Beaver Creek Project are not expected to contribute drastically to negative effects on migratory birds because sufficient habitat for a broad suite of NTMBs would be maintained. Habitats shift over time with dynamics in age class, composition, and structure changing naturally. Bird populations in the Swan Valley have adapted to this change with numbers of different species increasing or decreasing, depending on the availability of open forest, dense cover, old growth, snags, riparian habitats, or brush.

For more information about wildlife habitat conditions across the Flathead National Forest, relevant to migratory birds, reference the FEIS for the Flathead's Forest Plan Amendment 21 (USDA 1998), and the Flathead National Forest Evaluation and Compliance with NFMA Requirements/Diversity (USDA 2015b).

# EFFECTS OF A FOREST PLAN AMENDMENT TO ASSIGN MANAGEMENT AREAS TO ACQUIRED LANDS

The Beaver Creek Project includes a Forest Plan Amendment to assign interim management areas (MAs) to approximately 5,457 acres of former Plum Creek Timber Company (PCTC) lands recently acquired by the U.S. Forest Service to be managed as part of the Flathead National Forest. These interim management areas will be in effect on acquired lands until the ongoing Forest Plan Revision effort is completed, anticipated in 2 years.

The effects of the Forest Plan Amendment to migratory bird species within the analysis area under Alternative 1 – No Action Alternative are minor because the Forest Plan standards and guidelines to protect neotropical migratory bird species apply to all lands managed by the Flathead National Forest even if management areas are not assigned. The effects of the Forest Plan Amendment under Alternative 2 and 3 are also minor in scale because although they allow for timber management to occur on some lands they will maintain consistency with the forest-wide standards and guidelines that are in place to conserve migratory bird species over time. These MA assignments are consistent with the existing condition of these lands and the management direction assigned to adjacent lands and will not preclude future MA assignment under the Flathead Forest Plan Revision effort.

## REGULATORY FRAMEWORK AND CONSISTENCY

The 1988 amendment to the Fish and Wildlife Conservation Act mandates the USFWS to "identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act of 1973."

The Migratory Bird Treaty Act (MBTA) implements various treaties and conventions between the United States, Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. Under the Act, taking, killing, or possessing migratory birds, including nests and eggs, is unlawful. A list of NTMB protected by the MBTA is provided in 50 CFR 10.13.

In January 2001, an EO was signed outlining responsibilities of Federal agencies to protect migratory birds under the MBTA (EO 13186). The report, "Birds of Conservation Concern 2002," amended most recently in 2008, is the USFWS' most recent effort to carry out this mandate and to meet their responsibilities under the 1988 amendment. The overall goal of this report is to accurately identify the migratory and non-migratory bird species (beyond those already designated as federally threatened or endangered) that represent the highest conservation priority. In the report, the United States is broken down into Bird Conservation Regions (BCR), with bird species of conservation concern identified for each region. The Flathead National Forest is located in BCR 10. It is recommended that the Bird Conservation Regional lists, with bird species of conservation concern, be consulted in accordance with EO 13186, "Responsibilities of Federal Agencies to Protect Migratory Birds."

As a complimentary measure to EO 13186, the Forest Service and the USFWS entered into an MOU in 2008. The purpose of this MOU is to strengthen migratory bird conservation through enhanced collaboration between the agencies, in coordination with State, Tribal, and local governments. While this MOU has since expired, the Beaver Creek Project would be consistent with the direction included in the MOU.

Some migratory birds are covered by state hunting regulations; others are protected by non-game status with the MFWP. There are currently no Flathead Forest Plan Standards specific to migratory birds. The flammulated owl and the peregrine falcon (NTMBs) are also Forest sensitive species, and are discussed in the BE for the Beaver Creek Project, as well as in the Sensitive Wildlife Species Section of this EA.

No substantial loss of migratory bird habitat is expected by implementing this project. The intent of the MBTA, the 2001 EO, and the MOU to conserve and protect NTMB, would be met under the action alternatives. Implementation of the project alternatives would not result in a loss of viability to NTMB species.

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# RECREATION, WILDERNESS, LANDS, AND RANGE

## INTRODUCTION

The Beaver Creek Project Area is in the most southern portion of the Swan Lake Ranger District and can be separated into an east and west portion of the project area. The east portion of the project area is bordered by the Swan River to the north and the Lolo National Forest to the south and has opportunities for dispersed recreation, and hiking. The west portion of the project area contains the Mission Mountains Wilderness, which is bordered to the west and south by the Flathead Indian Reservation; this area has rugged backcountry recreation opportunities.

## ANALYSIS AREA

### SPATIAL BOUNDS

The analysis area for determining direct, indirect, and cumulative effects for Recreation, Wilderness, Lands, and Range Resources are the lands within the Beaver Creek Project Area boundary. It is on these lands that all proposed activities would take place, and where effects to these resources, if any, would most likely occur.

### TEMPORAL BOUNDS

The effects are limited to the operational period of the proposed action, including any post-activity treatments.

## AFFECTED ENVIRONMENT

### RECREATION

Existing recreational activities and opportunities in the project area can be categorized into three groups:

1. Developed recreation sites,
2. Dispersed recreation use, and
3. Travel routes.

Developed recreation sites are those facilities where the Forest Service has constructed amenities and encourages public use. Dispersed uses are those that are occurring on the landscape, often in locations where the Forest Service does nothing to encourage or discourage use and has installed few if any amenities. Travel routes are those roads and trails that facilitate access and recreation in the project area.

### DEVELOPED SITES

The only developed recreation site in the project area is the Crystal Lake South Trailhead (Table 100). There is a bulletin board, sign, hitching rail, and space for five vehicles to park. This trailhead serves the Jocko Trail #34 and Crystal Lake Trail #351. Popular destinations are Crystal Lake and Gray Wolf Lake.

**TABLE 100. DEVELOPED RECREATION SITES WITHIN THE BEAVER CREEK PROJECT AREA.**

| NAME | USE |
|---|---|
| Crystal Lake South | Trailhead serving #34 Jocko and #351 Crystal Lake Trails |

### DISPERSED USE

The project area is used for a variety of dispersed recreation activities at various times during the year such as camping, driving for pleasure, wildlife watching, hiking access, picnicking, huckleberry picking, firewood gathering, hunting, fishing, snowmobiling, cross country skiing, or just the opportunity to be outdoors. There are eight dispersed sites that have been inventoried as displayed in Table 101. These sites are areas where use has hardened the sites and show frequent use such as fire rings.

**TABLE 101. INVENTORIED DISPERSED SITES WITHIN THE BEAVER CREEK PROJECT AREA.**

| SITE NAME | USE |
|---|---|
| NFSR #906 Landing Site | Large pull out camping |
| Camp Near Closed NFSR #11646 | Small dispersed camping |
| NFSR #906 Creek Site | Small pull in camping |
| NFSR #9563 Site 1 | Long pull in camping |
| NFSR #9563 Site 2 | Wide pull out camping |
| NFSR #9563 Site 3 | Small pull in camping |
| NFSR #9563 Site 4 | Small pull in camping |
| NFSR #9563 Site 5 | Long pull in camping |

## TRAVEL ROUTES

### TRAILS

The following table lists the NFS trails within the project area and their current travel management.

**TABLE 102. TRAILS WITHIN THE BEAVER CREEK PROJECT AREA.**

| TRAIL NAME | MILES | TYPE |
|---|---|---|
| NFS Trail #34 Jocko Trail | 5.58 | Hiking/Bicycle/Pack and Saddle |
| NFS Trail #34 Jocko Trail | 3.92 | Wilderness non-Motorized/non-Mechanized |
| NFS Trail #351 Crystal Lake | 2.46 | Hiking/Bicycle/Pack and Saddle |
| NFS Trail #351 Crystal Lake | 4.24 | Wilderness non-motorized/non-mechanized |
| NFS Trail #490 Lindbergh | 2.80 | Wilderness non-motorized/non-mechanized |

Three trails in the Beaver Creek Project Area receive moderate use and are the only system trails that allow access to the southern portion of the Mission Mountains Wilderness. The beginning of the Jocko Trail and Crystal Lake South Trail allow bicycle travel up to the wilderness border. The Jocko and Crystal Lake Trails also allow pack animals; the Crystal Lake North Trail does not. Communication with the Confederated Salish Kootenai Tribe has indicated that the Jocko Trail

#34 is also commonly known as the Gray Wolf Trail, because the Forest Service database identifies Trail #34 as the Jocko Trail, it will be referred to by this name in this report.

### ROADS

In general, driving for pleasure is one of the most popular recreation activities within the Beaver Creek Project and the Flathead National Forest. Wheeled motorized access on forest roads also provides users access for hiking, firewood gathering, hunting, fishing, camping, huckleberry picking, ATV/motorcycle riding, wildlife viewing, stock use, and appreciating their National Forests from a vehicle. Within the project area, there are approximately 8.9 miles of road open yearlong to wheeled motorized use.

### WINTER MOTORIZED USE

The Flathead National Forest Winter Motorized Recreation Plan Record of Decision was signed November 17, 2006 (Project File Exhibit O-6). This plan designated winter-motorized routes, play areas, and seasons for snowmobile recreation throughout the Flathead National Forest. Routes and areas designated for winter motorized use are depicted on the 2011 Over the Snow Motor Vehicle Use Map (Project File Exhibit O-4). Routes and areas where snowmobiling are not allowed include the areas near Lindbergh Lake, Beaver Lake, as well as the Mission Mountains Wilderness.

## WILDERNESS

The Mission Mountains Wilderness was designated wilderness by Congress on January 5, 1975, with the enactment of PL 93-632. The 73,573-acre area is characterized by its high alpine peaks. The entire wilderness is roughly 30 miles from north to south while only 5 to 7 miles from east to west. The area is bounded on the west by the Mission Mountains Tribal Wilderness, an area of approximately 89,500 acres. The project area contains some of the highest elevation country with many open rocky slopes, alpine peaks, and larger lakes.

There are approximately 20,026 acres of wilderness in the project area. The main recreation use in the project area is hiking from June to September; this area is also very popular with hunters in the fall. Key destinations during the summer are Crystal Lake and Gray Wolf Lake. During the remainder of the year snowfall significantly limits recreational use to cross-country skiing and snowshoeing.

## LANDS

Land ownership patterns in the Beaver Creek Project Area have changed over the last 15 years. What was once a landscape characterized by a checkerboard ownership pattern with the majority landowners being the Forest Service and PCTC, is now largely in Forest Service ownership. Since 1998, the Forest Service has acquired approximately 5,432 acres in the project area. Acreage of other privately-held lands has generally remained constant over this period.

Table 103 below details the acquisition of lands by the Forest Service in the project area.

**TABLE 103. FEDERAL LAND ACQUISITION WITHIN THE BEAVER CREEK PROJECT AREA.**

| PARCEL | ACREAGE IN PROJECT AREA | YEAR ACQUIRED | ACQUISITION METHOD |
|---|---|---|---|
| Sec. 13, T19N, R17W | 320.4 | 1998 | Land & Water Conservation Fund - Purchase |
| Sec. 17, T19N, R16W | 603.1 | 2004 | Land & Water Conservation Fund – Purchase |
| Sec. 19, T19N, R16W | 600.2 | 2003 | Land & Water Conservation Fund – Purchase |
| Sec. 26, T19N, R17W | 523.9 | 2006 | Land & Water Conservation Fund – Purchase |
| Sec. 25, T19N, R17 W | 638.9 | 2006 | Land & Water Conservation Fund - Purchase |
| Sec. 35, T19N, R17W | 414.7 | 1998 | Land & Water Conservation Fund- Purchase |

**TABLE 103. FEDERAL LAND ACQUISITION WITHIN THE BEAVER CREEK PROJECT AREA.**

| PARCEL | ACREAGE IN PROJECT AREA | YEAR ACQUIRED | ACQUISITION METHOD |
|---|---|---|---|
| Sec. 29, T19N, R16W | 194.2 | 2008-2014 | Montana Legacy Project – Purchase |
| Sec. 21, T19N, R16W | 320.6 | 2008-2014 | Montana Legacy Project – Donation |
| Sec. 31, T19N, R16W | 526.9 | 2008-2014 | Montana Legacy Project - Donation |
| Sec. 11, T18N, R17W | 645.2 | 2008-2014 | Montana Legacy Project – Donation |
| Sec. 01, T18N, R17W | 643.8 | 2008-2014 | Montana Legacy Project - Donation |
| *Total* | **5431.9*** | *1998-2014* | |

* These acres reflect the recorded parcels housed at the USFS Region 1 office. Due to GIS discrepancies, these acres do not correspond with the approximate acreages used for MA calculations.

## LANDS SPECIAL USES

There are 38 Special Use Permits in the project area. These permits provide telephone service, power, and access to privately-owned lands. The authorizations are detailed below in the following table.

**TABLE 104. LANDS SPECIAL USES WITHIN THE BEAVER CREEK PROJECT AREA.**

| LEGAL DESCRIPTION | USE CODE | DESCRIPTION | PERMITTEE |
|---|---|---|---|
| Sec. 8 T19N R16W | 641 | REA Power-line | Missoula Electric Cooperative |
| Sec. 8 R19N R16W | 741 | DOT Easement | MT Dept. of Transportation |
| Sec. 8 T19N R16W | 751 | FRTA Road Easement | Missoula County |
| Sec. 8 T19N R16W | 822 | REA Telephone-line | Blackfoot Telephone Cooperative |
| Sec. 8 T19N R16W | 823 | Fiber Optic Cable | Blackfoot Telephone Cooperative |
| Sec. 9 T19N R16W | 641 | REA Power-line | Missoula Electric Cooperative |
| Sec. 9 T19N R16W | 741 | FRTA Road Easement | MT Dept. of Transportation |
| Sec. 9 T19N R16W | 822 | REA Telephone Line | Blackfoot Telephone Cooperative |
| Sec. 9 T19N R16W | 823 | Fiber Optic Line | Blackfoot Telephone Cooperative |
| Sec. 16 T19N R16W | 641 | REA Power-line | Missoula Electric Cooperative |
| Sec. 16 T19N R16W | 741 | DOT Easement | MT Dept. of Transportation |
| Sec. 16 T19N R16W | 751 | FRTA Road Easement | BNSF Railway |
| Sec. 16 T19N R16W | 822 | REA Telephone Line | Blackfoot Telephone Cooperative |
| Sec. 16 T19N R16W | 823 | Fiber Optic Cable | Blackfoot Telephone Cooperative |
| Sec. 18 T19N R16W | 753 | FLPMA Road Permit | Eres Una Barbara LLC |
| Sec. 19 T19N R16W | 753 | FLPMA Road Permit | Eres Una Barbara LLC |
| Sec. 20 T19N R16W | 641 | REA Power-line | Missoula Electric Cooperative |
| Sec. 20 T19N R16W | 752 | FRTA Road Easement | BNSF Railway |
| Sec. 20 T19N R16W | 753 | FLPMA Road Permit | Arrowwood Family Trust |
| Sec. 20 T19N R16W | 822 | EA Telephone Line | Blackfoot Telephone Cooperative |
| Sec. 20 T19N R16W | 823 | Fiber Optic Cable | Blackfoot Telephone Cooperative |
| Sec. 21 T19N R16W | 641 | REA Power-line | Missoula Electric Cooperative |
| Sec. 21 T19N R16W | 741 | REA Power-line | MT Dept. of Transportation |
| Sec. 21 T19N R16W | 822 | REA Telephone Line | Blackfoot Telephone Cooperative |
| Sec. 21 T19N R16W | 823 | Fiber Optic Cable | Blackfoot Telephone Cooperative |
| Sec. 22 T19N R16W | 641 | REA Power-line | Missoula Electric Cooperative |
| Sec. 22 T19N R16W | 741 | DOT Easement | MT Dept. of Transportation |
| Sec. 22 T19N R16W | 822 | REA Telephone Line | Blackfoot Telephone Cooperative |
| Sec. 22 T19N R16W | 823 | Fiber Optic Cable | Blackfoot Telephone Cooperative |
| Sec. 29 T19N R16W | 641 | REA Power-line | Missoula Electric Cooperative |
| Sec. 29 T19N R16W | 822 | REA Telephone Line | Blackfoot Telephone Cooperative |
| Sec. 29 T19N R16W | 823 | Fiber Optic Cable | Blackfoot Telephone Cooperative |
| Sec. 30 T19N R16W | 753 | FLPMA Road Permit | Beaver Creek Road User's Association |

**TABLE 104. LANDS SPECIAL USES WITHIN THE BEAVER CREEK PROJECT AREA.**

| LEGAL DESCRIPTION | USE CODE | DESCRIPTION | PERMITTEE |
|---|---|---|---|
| Sec. 12 T19N R17W | 641 | REA Power-line | Missoula Electric Cooperative |
| Sec. 12 T19N R17W | 822 | REA Telephone Line | Blackfoot Telephone Cooperative |
| Sec. 12 T19N R17W | 823 | REA Telephone Line | Blackfoot Telephone Cooperative. |
| Sec. 13 T19N R17W | 753 | FLPMA Road Permit | Eres Una Barbara LLC |
| Sec. 36 T19N R17W | 751 | FRTA Road Easement | BNSF Railway |

## RANGE

The Holland Range Allotment covers 11,797 acres in the project area. The allotment allows 50 cows between June 1 and September 30. This allotment is actively stocked; however, cattle have not grazed on portions of the allotment within the project area in a number of years.

# ENVIRONMENTAL CONSEQUENCES

The Beaver Creek Project consists of two action alternatives and a No Action Alternative. The alternatives are described in detail in Chapter 2 of this EA. The Recreation, Wilderness, and Range Cumulative Effects Worksheet (Project File Exhibit O-2) consider and describe proposed activities in addition to the past, current, and reasonably foreseeable activities listed at the beginning of this chapter. Please refer to these worksheets for more detailed discussion on cumulative effects.

## ALTERNATIVE 1 – NO ACTION
## DIRECT AND INDIRECT EFFECTS

## RECREATION

Under this alternative, no new management actions would occur. The project area would continue to be used-for year round motorized and non-motorized recreation, such as driving for pleasure, huckleberry picking, camping, hiking, snowmobiling, skiing, and just enjoying the natural environment. In general, recreation would continue as it is now under current management direction. The developed and dispersed recreation pursuits would be unaffected if Alternative 1 were implemented. There would be no changes to the existing access management to trailheads, wheeled motorized use, and snowmobile seasons. Fuels reduction, forest health treatments, and associated activities would not take place, thereby, resulting in no effect to recreationists in the short term.

## WILDERNESS

The Wilderness Act challenges the Forest Service to preserve and protect designated lands “in their natural condition,” to retain their “primeval character and influence.” One of the greatest dilemmas for the wilderness manager has been allowing fire to play its natural role, uninfluenced by the hand of man, in designated wilderness. This is true in the Mission Mountains Wilderness. Since its designation in 1975, the Forest Service has, in all but two instances, suppressed wildfires in the Mission Mountains, including natural ignitions because fire managers have determined that there is a high probability for fire to escape the Fire Management Area (FMA) boundary June through August (Project File Exhibit K-64). During the 2010 and 2015 fire seasons, two lightning-caused fires were managed for resource benefit as the location, date of ignition and fuel conditions warranted allowing these two fires to burn unhindered. Decades of suppression and the topographical- and fuels-related challenges have allowed forest conditions in the project area and other portions of the Missions Mountains to develop conditions that can be described as lacking natural characteristics.

Under Alternative 1, no management-ignited prescribed fire would occur in the project area. Wildfires, either natural ignitions or human-caused, would continue to be evaluated and likely suppressed if they began before September 1.

Without prescribed fire and limited opportunities for a natural ignition to burn unhindered, stand and fuels conditions would likely continue to further depart from natural, historic conditions with the continued disruption of the historic fire regime under this alternative. A consideration of the direct and indirect effects of no action on the four identified quality indicators for wilderness character follows.

**TABLE 105. EFFECTS FOR QUALITY INDICATORS FOR WILDERNESS CHARACTER.**

| QUALITY | EFFECTS |
|---|---|
| Untrammeled | The project area would remain relatively un-manipulated and free from human control until such time as a wildfire could necessitate suppression actions that would affect this quality of wildness. |
| Natural | With continued minimal opportunities for the return of historic natural fire regimes, the quality of naturalness would continue to trend away from desired conditions resulting in an ongoing negative effect on wilderness character. |
| Undeveloped | There would be no direct or indirect effects to the undeveloped nature of the project area and wilderness under Alternative 1. |
| Solitude/Unconfined | There would be no direct or indirect effects to opportunities for solitude or primitive and unconfined recreation within the project area and wilderness from Alternative 1. |

In the short term, effects to wilderness character would be minimal. A central component of wilderness character is human perception. It is likely the average wilderness visitor travelling through the project area would continue to perceive the character of the area to be untrammeled, natural, and undeveloped. Alternative 1 – the No Action Alternative would likely have no direct or indirect effect on these qualities for the wilderness visitor or their ability to find solitude or unconfined recreation in the short term. This is the case as the average visitor does not recognize the vegetative conditions that are trending further and further away from a natural state. In the longer term, however, the effects of the No Action Alternative can be seen to increase for two of the wilderness character qualities.

Further departure from historic stand conditions and fire regimes, with continued suppression of wildfires, would lead to an ongoing loss of naturalness in the project area and a resulting negative impact on wilderness character. There is a potential of negative impact on the untrammeled quality of the project area, as well from suppression efforts of future wildfires. Suppression tactics would potentially be more impactful to the wilderness character should fuel loading continue to increase into the future. This is, of course, dependent on a natural or human-caused ignition outside the constraints when an ignition could be allowed to burn unhindered.

## LANDS AND RANGE

These resources would not be affected by Alternative 1, existing resources would remain available.

# ALTERNATIVES 2 AND 3 – ACTION ALTERNATIVES
# DIRECT AND INDIRECT EFFECTS

## RECREATION

The general nature of effects to recreational opportunities in the Beaver Creek Project Area can be characterized as short-term disturbance that is limited in scope. Logging or burning operations may displace recreationists, be they hunters, hikers, or recreational road users, during operational periods in the summer and fall as closures would be implemented for public safety. This is particularly true for those visitors using the Jocko Trail #34, Crystal Lake Trail #351 and Lindbergh Trail #490 that are located in proposed treatment areas.

Treatment Units 237, 238, 102, 251, and 252 in Alternative 2 and Units 238, 102, 251, and 254 in Alternative 3 encompass portions of the Jocko Trail #34. Treatments include pre-commercial thinning, commercial thinning, seed tree, and an improvement cut. Unit 252 in Alternative 2 and Unit 254 in Alternative 3 encompass portions of the Crystal Lake Trail #351. In Alternative 2 Unit 252 is proposed as a seed tree cut; in Alternative 3 Unit 254 is proposed as an improvement cut. Ground-based mechanized equipment would be used for felling and skidding operations. There would be short-term displacement of recreationists hiking these trails in the summer and fall when logging operations are conducted due to temporary closures. Design Criteria (Table 16) would be implemented to minimize the impacts to the recreation users and the trails while still implementing management activities.

Prescribed burn treatment Units 308 and 309 encompass portions of Trails #351 and #490. There would be short-term displacement to recreationists hiking these trails in the summer and fall when burning operations are conducted due to temporary closures.

Under Alternatives 2 and 3, Temporary Road A1 is located to the east of Trail #34 and comes to within about a 100 feet of this historic trail, but never crosses it. Recreationists hiking the trails could experience short-term noise effects from machinery operating during construction of this road. Temporary roads proposed in the action alternatives would not be available for public motorized use and would be obliterated at the end of the project.

Existing roads providing access to private land and to the general forest area would not change. Firewood and other forest products gathering opportunities would remain the same in all action alternatives. The indirect effects of increased traffic from timber management operations, including road maintenance such as BMP work on roads due to the proposed activities would be short-term.

Under Alternatives 2 and 3, NFS roads #10737, #10739, and #91203 are proposed for road storage once hauling is completed. NFS roads #10737 and #10739 currently intersect with the Jocko Trail #34; NFS road #91203 currently intersects with the Crystal Lake Trail #351. Storage activities for these roads would include construction of water bars, where necessary. Portions of the road templates would still be available for foot traffic.

Under Alternatives 2 and 3, NFS roads #10740 and #91204 would be decommissioned. National Forest System road #10740 intersects with Trail #34; NFS road #91204 intersects with Trail #351. Road decommissioning activities for these roads would consist of placing barriers at the beginning of the road, recontouring, and constructing water bars where needed. Proposed road decommissioning would affect some road miles that are currently available for non-motorized use. Portions of the road templates would still be available for foot traffic.

Short-term disturbance could affect recreation visitors as a result of temporary area closures being implemented during road storage and decommissioning activities.

There would be no changes to the existing access management to trailheads, wheeled motorized use, and snowmobile seasons.

## WILDERNESS

Suppression of wildfires and most importantly natural ignitions have manipulated the Mission Mountains Wilderness and the project area over time. The same can be said for the natural character of the area as unnatural fuel loads, stand conditions and a manipulated fire regime have developed.

Use of management-ignited prescribed fire could reduce hazardous fuel loading both within and adjacent to the wilderness in the project area. The burn would also help forest stands in the project area start a trend back toward historic fire regimes.

## FOREST SERVICE POLICY

As stated in FSM 2324.21 for Wilderness Management: Forest Service managers may ignite a prescribed fire in wilderness to reduce unnatural buildups of fuels only if necessary to meet at least one of the wilderness fire management objectives set forth in FSM 2324.21 and if all of the following conditions are met:

a. **The use of prescribed fire or other fuel treatment measures outside of wilderness is not sufficient to achieve fire management objectives within wilderness.**

   The ability to address the wildfire risks contained within the wilderness cannot be achieved strictly through treatments to areas outside of wilderness. Historical suppression of natural starts has caused the accumulation of downed woody material within the wilderness. As these fuels need to be addressed in order to achieve fire management objectives, it is necessary to treat the fuels where they are located.

b. **An Interdisciplinary Team of Resource Specialists has evaluated and recommended the proposed use of prescribed fire.**

   An Interdisciplinary Team of Resource Specialists has evaluated and recommended the proposed use of prescribed fire. Documentation of these recommendations can be found in this environmental assessment and the Beaver Creek Landscape Restoration Project File.

c. **The interested public has been involved appropriately in the decision.**

   As part of the NEPA process for this project, the public was solicited for comment through scoping letters and public meetings. Comments were received from the public regarding the proposed prescribed burning in the Mission Mountains Wilderness and were considered in the resource analyses displayed in this EA.

d. **Lightning-caused fires cannot be allowed to burn because they will pose serious threats to life and/or property within wilderness or to life, property, or natural resources outside of wilderness.**

   The ability to allow lightning caused fires to burn in the wilderness when they occur is severely limited due to the nature of the topography and area boundaries of the wilderness and the proximity of life and property outside of wilderness.

### WILDERNESS ACT AND FOREST SERVICE DIRECTION

As stated in the Wilderness Act of 1964 wilderness shall be managed following these purposes:

> “A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain.”

Where wilderness is “protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation…and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value." Additionally, "except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act (including measures required in emergencies involving the health and safety of persons within the area), there shall be no temporary road, no use of motor vehicles, motorized equipment or motorboats, no landing of aircraft, no other form of mechanical transport, and no structure or installation within any such area."

Yet as a special provision the Act states "the use of aircraft or motorboats, where these uses have already become established, may be permitted to continue subject to such restrictions as the Secretary of Agriculture deems desirable. In addition, such measures may be taken as may be necessary in the control of fire, insects, and diseases, subject to such conditions as the Secretary deems desirable." This project proposes prescribed burning using aerial ignition (See Chapter 2 - Alternatives) within the wilderness.

It should be noted that administrative use of aircraft including the landing of helicopters within wilderness is not a prohibited use. Private landing of helicopters however is prohibited, along with all other private uses of motorized or mechanical transport except as authorized by enabling legislation. The helicopter proposed for use in this project would not be landing in the wilderness area. Aircraft are not prohibited from flying over wilderness areas, and many private individuals enjoy this privilege. Although Forest Service policy (FSM 2326.03) "discourage(s) flights over wilderness within 2,000 feet of the ground surface, except in emergencies or for essential military missions," policy does not prohibit overflight.

Use of motorized equipment can be approved if needed "to meet minimum needs for protection and administration of the area as wilderness, only as follows: a delivery or application problem necessary to meet wilderness objectives cannot be resolved within reason through the use of non-motorized methods (FSM 2326.1)." In this project analysis, it has been determined that hand ignition alternatives were not the best management applications for this project. This is due to a larger number of personnel and longer time period needed to conduct the operation affecting the solitude and primitive recreation experience to recreation visitors. These intrusions would last the duration of implementation. In addition, the non-motorized method contains safety risks as the country is rugged and would be difficult for fire personnel to navigate while carrying drip torches. The terrain in this area would also affect the ability of employees to escape in a timely fashion should the fire not behave as expected. Forest Service guidelines recommend a "Minimum Requirements Decision Guide" to assist in making decisions regarding administrative actions in the wilderness. Based upon the factors discussed above with respect to safety and the duration and impacts to solitude and primitive recreation experiences, the minimum tool to meet objectives with the least impact on wilderness character and values is through aerial ignition by means of helicopter. Please refer to the Minimum Requirements Decision Guide (Project File Exhibit O-15) for the information and rationale being used for this determination.

Another objective listed in Manual direction states "protect and perpetuate wilderness character and public values including, but not limited to, opportunities for scientific study, education, solitude, physical and mental challenge and stimulation, inspiration, and primitive recreation experiences;" where the Forest Service direction identifies four qualities related to wilderness character:

- Untrammeled
- Natural
- Undeveloped
- Opportunities for solitude or a primitive and unconfined type of recreation

The effects of prescribed fire for both action alternatives on wilderness character are summarized below in Table 106. Effects to Quality Indicators for Wilderness Character..

**TABLE 106. EFFECTS TO QUALITY INDICATORS FOR WILDERNESS CHARACTER.**

| QUALITY | EFFECTS |
|---|---|
| Untrammeled | Management-ignited prescribed fire would have a short-term negative effect on the untrammeled character of the wilderness by manipulating vegetative conditions through ignited fire rather than awaiting a natural ignition to achieve the same goal. This short-term loss, however, has the long-term benefit of reducing the need for further manipulation or trammeling of the wilderness character by trending the vegetative conditions and fire regime toward a more natural and historic condition. After implementation of the burn, the relative risk of wildfire to adjacent lands and associated values is reduced. As such, the window of opportunity for naturally-ignited fire to be allowed to burn unhindered in the project area would be increased allowing for both more natural conditions and a wild, untrammeled condition. |
| Natural | Direct and indirect effects on the natural character of the project area and wilderness would be largely beneficial as fire would help re-establish natural stand conditions and historic fire regimes and increase opportunities for natural cycles of fire and forest regeneration to occur.<br><br>This project has the potential of striking a working balance between re-establishing natural characteristics and, over the longer term, benefiting wildness. In this case, despite a short-term negative effect to the untrammeled wild character of the wilderness, the long-term effect would support wildness and be beneficial to naturalness. |
| Undeveloped | The undeveloped character of the area would be affected in the short term by the implementation of prescribed fire. The presence of fire fighters during the burn, use of the helicopter and other ignition tools and the potential effects of containment actions if the fire exceeds the prescription or leaves the project area, all affect that undeveloped character of the area.<br><br>Similar to the prior two factors, long-term effects to the undeveloped character would likely be beneficial. Reducing fuels and re-introducing a more natural fire regime would likely result in few wildfires in the project area that require suppression with its resulting effects on the undeveloped character of the area. |
| Solitude/Unconfined | Effects to solitude and primitive and unconfined recreation would be limited to the implementation period of the burn as people are displaced from the area during operations. |

## LANDS

Activities are proposed on lands acquired by purchase as part of the Montana Legacy Project and the LWCF. Lands acquired by purchase shown in Table 106 above are not deed restricted to retain ownership of the merchantable timber, unlike those parcels that are acquired by donation. No harvest activities are proposed in the Beaver Creek Project Area on those lands acquired by donation listed in Table 106 above. None of the proposed treatments are contrary to the purposes for which the land was acquired. Please refer to Project File Exhibit O-11 for more information.

## RANGE

Approximately 3,939 acres of treatments are proposed within the Holland Range Allotment in Alternative 2 and 3,179 acres in Alternative 3. These treatments include regeneration harvest, intermediate harvest, pre-commercial thinning, prescribed burning, and fill planting. These actions would have a long-term beneficial effect on range resources, allowing for improved forage conditions. Grazing operations may be directly impacted by disturbance during harvest operations. The disturbance would be short-lived and as these are small portions of the much larger allotment the effects are considered minimal.

## ALTERNATIVES 2 AND 3 – ACTION ALTERNATIVES CUMULATIVE EFFECTS

Cumulative effects could result from the local and visiting populations that are increasing in the project area. Their desire for recreation activities, such as camping, hunting, fishing, huckleberry picking, firewood gathering, hiking, and biking would also increase. The collective effect of these activities could result in overlapping the recreationists onto the same area, trails, and roads. The cumulative results are increased maintenance and repairs on facilities, roads, and trails, providing for health and safety issues, and overall people management.

## EFFECTS OF A FOREST PLAN AMENDMENT TO ASSIGN MANAGEMENT AREAS TO ACQUIRED LANDS

The Beaver Creek Project includes a Forest Plan Amendment to assign interim management areas (MAs) to former PCTC lands acquired by the USDA Forest Service to be managed as part of the Flathead National Forest. These interim management areas will be in effect on acquired lands until the ongoing Forest Plan Revision effort is completed, anticipated in 2 years.

Alternative 1- No Action Alternative proposes not to assign management areas to acquired lands although forest-wide standards and guidelines will continue to apply to all NFS lands on the Flathead National Forest.

Alternative 2 proposes to assign 55 acres of acquired lands to MA 2, 8 acres of acquired lands to MA 5, 2,312 acres to MA 11C, 320 acres to MA12, 2,033 acres to MA 15, 712 acres to MA 15C, and 17 acres to MA 17. These proposed MA assignments were made in consideration of the characteristics of the acquired parcel and the management direction on surrounding lands. Table 11 describes the management emphasis for each of these MAs, but lands assigned to MA 5, MA 11C, MA 15, MA 15C, and MA 17 are considered suitable for timber production, while MA 2 and MA 12 are considered unsuitable for timber production although management activities may occur to benefit other resources.

Alternative 3 proposes different management area assignments to reflect public concern about the scenic integrity of lands on the east side of Lindbergh Lake. To accomplish this, Alternative 3 assigns MA 5 instead of MA 15 on approximately 502 acres of acquired land on the east side of Lindbergh Lake to maintain or enhance the scenic quality of these lands when viewed from Lindbergh Lake. Although MA 5 will allow for timber harvest to occur on these lands, it will emphasize the maintenance of a natural appearing landscape where management activities are not evident.

The Forest Plan Amendment will have minor effects to the recreation resources described in this report. The management areas assignments under Alternative 3 would be most beneficial to recreational resources because it would limit the potential for timber harvest on lands adjacent to existing trails, thereby minimizing some short term future effects that users might experience. The management area assignments would occur within the Holland Range Allotment but would not have a direct, indirect or cumulative effect to the allotment which will remain in place, with the same conditions, under all alternatives. The management area assignments will have minimal effects to wilderness under any of the alternatives because the acquired lands adjacent to wilderness have been managed as industrial timberlands prior to acquisition by the U.S. Forest Service. These MA assignments are consistent with the existing condition of these lands and the management direction assigned to adjacent lands and will not preclude future MA assignment under the Flathead Forest Plan Revision effort.

The cumulative effects of this forest plan amendment are very limited due to the geographic scope and expected duration of the amendment. At the Flathead National Forest scale, this amendment is only addressing management area direction on less than 1 percent of the NFS acreage on the Flathead National Forest. Additionally, the duration of this amendment is expected to be short-term since forest plan revision is ongoing with a decision expected in 2017. When the revision effort is completed, new management areas will be assigned across the entire Flathead National Forest, including the Beaver Creek project area, and will supersede any of the interim management areas proposed in this amendment. Reasonably foreseeable activities identified on the lands associated with the amendment is very limited as identified in Table 17 in Chapter 3 of this EA. If future land management activities occur on these lands they will be subject to forest-wide direction found in the Flathead National Forest Land and Resource Management Plan, federal and state laws, and other Forest Service regulations, as they are now, and will be guided by the proposed management area direction. Future land management activities such as timber harvest, road work, changes to public access etc. would be subject to site-specific NEPA analysis in the future.

## REGULATORY FRAMEWORK AND CONSISTENCY

This analysis tiers to the Forest Plan, Forest Plan EIS, and ROD, as amended. Chapter 2 of the Forest Plan establishes Forest-wide Recreation, Wilderness, and Range goals and standards. This project is consistent with Forest Plan direction for management of Recreation, Wilderness, Lands and Range Resources.

# SCENERY

## INTRODUCTION

The Beaver Creek Landscape Restoration Project will meet Forest Plan Visual Quality Objectives (VQOs). Several of the proposed vegetation treatment units would create visual contrast in highly visually sensitive areas, but these treatments are consistent with the Forest Plan. In comparing the action alternatives, Alternative 3 would incur the least amount of visual impacts in sensitive viewing locations, while Alternative 2 would incur the most relative primarily to Unit 83 and the amount of acreage seen within sensitive viewsheds.

## ANALYSIS AREA

### SPATIAL BOUNDS

The total project area encompasses approximately 34,962 acres. Views into the project area from sensitive areas and non-NFS lands (i.e., private lands) were documented. Sensitive travelways and use areas for this analysis are described in Table 107. The viewed units within the "seen" area as determined from the sensitive areas made up the spatial boundary for assessing direct and indirect effects. All of the viewed lands within the seen area made up the spatial boundaries for assessing cumulative effects (Figure-1. Viewshed and Viewpoint Location Map).

### TEMPORAL BOUNDS

The temporal boundary used to describe effects varied from "immediate upon project completion" up to 5 years (short-term). Effects visible for more than 5 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.

- **Retention VQO** - "Immediate reduction in form, line and color, texture contrast… during operations or immediately after… " (USDA 1974).
- **Partial Retention VQO** - "As soon after project completion as possible or at a minimum within the first year" (USDA 1974).
- **Modification VQO** - "Reduction in the form, line, color, and texture should be accomplished in the first year or at a minimum should meet existing regional guideline" (USDA 1974).
- **Maximum Modification VQO** - "Reduction of contrast should be accomplished in five years." (USDA 1974).

Cumulative effects were analyzed for a 25-year period, which is the approximate time vegetation regrowth would need to occur before impacts would appear negligible within the characteristic landscape.

## DATA SOURCES, METHODS, AND ASSUMPTIONS USED

The scenery resources inventory consisted 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 1995c) and the Visual Management System (VMS) (USDA 1974), National

Forest Landscape Management, Volume 2, Chapter 1, and the Agriculture Handbooks. 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 System. The project inventory was conducted in the summer of 2014. The forest-wide SMS inventory data was updated in 2006 and this data was also used in this analysis. 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 for change to the 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. Three-dimensional modeling from viewpoints helped to identify the potential for change in the landscape.

The primary criterion for determining the project's effect is in evaluation of scenic integrity levels or meeting the 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 result in an "adverse" effect. Achievement of or meeting the specified VQO would result in "no effect" finding, and meeting a VQO higher than specified would be a "beneficial" effect. Additional terms used to describe intensity of impacts include:

- **Negligible**: A majority of all visitors would not notice any effects or changes to the landscape. Design Criteria would not be necessary.
- **Minor**: The desired character of the landscape would be changed, but is not evident. Long-term deviations repeat form, line, and color and the effects on the valued landscape remain the same or appear intact; or effects would be short-term. If Design Criteria were necessary to offset adverse effects on Scenery Resources, it would be relatively simple and effective.
- **Moderate**: Effects would slightly alter the landscape character. Long-term deviations would be subordinate to the landscape character. Short-term effects could have a greater deviation, but would recover to express intactness and natural appearance. Design Criteria would reduce long-term impacts.
- **Major**: Effects would dominate the landscape character. There would be substantial consequences to Scenic Resources. Effects would be very obvious, widespread, and long-term. Intactness of the landscape would be greatly altered. Design Criteria may help reduce impact but impacts would remain evident or even dominant.

## ISSUES

The public scoping process identified the viewshed as seen from Lindbergh Lake as the key scenic resource issue.

## MEASUREMENT INDICATORS

Measurement indicators for the Scenery Resource will evaluate the effect of project implementation on scenic integrity (visual quality). Scenic Resource indicators to be evaluated are:

1. Change in landscape character.
2. Whether VQOs are met or not.

# AFFECTED ENVIRONMENT

## EXISTING LANDSCAPE CHARACTER/PLACE SETTING

The project area is located within the Mission Mountains and Swan Valley, an area of outstanding scenic beauty described as rugged, snowcapped peaks, several small glaciers, alpine lakes, meadows, and clear cold streams. The upland topography is generally rough and broken. Slopes in the basins are gentle, but are steep toward the ridge-top. Vertical cliffs, flat, slab-like boulders, and talus slopes are abundant. The rock is of metamorphic origin and the soils are thin and gravelly. Several crystal clear lakes and lush wetland areas are scattered throughout the project area creating thick pockets of vegetation and picturesque landscape.

Mountain top trees in the Mission Mountains are slow-growing; many are stunted and deformed. Trees are much thicker on the valley and lower mountain slopes. Common trees and shrubs are western larch, western red cedar, Engelmann spruce, Douglas fir, western white pine, lodgepole pine, whitebark pine, alpine fir, grand fir, quaking aspen, Rocky Mountain maple, and alder. The outstanding multi-colored displays of wildflowers in the alpine meadows and high basins are evident in late summer.

Although largely natural appearing mountain slopes are evident, contrasting past harvest units on nearby and distant hillsides can be seen as evidence of timber harvest activity in the Swan Valley.

## LANDSCAPE VISIBILITY

Distance zones are an important element of scenery analysis because as the distance increases the level of visible detail decreases. Also, as distance increases, so does the opportunity to minimize the impacts. Visibility is also affected because of topography, steep terrain, ridges, and road cuts that can affect sightlines. Topography and vegetation are factors used during project level planning and design.

Distance zones are measured from the viewpoint and are divided into five (5) categories:

1. Immediate Foreground, 0 to 300 feet.
2. Foreground, 300 feet to ½ mile.
3. Middle ground, ½ to 4 miles.
4. Background, 4 miles to horizon.
5. Seldom seen, areas not normally visible from the ground due to topography and lack of access.

Concern levels are a measure of the degree of importance the public places on a landscape being viewed from a particular travel way or use area. Three (3) concern levels are used. Level 1 is the most important and Level 3 the least important. Concern 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.
>
> **Level 2** areas are areas of lesser importance, such as state highways, county roads, secondary trails, scenic overlooks, summer home tracts etc.
>
> **Level 3** areas are low use areas and low volume roads, trails waterways or recreation facilities.

Visibility levels were identified through existing data compiled during the Forest-wide SMS Inventory 2006 and verified by field observation in 2011. The project area has several areas of high concern (Level 1) because of high visibility. These areas include foreground and middle ground views of residences along the north and east shoreline of Lindbergh Lake. Also, the immediate foreground of Highway 83 (Swan Highway) is of high concern as a major highway. Recreational users on the lake, at the campground, and other scattered residences located within the project area would also have high concern. Other secondary roads and forest lands would have lower concerns levels depending on their level of use. Screening by vegetation and topography conceals many parts of the project area which reduces the concern level for those forest lands (Figure 1).

## TRAVEL WAYS AND USE AREAS

Use areas are locations that receive concentrated public viewing use. They include vista points, trailheads, campgrounds, recreation residences, parks, ski resorts, and other recreation sites. Use areas can also include urban areas, towns, suburbs, or other public lands and gathering places. Travel ways represent linear concentrations of public viewing, including freeways, highways, roads, railroads, trails, commercial flight paths, rivers, canals, and other waterways.

Table 107 identifies use areas and travel ways not completely screened from the proposed treatment areas by vegetation or topography. The Distance Zone and Concern Level were identified from the 2006 SMS Forest-wide inventory as well as from GIS data and field observation.

**TABLE 107. SUMMARY OF TRAVEL WAYS AND USE AREAS.**

| NAME | DESCRIPTION | DISTANCE ZONE | CONCERN LEVEL |
|---|---|---|---|
| Swan Highway (Hwy 83) | Open to screened views | Immediate Foreground & Middleground & Background | 1 = High |
| Residences | Partially screened views | Immediate Foreground & Foreground | 1 = High |
| Lindbergh Lake Campground | Open view from lakeshore | Middleground & Background | 1 = High |
| Lindbergh Lake | Open views | Foreground, Middleground, & Background | 1 = High |
| Crystal Lake | Open views | Foreground | 1 = High |
| Crystal Lake Trail #351 | Open to partially screened | Immediate Foreground & Foreground | 1 = High |
| Lindbergh Lake Trail #490 | Open to partially screened | Immediate Foreground & Foreground | 1 = High |
| Elbow Overlook | Open to partially screened. | Middleground & Background | 2 = Moderate |
| NFS road #906 | Open to partially screened | Immediate Foreground | 2 = Moderate |
| Jocko Trail #34 | Open to partially screened | Immediate Foreground, Foreground & Middleground | 2 = Moderate |
| NFS road #79 | Open to partially screened | Immediate Foreground, Middleground & Background | 2 = Moderate |
| NFS Road #9563 (Beaver Creek Road) | Open to partially screened | Immediate Foreground | 2 = Moderate |
| Crystal Lake south trailhead | Open to partially screened | Foreground | 2 = Moderate |

| Table 107. Summary of Travel Ways and Use Areas. | | | |
|---|---|---|---|
| **Name** | **Description** | **Distance Zone** | **Concern Level** |
| Crystal Lake north trailhead | Open to partially screened | Immediate Foreground | 2 = Moderate |
| Dispersed Camping | Open to partially screened | Immediate Foreground | 2 = Moderate |
| NFS road #9557 (Old Barn Road) | Open to partially screened | Immediate Foreground | 3 = Low |
| NFS road #646 (Colt Beaver Cut Off) | Open to partially screened | Immediate Foreground | 3 = Low |
| Other NFS roads | Open to partially screened | Immediate Foreground | 3 = Low |

## Viewsheds and Viewpoints

Viewsheds are visible portions of the landscape seen from viewpoints. The level of screening within the project area varies greatly. Figure 48 identified areas screened by topography using a GIS 10-meter Digital Elevation Model. The map areas shown in red are completely screened (i.e., a standing individual in these areas would not have a view of the proposed 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 viewshed mapping helps identify large portions of land area that can be eliminated as potential viewing areas and focuses the inventory on travel ways and use areas with potential views of the proposed treatments.

Views from the Swan Highway (Hwy 83) and connected secondary roads are mostly screened by trees adjacent to the road. However, one opening shows open distant views and some of the proposed treatments are directly adjacent to Hwy 83. Views are generally open from areas on Lindbergh Lake into some of the proposed treatments area. Some secondary roads offer immediate foreground and middleground views of proposed treatment areas. Views from high on the mountains slopes, such as Elbow Overlook, also offer open views but are primarily seen in the distant middleground and background views. Views looking from the campground boat launch are also distant. Several units are visible at different locations on Lindbergh Lake. Numerous viewpoints were identified including residences, recreational facilities, and travel ways. A selection of these typical viewpoints were documented and included as part of this inventory. The following viewpoints were selected because they best represent critical views from use areas and travel ways with views towards the proposed treatments (See Viewshed and Viewpoint Location Map: Figure 48 and Figure 49 through Figure 58).

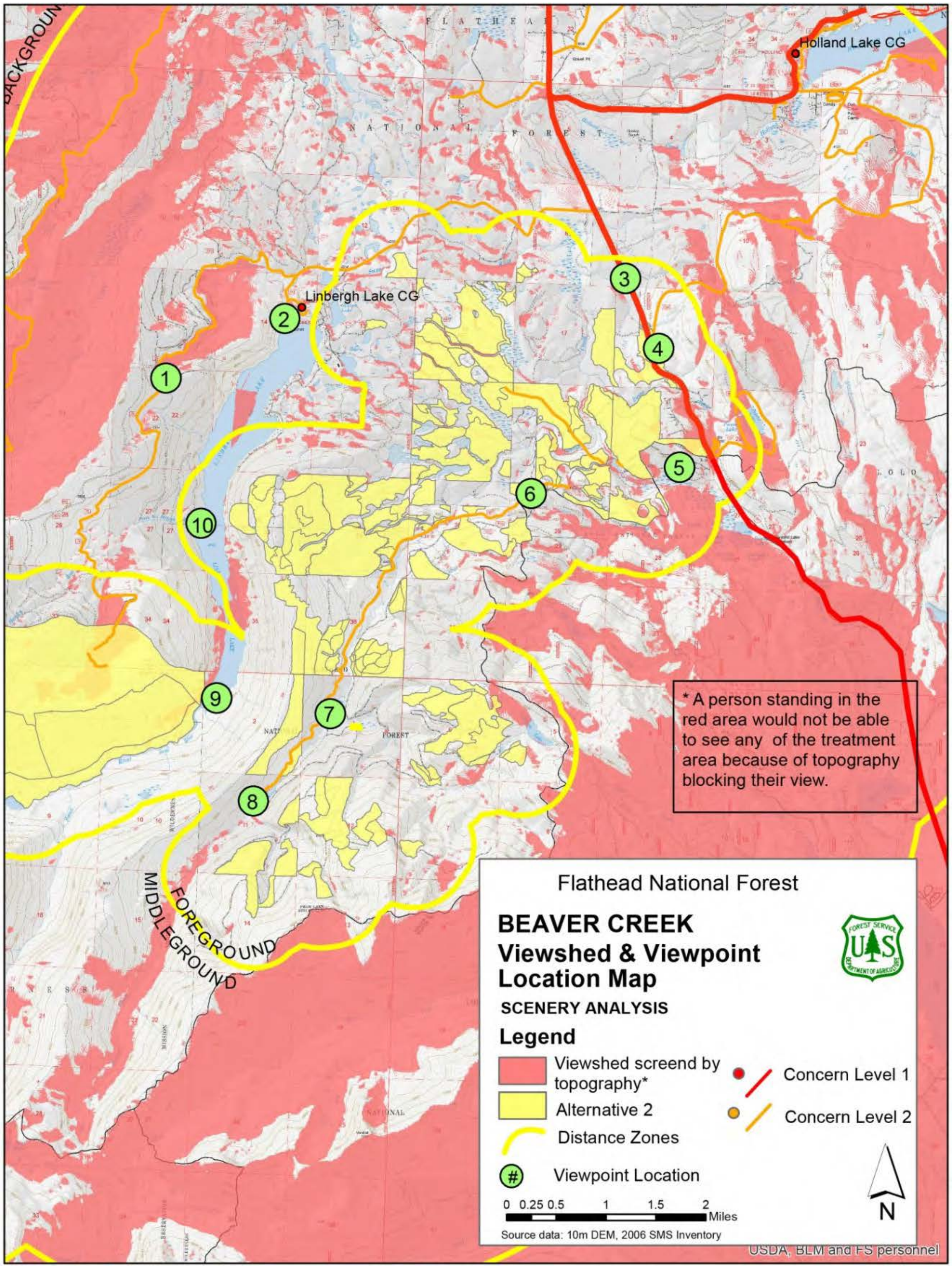


**FIGURE 48. VIEWSHED AND VIEWPOINT LOCATION MAP.**

**Figure 49. Viewpoint 1. Looking west from Elbow Overlook.**

**Figure 50. Viewpoint 2. Looking southeast across Lindbergh Lake from the campground boat launch.**

FIGURE 51. VIEWPOINT 3. VIEW FROM HIGHWAY 83 LOOKING SOUTH.

**Figure 52. Viewpoint 4. Looking South along Highway 83 into Unit 4.**

**Figure 53. Viewpoint 5. Looking southwest from Beaver Creek Road (NFS road #906).**

**Figure 54. Viewpoint 6. Located on NFS road #906.**

**FIGURE 55. VIEWPOINT 7. LOOKING UP FROM NFS ROAD #906, PAST SLASH PILES IN THE IMMEDIATE FOREGROUND.**

**FIGURE 56. VIEWPOINT 8. LOOKING WEST NEAR CRYSTAL LAKE SOUTH TRAILHEAD.**

**Figure 57. Viewpoint 9. Foreground view from the south end of Lindbergh Lake.**

**Figure 58. Viewpoint 10. Foreground view from Lindbergh Lake.**

## 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), p.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 project area as “Class B” typical with a portion, primarily located in riparian corridors, as “Class A” distinctive. There are very limited “Class C” indistinctive areas identified (Project File Exhibit Q-1). After field review, it was confirmed that the majority of the project area has typical to distinctive scenic attractiveness. Mountain slopes rising from Lindbergh Lake are classified as distinctive because of the variety of vegetation, water, and landform which create vividness.

## SCENIC CLASS

Scenic class combines the visibility and scenic attractiveness to identify land areas of public scenic value. Scenic classes from the 2006 SMS Forest-wide inventory range from 1 (highest) to 5 (lowest). Most of the project analysis area is Classes 1 and 2, which have high value. Portions that appear to be screened by topography were identified as having lower visibility and concern from the public (Project File Exhibit Q-1). The MT Highway 83 corridor, wilderness areas, and portions of the Lindbergh Lake viewshed are classified as a Level 1 Scenic Class.

## EXISTING SCENIC INTEGRITY

Existing Scenic Integrity is determined on the basis of visual changes that detract from the scenic quality of the area. The existing scenic integrity was determined through ground surveys of the project area and adjacent lands. Viewed from the use areas and travel ways documented earlier, the project area and adjacent lands have low to high scenic integrity relative to land ownership within the respective settings. The project area is largely intact, appears natural, and has a high existing scenic integrity; however, portions of the project area have low scenic integrity as a result of past harvest activities showing contrasting landings, slash piles, and disturbed soil. These areas of contrasting unnatural features are emphasized where the edge of vegetation changes along former and existing property boundary. Additionally, visible cut and fill areas along the roads around the project area decrease the intactness and appear unnatural on the landscape. Other areas of disturbance are in localized areas and are because of past vegetation harvests, utilities, roads and housing, which generally have low scenic intactness. However, on a landscape scale, the viewsheds of the project area have moderate to high scenic integrity, because of the grand scale of the surrounding mountain landscape, which appear largely natural appearing.

Within the Forest Plan, VQOs are identified geographically by MA and in narrative. Alternative 1 show the current VQOs as it related to current Forest Plan, Alternative 2 shows the VQOs associated with the proposed management area assignments for acquired lands under this alternative, and Alternative 3 shows VQOs relative to the management area proposed for acquired lands under Alternative 3. The VQOs in the project area that have treatments proposed include the following:

### RETENTION

Management activities are not visually evident. Activities may only repeat form, line, color, and texture, which is frequently found in the characteristic landscape. Change in their qualities, pattern, etc., should not be evident.

### PARTIAL RETENTION

Management activities remain visually subordinate to the characteristic landscape when managed according to the partial retention visual quality objective. Activities may repeat form, line, color, or texture common to the characteristic landscape, but not change in the qualities of size, amount, intensity, direction, pattern, etc. Activities remain subordinate to the visual strength of the characteristic landscape (USDA 1977).

### MODIFICATION

Management activities may dominate the original characteristic landscape. However, activities of vegetation and landform alteration must borrow from the naturally established for, line, color, or texture so completely and at such a scale that its visual characteristics are those of natural occurrences within the surrounding character type. Additional parts of these activities, such as structure, road, slash, root wads, etc., must remain visually subordinate to the proposed composition.

### MAXIMUM MODIFICATION

Vegetation and landform alterations may dominate the characteristics landscape. However, when viewed as background, the visual characteristics must be those of natural occurrence within the surrounding area or character type. When viewed as foreground or middleground, they may not appear to completely borrow from the natural established for, line, color, or texture. Alterations may also be out of scale, or contain detail which is incongruent with the natural occurrences as seen in foreground and middle ground. Introduction of additional parts of these activities such as structures, roads, slash, root wads must remain visually subordinate to the proposed composition as viewed in background.

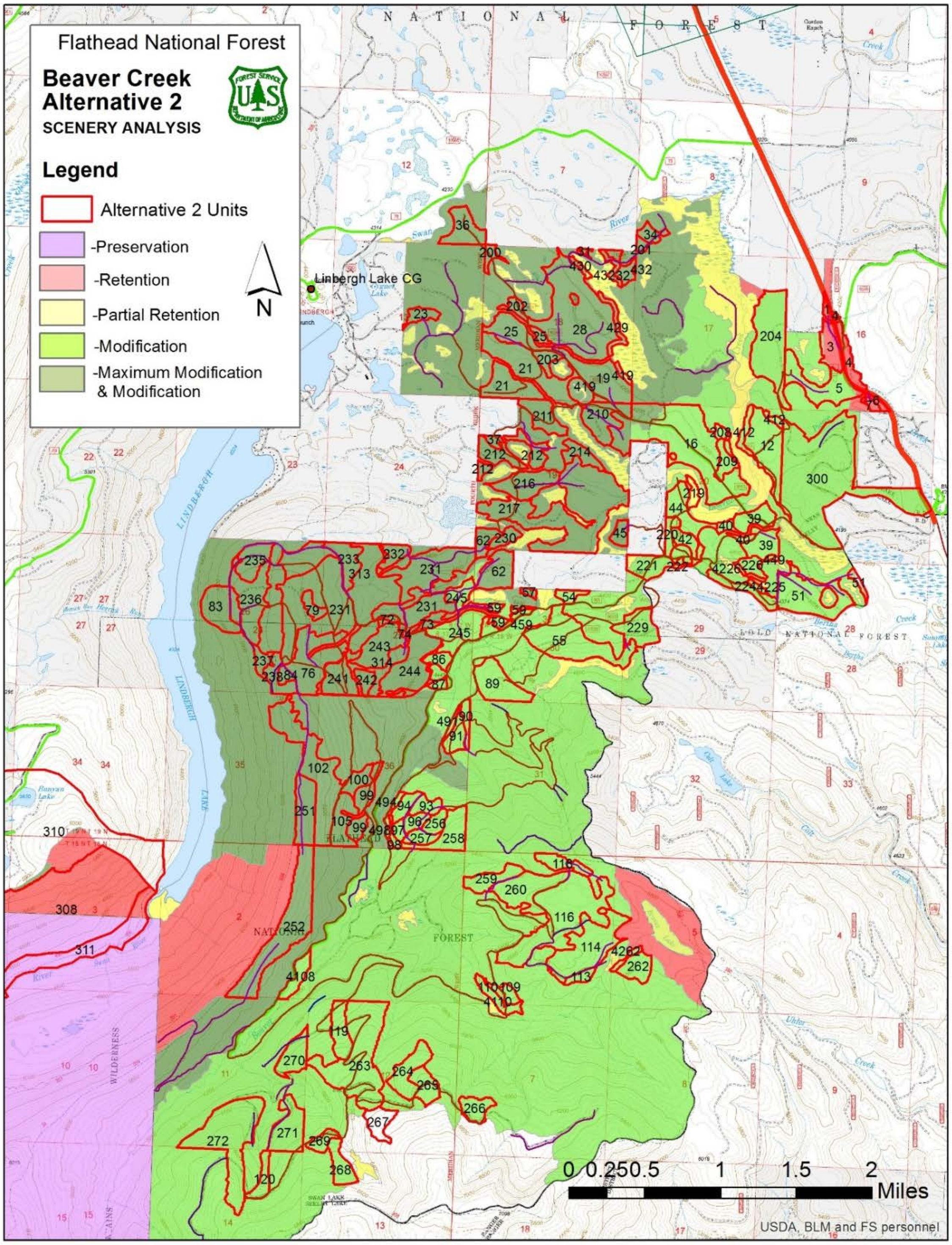


FIGURE 59A. ALTERNATIVE 2 -VISUAL QUALITY OBJECTIVE MAP.

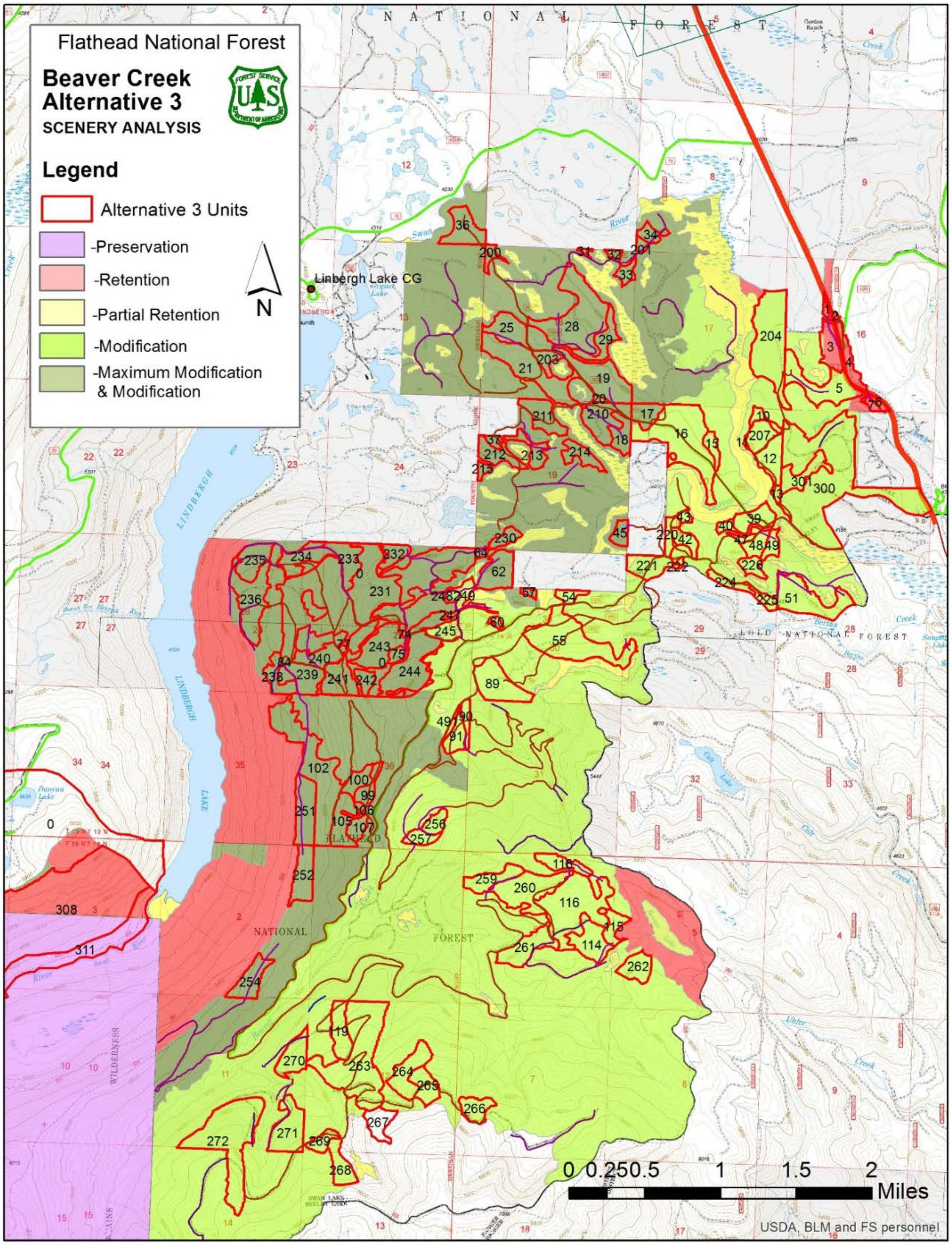


**FIGURE 60B. ALTERNATIVE 3- VISUAL QUALITY OBJECTIVE MAP.**

## VISUAL ABSORPTION CAPACITY

Visual Absorption Capacity (VAC) refers to the ability of forest lands to withstand various types of use without the loss of their natural character. These assessments provide the basis for predicting future scenic conditions that would result from project proposals. Slope, vegetation screening, and vegetation diversity are primary factors incorporated into VAC determinations. The project area has a wide range of varying degrees of VAC. Generally areas of reduced VAC occur on upper steep slopes, areas with contrasting soil, and monoculture tree species dominance. Flatter terrain generally has higher VAC, which offers the ability for vegetation.

# ENVIRONMENTAL CONSEQUENCES

The Scenery Resource was analyzed for Alternative 1 - No Action, Alternative 2 - Proposed Action, and for Alternative 3. Assessing potential change resulting from the alternative impacts to Scenery Resources was measured through assessment of representational viewpoints at various unscreened locations towards proposed treatment areas. Table 108 shows the VQOs and potential for change in scenic integrity from the selected viewpoints as they relate to the alternatives with applied Design Criteria. Additionally, the alternatives were analyzed for potential immediate effect (short-term) and effects after 5 years (long-term) (Project File Exhibit Q-3).

**TABLE 108. SCENIC INTEGRITY IMPACTS SUMMARY FROM REPRESENTATIONAL VIEWPOINT LOCATIONS.**

| # | Viewpoint Location | Visibility[1] | VQO(s) | Change in Scenic Integrity[2] | | |
|---|---|---|---|---|---|---|
| | | | | Alt. 1 Short term / Long term | Alt. 2 Short term / Long Term | Alt. 3 Short Term / Long Term |
| 1 | Elbow Overlook | MG & BG / 1 | Modification & Maximum Modification | Not evident Not evident / | Evident but remains subordinate / Evident but remains subordinate | Evident but remains subordinate / Evident but remains subordinate |
| 2 | Campground Boat Launch | MG & BG / 1 | Modification & Maximum Modification | Not evident/ Not evident | Evident / Evident but remains subordinate | Evident but remains subordinate / Not evident |
| 3 | Highway 83 (North) | BG / 1 | Modification | Not evident/ Not evident | Evident but remains subordinate / Evident but remains subordinate | Evident but remains subordinate / Not evident |
| 4 | Highway 83 (South) | IFG / 1 | Retention | Not evident/ Not evident | Evident but remains subordinate / Not evident | Evident but remains subordinate / Not evident |
| 5 | NFS road #906 (West) | FG / 2 | Modification | Not evident/ Not evident | Evident but remains subordinate / Not evident | Evident but remains subordinate / Not evident |
| 6 | NFS road # 906 (Unit 222) | IFG/2 | Modification | Not evident/ Not Evident | Evident but remains subordinate / Not evident | Evident but remains subordinate / Not evident |
| 7 | NFS road #906 (Slash Pile) | FG/2 | Modification | Not evident/Not evident | Evident but remains subordinate / Not evident | Not evident / Not evident |
| 8 | Crystal Lake South Trailhead | FS/1 | Modification | Not evident / Not evident | Evident but remains subordinate / Not evident | Evident but remains subordinate / Not evident |
| 9 | Lindbergh Lake (South) | FS/1 | Modification | Not evident / Not evident | Evident bur remains subordinate / Not evident | Evident but remains subordinate / Not evident |
| 10 | Lindbergh Lake (Unit 83) | FS/1 | Modification (Alt. 2) Retention (Alt. 3) | Not evident / Not evident | Dominate / Evident | Not evident / Not evident |

[1] Viewing Distance/Concern Level (BG = Background; MG=middle ground, FG = Foreground, IFG = immediate Foreground)
[2] Change in scenic integrity of project area as seen from viewpoint locations.

## ALTERNATIVE 1 – NO ACTION DIRECT AND INDIRECT EFFECTS

If no action is taken and the project does not take place, there would be no direct effect to landscape character associated with the project activities. There would be no change to the landscape character as a result of this project and, therefore, no direct change in future scenic integrity of the project area from current conditions. The No Action Alternative would meet Forest Plan VQOs.

Potential indirect effects on landscape character and scenic integrity would be probable loss of large groupings of pine trees because of mountain pine beetle infestation, with even greater mortality in uniform lodge pole pine stands. In addition, the potential fire hazard would increase for a short-term until the red-brown dead needles fell from the trees and then also in the longer term when trees begin to fall over. In the event of a fire, the fire scar would potentially damage scenic integrity for the long-term as seen from viewing areas with high concern. The impact would lower the intactness of the landscape and create a dominance of short-term contrasting color or long-term burn contrast if the beetle infestation and fire occurred on a larger than typical scale.

## ALTERNATIVE 1 – NO ACTION CUMULATIVE EFFECTS

The No Action Alternative cumulative effects analysis for Scenery Resources include analysis of the viewsheds of the land area encompassing the project area. Approximately 5,457 acres of land in the project area were previously owned by Plum Creek Timber Company and were transferred to Forest Service ownership between 1998 and 2012 through the Land and Water Conservation Fund (LWCF) and the Montana Legacy Project. A fiber supply agreement was included on some of these lands donated through the Montana Legacy Project, and as part of that agreement The Nature Conservancy conducted two timber sales in the project area within the existing viewsheds of the Highway 83 corridor and the Swan Valley: Beaver Highway (2011, 341 acres – overstory removal, 320 MBF) and Two Bears (2012, 203 acres - overstory removal, 111 acres - commercial thin, 345 MBF). At this time the Forest Service is not aware of any planned timber harvest on Legacy Land or private land in the project area.

Under the No Action Alternative, there would be the potential for increased risk of collapse of stands due to insect and disease attacks or catastrophic wildfire, spreading over a larger area within the respective viewshed identified. This potential risk of reddish brown dead trees on the surrounding slopes would show a short-term contrast in color. These impacts associated with insect and wildfire is foreseeable but the level of impacts to future scenic integrity is unknown. The No Action Alternative compared to the other alternatives would contribute to dead and dying trees within the viewsheds but would have minor cumulative effects and would not change the landscape character of the surrounding viewshed.

## ALTERNATIVE 2 – PROPOSED ACTION DIRECT AND INDIRECT EFFECTS

Visual effects from Alternative 2 will be described in several categories. The descriptive categories are separated because the level of potential visual impacts is easily distinguishable between the associated types of treatment. Road impacts will be described in association with specific units. Restoration components will also be evaluated. This impacts analysis references the representational viewpoints (Table 108) and is described as a baseline for change in landscape character and for comparison of alternatives. All proposed harvest units were analyzed for potential impacts and assigned Design Criteria if needed, to reduce impacts and meet VQOs.

## INTERMEDIATE HARVEST UNITS

Approximately 1,574 acres of intermediate harvest is proposed, including commercial thin (1,015 acres) and improvement cut (559 acres). Harvest units would be given skyline or ground-based mechanical treatments, which could include whole tree yarding, yarding of tops, lop and scatter, mastication, and/or piling. Some units would receive prescribed fire, in addition to pile burning. Most of the units are ground-based mechanical, but 126 acres would be logged with a skyline system.

Views into ground-based harvest units are generally screened or partially screened and have a high VAC, with exceptions of being located directly adjacent to travel ways or use areas. Skyline units are generally more prominent on the hillside slopes were VAC is generally low. Negative visual effects resulting in lower scenic integrity, as a result of implementation of these units would be minor to negligible from these background and distant middle ground views. Greater visual impacts would occur from foreground and immediate foreground views primarily from adjacent roads views. A higher percentage of overhead tree canopies would be retained in these intermediate harvest units (20 to 70 percent); however, a limited number of units would have some negative visual effects from viewing areas with high concern, such as roadways, trails, and from private property. After implementation, treatment units would show short-term contrast from unnatural appearing slash and stumps adjacent to roadsides. Piles or landing slash would also contrast and appear unnatural. Paint marking, skid trails, roads, and landings would also create impacts because of contrast in color and form. Some units would expose vertical skyline corridors contrast. Unnatural vegetation forms, like landings and skyline corridors or straight boundary unit edges, may take up to 15 to 25 years to become subordinate to the landscape character. Unnatural form or change in texture in vegetation would be greatest in winter because of contrasting elements are emphasized by the snow cover. In limited viewsheds throughout the project area, skid trails would also appear more dominate in the landscape, exposing contrasting soil disturbance that would delineate unnatural lines and forms. For those units with prescription burning planned, there would be potential for black scaring of vegetation, stumps, and earth, which would largely appear natural unless abnormal appearing fire barriers or lines are created.

However, within the first year as new vegetation grows, the majority of these impacts would lessen and within 5 years much of the contrast associated with soil disturbance would become subordinate in the landscape. Road and landings that are to be constructed would be evident in foreground views longer than 5 years. The travel ways and use areas (Figure 48) analyzed adjacent to or within intermediate treatments that show the greatest sensitivity to viewers located in immediate foreground and foreground views include Hwy 83 (Units 1, 3, 4, 5, and 6), Lindbergh Lake (Unit 83), which has high concern.

Of concern level 2, NFS road #906 (Units 39, 40, 44, 54, 55, 86, 87, 221, 459, 108), NFS road #9563 (Units 16, 19, 25, 39, 203), Jocko Trail #34 (Units 102, 237), and residences adjacent to Units 6, 16, 44, and 67. With Design Criteria implemented, all intermediate harvest units would meet the Forest Plan and VQOs.

## REGENERATION HARVEST UNITS

Approximately 777 acres of harvest units including clearcut with reserve trees (16 acres), seed tree with reserve trees (428 acres), and group selection (333 acres) are proposed as regeneration harvest. These treatments would include tractor, skyline harvesting, mechanical, hand, and post-harvest treatments (i.e., burn piles and broadcast burns). Visual impacts associated with the above harvesting methods would be potentially greater because of the level of vegetation removed that would expose more ground disturbance impacts. Trees per acre would average 5 to 10 percent canopy cover; group selection have a greater range of 0 to 70 percent canopy cover. Tree planting would occur post-harvest where natural regeneration was not successful.

Foreground and immediate foreground views (less than ½ mile) are limited to Unit 21 along NFS road #9563, which has a lower concern level near the north end of Beaver Creek Road. Additionally, Units 57 and 62, are adjacent to residences, which have higher concern. Negative effects from contrasting skid trails, landing areas, and temporary road construction, as well as unit shape and edge contrast, would dominate the view. Additional exposure would occur from marking paint, and slash and stumps visible from the road. Post- harvest scattering of the slash/fuels or hand piling and mechanical treatments, including whole tree yarding, excavator piling, or chipping/mastication, and pile burning, would all have short-term negative impacts from viewing areas. For those units with prescription burning planned, there is potential for black scaring of vegetation, stumps, and earth, which would largely appear natural unless abnormal appearing fire barriers or lines are created. Unnatural contrast in color and texture and form would dominate the landscape character in the short-term from foreground views.

Middleground and background views are generally limited within the project area because of topography and vegetation screening. Exceptions include an opening along Hwy 83 and views from Lindbergh Lake. Other openings along secondary roads and use areas offering views from surrounding mountains would have minor to negligible effects because of the distant background and distant middleground views within the context of the larger-scale landscape. The travel ways and use areas (Figure 48) analyzed show the greatest sensitivity for viewers located in middleground and background views associated with recreation user and residences. Distant views from Lindbergh Lake and a few shoreline residences would experience background views associated with regeneration harvest Units 116, 263, and 266. Negative effects from contrasting unit shape, texture, and form, as well as edge contrast would be evident but subordinate to the characteristic landscape from background views. They would show higher contrast in harvest unit edges and shapes during snow covered winter months. Overall these impacts would create minor to moderate visual effects from the above mentioned viewing areas with high concern. Within 5 years the unnatural appearing edge, silhouette, and shape effects caused by the proposed units and roads would begin to be reduced as new vegetation growth would begin to blend colors of the treatment areas, screen and change textures. In the long-term and with Design Criteria implemented, the effect of the proposed treatments would not be substantial enough to alter the character of the landscape. However the proposed harvest units collectively would have short-term and long-term moderate effects (Project File Exhibit Q-3). All regeneration harvest units would meet the Forest Plan and VQOs for Alternative 2 as management area assignments have been proposed.

### NONCOMMERCIAL UNITS

Approximately 3,101 acres make up the proposed non-commercial vegetation management component of the proposed project including pre-commercial thinning (882 acres), daylighting (82 acres), prescribed burning (1,808)[7] and fill planting (329 acres). Change in landscape character, as a result of thinning implementation of these units, would be minor to negligible from background and middleground views except were an existing unit shows a strong unnatural contrast in line and texture next to untreated units (or heavily forested land); no units were identified that would impact sensitive middleground or background views. Additionally, a limited number of units would show negative visual effects from immediate foreground views when adjacent to roadways and trails, showing contrast from unnatural appearing slash, slash piles, and stumps and felled trees. For those units with prescribed burning planned, there would be potential for black scaring of vegetation, stumps, and earth, which would be natural appearing. Fill planting would be planted with samplings in areas previous subject to regeneration harvest where regeneration was not completely successful. The planting units' impacts would be beneficial in reducing areas of low scenic integrity over time.

Impacts from pre-commercial thinning and daylighting would be temporary and would not dominate the landscape character. The thinning units with greatest viewer sensitivity are located in the immediate foreground. These foreground views include: Highway 83 (Unit 300) NFS road #906 (Units 220, 224, and 300), NFS road #9563 (Units 209, 210), Jocko Trail #34 (Units 251 and

[7] It is important to note that this reflects total acres where prescribed burning occurs and on some of these acres other treatments have also been proposed.

238), and residences adjacent to Units 7 and 300. These units have the greatest potential for impacting sensitive views, creating minor to moderate impacts, because of the higher concern level and close distance to viewers. All non-commercial units would meet the Forest Plan and VQOs.

Temporary road construction would include 7.5 miles, and 4.5 miles of roads are proposed for decommissioning. Several temporary roads were identified that would potentially have moderate effects as seen from sensitive travel ways and use areas with Concern Level 1, including access road off of Hwy 83, road access of Unit 83 as seen from the Lindbergh Lake in the foreground and distant views of Unit 259's temporary road, which would be partial screened. Impacts from these new access points would be contrast in color and texture and form creating edge effects from soil and vegetation disturbance. Any road construction would typically take longer than 5 years to recover, because of contrasting line and form elements that appear unnatural in the landscape. Decommissioned roads would potentially have a long-term beneficial effect to scenery resources because there would be a permanent reduction in impacts associated with cut and fill and the liner form of the roads within the natural appearing landscape. With Design Criteria implemented, the road construction would be consistent with Forest Plan direction and would meet the VQOs.

Located within the Mission Mountains Wilderness, 1,104 acres of treatment would be implemented through helicopter aerial ignition. Views of mosaic of blackened areas and brown trees would contrast with non-burned areas, but would appear as a natural occurrence. Distance middleground views and background views along the Swan Highway corridor are mostly screened, but where limited openings in the vegetation would expose the proposed treatments, a natural appearing disturbance would contrast in color with green vegetation. The visual contrast from fire scar would be short-term and within a growing season be less evident.

Additionally, according to research found in findings, "Social Science to improve Fuels Management: A synthesis of Research on Aesthetics and Fuel Management (2000)", prescription burns can actually improve scenic integrity of an area as an indirect effect. The proposed fuel treatment and habitat improvement project would, therefore, have short term negligible impacts to the landscape character if the visual mitigation measures are implemented. The proposed alternative would improve the forest health of the treatment areas and meet the Forest Plan VQO.

### CONCRETE FISH BARRIER AND CULVERT REPLACEMENT

The installation of new culverts and fish barriers may be evident from the roadside because of soil contrast and built structures. These unnatural features in the landscape would be remote in location in areas with low concern levels. Soil disturbance associated with installation would show contrast; however, as vegetation becomes reestablished, these impacts would lessen and would be beneficial in the long term by contributing to a healthy, visually-appealing ecosystems. Project components would meet the Forest Plan direction and VQOs.

## ALTERNATIVE 2 – PROPOSED ACTION CUMULATIVE EFFECTS

The Alternative 2 cumulative effects analysis for the scenery resources of the projects include analysis of the analysis areas and the land area encompassing the viewsheds of the project area. Several past vegetation modification projects, including harvest and prescription burns, have occurred and are ongoing on both private and public lands within the existing viewsheds (Project File Q-4). Additionally, there are several private land residential, commercial, and utility developments that could contribute to the cumulative effects within the project areas that are historical, present and ongoing.

Primarily viewable from high concern travel ways (such as the Swan Highway corridor), vegetation harvest units including both private and public land management activities have created unnatural appearing contrast in color, texture, form and line having long-term negative impacts. These include sales conducted by The Nature Conservancy in the project area within the existing viewsheds of the Highway 83 corridor and the Swan Valley: Beaver Highway (2011, 341 acres – overstory removal, 320 MBF) and Two Bears (2012, 203 acres - overstory removal, 111 acres - commercial thin, 345 MBF). Located within the viewshed, these negative effects vary because regeneration harvest impacts have been reduced on some of the older projects because of vegetation regrowth. Other nearby harvest units on public and private lands have limited or reduced effects because of limited seen area, lower sensitivity, and because of the age of the harvest units (older than 25 years). Other activities including private residential and commercial development and utilities (i.e., power lines, and roads) have lowered the scenic integrity of the landscape.

Reasonably foreseeable future actions are a continuation of these treatments within the mountain range and valley viewsheds. The planned treatment areas would have similar if not greater negative contrasting effects and the greatest contributing impacts, because of the close proximity of the proposed alternatives.

If Alternative 2 is selected, impacts associated with this project would contribute negatively to lowering the landscape scenic integrity in the short-term, but would meet Forest Plan direction for the existing management areas and the proposed management areas under this alternative. There would not be a change in long-term scenic integrity for the majority of the project area. The proposed management activities, with Design Criteria implemented would create some short-term dominate-unnatural appearing visual contrast, primarily from roadside immediate foreground and foreground views. However, overall, these impacts would lessen over time and within 5 years would appear less evident. However, all of the proposed treatments would meet current Forest Plan VQOs.

## ALTERNATIVE 3 – ACTION ALTERNATIVE DIRECT AND INDIRECT EFFECTS

Alternative 3 addresses key issues of visual effects of vegetation treatments to the users of Lindbergh Lake in addition to wildlife habitat connectivity, and treatment within RHCAs. Visual effects from Alternative 3 will be described in several categories. All proposed harvest units were analyzed for potential impacts and assigned Design Criteria if needed, to reduce impacts and to meet VQOs.

### INTERMEDIATE HARVEST UNITS

Approximately 1,366 acres of intermediate harvest (801 acres of commercial thin and 565 acres of improvement cut) are proposed. Similar to Alternative 2, harvest units would be given skyline or ground-based mechanical treatments, which could include whole tree yarding, yarding of tops, lop and scatter, mastication, and/or piling. Some units would receive prescribed fire in addition to pile burning. Most of the units are ground-based mechanical, but 34 acres would be logged with a skyline system (100 fewer acres than Alternative 2). Negative visual effects resulting in lower scenic integrity as a result of implementation of these units would be minor to negligible from these background and distant middle ground views. Foreground impacts would be similar to Alternative 2. The difference between Alternative 2 and 3 is primarily related to the amount of intermediate harvests within sensitive views. Concern Level 1 travel ways and use areas include views from Hwy 83, which would receive similar impacts for Alternative 2 and 3 in foreground views with intermediate treatments (Project File Exhibit Q-3). Alternative 3 would have a reduction of impacts for the Lindbergh Lake viewshed, with no foreground impacts from non-treatment of Unit 83. Distant background views would also receive a modest reduction in visual impacts from northern lake shore. Similar to Alternative 2, with Design Criteria implemented, all intermediate harvest units would meet the Forest Plan and VQOs under the management area assignments proposed for this alternative.

### REGENERATION HARVEST UNITS

Approximately 220 acres of harvest units including clearcut with reserve trees (16 acres), seed tree with leave (94 acres), and group selection (110 acres) are proposed as regeneration harvest.

These treatments would be implemented the same as Alternative 2 with similar intensity of visual impacts associated with regeneration treatments. With a total reduction of 185 acres compared to Alternative 2, only the non-treatment of Unit 263 would have a reduction in impacts from sensitive (Concern Level 1) background views (Project File Exhibit Q-3). Foreground and immediate foreground views (less than ½ mile) are primarily limited to Unit 21 along NFS road #9563, which has a lower concern level and would be equivalent to Alternative 2.

### NONCOMMERCIAL UNITS

Approximately 2,748 acres make up the proposed non-commercial vegetation management component of Alternative 3 including pre-commercial thinning (552 acres) and daylighting (70 acres), and prescribed burning (approximately 1,797 acres). Fill planting (329 acres) would be the same for both alternatives.

Impacts from pre-commercial thinning and daylighting would be temporary and would not dominate the landscape character. The units with greatest sensitivity to viewers located in immediate foreground and foreground views include: Highway 83 (Unit 300) NFS road #906 (Units 220, 224, 300), NFS road #9563 (Units 209 and 210), Jocko Trail #34 (Units 238 and 251), and residences adjacent to Units 7 and 300. These thinning units have the greatest potential for impacting sensitive views, creating minor to moderate impacts, because of the higher concern level and close distance to viewers. All noncommercial units would meet the Forest Plan and VQOs.

In Alternative 3, only 5 miles of temporary road construction is proposed, and 4.5 miles of roads are proposed for decommissioning, which is the same for both action alternatives. Moderate effects would occur with Hwy 83 and Unit 3. Impacts from these new access points would be contrast in color and texture and form creating edge effects from soil and vegetation disturbance. Any road construction would typically take longer than 5 years to recover because of contrasting line and form elements that appear unnatural in the landscape. The Mission Mountains Wilderness prescription burn of 1,104 acres would have the same impacts as Alternative 2. Alternative 3 does not propose installation of a concrete fish-barrier and instead proposes culvert replacements to achieve aquatic restoration and would occur in areas of low concern and would be beneficial in the long term contributing to a healthy, visually appealing ecosystem. Project components would meet the Forest Plan direction and VQOs under the management areas proposed for Alternative 3, which increase the VQO level for the Lindbergh Lake viewshed.

## ALTERNATIVE 3 – ACTION ALTERNATIVE CUMULATIVE EFFECTS

Several past vegetation modification projects including harvest and prescribed burn have occurred and are ongoing on both private and public lands within the existing viewsheds. Additionally, several private land and utility developments that could contribute to the cumulative effects within the project area are historical, current, and ongoing. Past, existing, and reasonably foreseeable projects that would contribute to the viewshed cumulative impacts are noted in the Alternative 2 description (See Alternative 2 cumulative effects). Reasonably foreseeable future actions are a continuation of these treatments within the mountain range, valley and highway viewsheds and also the potential for an increase in sensitive viewers. Alternative 3 would also contribute to lower the scenic integrity of the landscape, but these impacts would be less than Alternative 2 relative to the amount of harvest units seen from areas of high concern.

## COMPARISON OF ALTERNATIVES

The past, present, and reasonably foreseeable short-term impacts would be less for Alternative 3, which would have the fewer visible harvest units (Table 109).

**TABLE 109. NUMBER OF UNITS IMPACTING HIGH-CONCERN FOREGROUND VIEWSHEDS BY ALTERNATIVE.**

| TREATMENT CATEGORY | ALTERNATIVE 1 | ALTERNATIVE 2 | ALTERNATIVE 3 |
|---|---|---|---|
| Intermediate Units | 0 | 9 | 8 |
| Regeneration Units | 0 | 2 | 0 |
| Pre-Commercial Units | 0 | 2 | 1 |

With the implementation of Alternative 3, there would not be a change in long-term scenic integrity. The proposed management activities would create uncharacteristic, unnatural appearing visual impacts in the short-term. Overall, these major effects would lessen over time and, within 5 years, would appear less evident. Alternative 3 would have less visual impacts than Alternative 2 with Alternative 1 having overall the least amount of visual impact. All of the proposed treatments would meet Forest Plan VQOs.

# EFFECTS OF A FOREST PLAN AMENDMENT TO ASSIGN MANAGEMENT AREAS TO ACQUIRED LANDS

The Beaver Creek Project includes a Forest Plan Amendment to assign interim management areas (MAs) to approximately 5,457 acres of former PCTC lands acquired by the USDA Forest Service to be managed as part of the Flathead National Forest. These interim management areas will be in effect on acquired lands until the ongoing Forest Plan Revision effort is completed, anticipated in 2 years.

Alternative 1- No Action Alternative proposes not to assign management areas to acquired lands although forest-wide standards and guidelines will continue to apply to all NFS lands on the Flathead National Forest.

Alternative 2 proposes to assign 55 acres of acquired lands to MA 2, 8 acres of acquired lands to MA 5, 2,312 acres to MA 11C, 320 acres to MA 12, 2,033 acres to MA 15, 712 acres to MA 15C, and 17 acres to MA 17. These proposed MA assignments were made in consideration of the characteristics of the acquired parcel and the management direction on surrounding lands.

Alternative 3 proposes different management area assignments to reflect public concern for the viewshed on the east side of Lindbergh Lake. To accomplish this, Alternative 3 assigns MA 5 instead of MA 15 on approximately 502 acres of acquired land on the east side of Lindbergh Lake to maintain or enhance the scenic quality of these lands when viewed from Lindbergh Lake. Although MA 5 will allow for timber harvest to occur on these lands, it will emphasize the maintenance of a natural appearing landscape where management activities are not evident.

The effects of the Forest Plan Amendment to the scenery resource within the analysis area under Alternative 1 – No Action Alternative are minor because although the Forest Plan assigns VQOs according to management areas, the scenic resource considers visually sensitive areas regardless of management areas. The effects of the Forest Plan Amendment under Alternative 3 are more favorable to the scenic resource that under Alternative 2. The proposed management areas under Alternative 3 will maintain consistent VQOs for all of the high concern lands surrounding Lindbergh Lake. The MAs assigned under Alternative 2 could allow for more modification within the viewshed of Lindbergh Lake.

These proposed MA assignments are consistent with the existing condition of these lands and the management direction assigned to adjacent lands and will not preclude future MA assignment under the Flathead Forest Plan Revision effort.

The cumulative effects of this forest plan amendment are very limited due to the geographic scope and expected duration of the amendment. At the Flathead National Forest scale, this amendment is only addressing management area direction on less than 1 percent of the NFS acreage on the Flathead National Forest. Additionally, the duration of this amendment is expected to be short-term since forest plan revision is ongoing with a decision expected in 2017. When the revision effort is completed, new management areas will be assigned across the entire Flathead National Forest, including the Beaver Creek project area, and will supersede any of the interim management areas proposed in this amendment. Reasonably foreseeable activities identified on the lands associated with the amendment is very limited as identified in Table 17 in Chapter 3 of this EA. If future land management activities occur on these lands they will be subject to forest-wide direction found in the Flathead National Forest Land and Resource Management Plan, federal and state laws, and other Forest Service regulations, as they are now, and will be guided by the proposed management area direction. Future land management activities such as timber harvest, road work, changes to public access etc. would be subject to site-specific NEPA analysis in the future.

## LANDSCAPE CHARACTER GOALS, OBJECTIVES, AND STANDARDS

The Flathead Forest Plan contains direction for managing the scenic resources of the forest. Direction is contained in both forest-wide and MA specific sections of the Plan. Direction relevant, with respect to scenery, to the proposed treatment units are summarized below.

### FOREST-WIDE SCENERY STANDARDS:

- In each management area, meet or exceed the recommended VQO (visual quality objective). Where management area goals and objectives can be fully achieved and a higher VQO met without increased costs or reduced future options, the higher VQO should be achieved.
- Through the use of proper design and scheduling of activities, potential impacts on the visual resource will be dispersed and not concentrated within an area or travel corridor within a short time frame. Achieving the long-term visual quality goal on the Forest will work in direct proportion to how well the cumulative effects of time and space are addressed. The time and space principles especially need to be applied to the key areas mentioned above. These areas are not viewed as a whole at one time; however, they are viewed sequentially from primary use areas, travel routes, or recreation sites (II-17).

### MANAGEMENT AREA SCENERY STANDARDS AND GOALS:

- MA 1 Not specified
- MA 2 Retention
- MA 5 Retention.
- MA 9 Partial Retention
- MA 12 Partial Retention
- MA 15 Modification or Maximum Modification.
- MA 15C Modification or Maximum Modification
- MA 17 Not specified/
- MA 22 Preservation

The Forest is transitioning to the Forest Service Scenery Management System (SMS) Scenic Integrity Objectives as part of the ongoing Forest Plan Revision (not final). The 2006 SMS Forest-wide Scenery Inventory was documented as part of this analysis but the existing 1985 VQOs were used as it relates to the current Forest Plan management direction. All alternatives would meet the Forest Plan Direction, with design criteria implemented. The treatments would comply with the Swan Valley Highway Landscape Management Plan. In each management area, meet or exceed the recommended VQO (visual quality objective). Where MA goals and objectives can be fully achieved and a higher VQO met without increased costs or reduced future options, the higher VQO should be achieved.

Through the use of proper design and scheduling of activities, potential impacts on the visual resource will be dispersed and not concentrated within an area or travel corridor within a short time frame. Achieving the long-term visual quality goal on the Forest will work in direct proportion to how well the cumulative effects of time and space are addressed. The time and space principles especially need to be applied to the key areas mentioned above. These areas are not viewed as a whole at one time; however, they are viewed sequentially from primary use areas, travel routes, or recreation sites (II-17).

## HANDBOOK DIRECTION PERTAINING TO THE SCENIC RESOURCES

In addition to Forest Plan direction, the following handbooks apply to NFS lands under the Visual Management System. Definitions, guidance and procedure for managing the Scenic Resources are contained in the following Forest Service Handbooks:

- USDA. Agriculture Handbook 462. National Forest Landscape Management, V. 2, Chapter 1: The Visual Management System. 1974.
- USDA. Agriculture Handbook 483. National Forest Landscape Management, V. 2, Chapter 4: Roads. 1977.
- USDA. Agriculture Handbook 559. National Forest Landscape Management, V. 2, Chapter 5: Timber. 1980.
- USDA. Agriculture Handbook 608. National Forest Landscape Management, V. 2, Chapter 6: Fire. 1985.

(The above references can be found at http://fsweb.r1.fs.fed.us/rmlhw/scenery_mgmt/scenery.htm.)

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# HERITAGE RESOURCE

## INTRODUCTION

Heritage Resources involve the conservation of archeological, cultural, architectural, and historic sites and artifacts. This section describes the existing Heritage Resource conditions of the Beaver Creek Landscape Restoration Project and how the no action and action alternatives would affect the various components of this resource. The effects analysis focuses on those areas where potentially ground-disturbing activities, such as prescribed burning and fuel break construction, are proposed. Activities that only involve the use of hand crews and no heavy equipment, such as prescribed burning, would typically receive less consideration from Heritage Resource personnel.

## ANALYSIS AREA

### SPATIAL BOUNDS

The analysis area used to discuss the effects on Heritage Resources is the Beaver Creek Project Area. The effects on Heritage Resources would not extend beyond the project boundary.

## DATA SOURCES, METHODS, AND ASSUMPTIONS USED

The Flathead National Forest is taking a multi-phase approach to Heritage Resource compliance [36 CFR 800.3(c)] for the Beaver Creek Project. This is possible because of the site-specific nature of Heritage Resources and Heritage Resource compliance. The first phase is a reconnaissance-level inventory of known Heritage Resources and a sampling of areas with a high probability for the occurrence of additional Heritage Resources. A pre-survey files search for information on previously recorded heritage sites in the proposed project area is also conducted. This phase includes initial consultation with the Confederated Salish and Kootenai Tribes to identify any concerns they may have regarding traditional cultural properties, traditional use plants, and areas of spiritual importance in the project area. The second phase occurs prior to actual project implementation and requires a thorough inventory of all proposed undertakings to locate, record, and evaluate the historical significance of any identified Heritage Resources.

## AFFECTED ENVIRONMENT

### HISTORIC CONDITION

Human occupation of the greater Swan Valley, in general, and within boundaries of the proposed Beaver Creek Project Area, specifically, has probably spanned the past 10,000 years. Evidence of those prehistoric hunters and gatherers, however, forest wide, is rare. Typical Heritage Resource sites or artifacts that one might encounter during pedestrian inventories would include tepee rings, scarred trees, pictographs or petroglyphs, lithic (stone) scatters of flint/chert debris from the production of stone tools, isolated arrowheads or lance points, travois trails, hearths or roasting pits, bone tools, stone scrapers, awls, bifaces, knives, and cores.

Historic era Euro-American settlement of the Flathead Valley, in general, and the Swan Valley, in particular, came more than 50 years after fur trader/trapper David Thompson's early ventures into northwest Montana, circa 1810. Evidence of early white settlers that might be discovered during Heritage Resource Surveys include trappers lean-tos, metal traps, log cabins, rifles or other firearms, and various metal tools from plows to saws.

# EXISTING CONDITION

## PRE-SURVEY FILES SEARCH

Prior to the two-phase inventory, the Forest's Heritage Resources Staff conducted an in-house files search for information on known, previously recorded heritage sites in the Beaver Creek Project Area. General Land Office Plat Maps, HES plats, BLM Land Status Records, historic forest maps, local history texts, the Forest's Historic Overview, studies on Native American use of western Montana, and the Forest's cumulative site atlas and survey atlas were all referenced.

The results of a pre-survey files search for information on known heritage resources in the proposed Beaver Creek Project Area identified three recorded heritage properties in the analysis area and eight previous inventories going back to 1982. Previous heritage surveys covered approximately 20 percent of the acreage in the Beaver Creek Project Area. Previous inventories recorded three cultural sites in the analysis area. None of the recorded heritage properties are in or near proposed treatment units and all will be unaffected by the proposed activities.

Consultation with the Salish and Kootenai Tribes Historic Preservation Department and talks with local land owners has identified NFS trail #34 as a portion of a historic Native American travel route known either as the Jocko Trail or the Gray Wolf Trail. It may be affected by proposed activities. The Jocko Trail crosses the Mission Mountains into the Seeley-Swan Valley. A southern fork goes up the Middle Fork of the Jocko River, passing the Jocko Lakes on the Flathead Indian Reservation, and drops into the Seeley Lake/Clearwater River area, while a northern branch follows the North Fork of the Jocko River, passing below Gray Wolf Peak and Gray Wolf Lake and into the analysis area as NFS trail #34.

## PEDESTRIAN SURVEY

The second phase of the two-part strategy requires the staff conduct a pedestrian-based, stratified-sample survey (inventory) of the proposed Beaver Creek Project Area. The survey strategy was taken from the Forest's Site Identification Strategy, which is part of the Region 1 Programmatic Agreement with the Montana State Historic Preservation Office and the Advisory Council on Historic Preservation regarding compliance to Section 106 of the National Historic Preservation Act. The survey methodology is tied to topography and basic professional judgments about historic land use and cultural adaptation throughout history.

Simply stated, the methodology requires an 80 percent reconnaissance in topographic areas of less than 20 percent slope (such a level stream terraces) or in areas considered to exhibit a "high probability" for evidence of past cultural manifestations (i.e., ridge tops, rock outcrops, stream confluences). Survey transects would be spaced every 20 meters (65 feet) apart. Topographic areas in excess of 20 percent slope, but less than 50 percent, and which feature a "moderate" level of probability for containing cultural sites, were surveyed at 40 percent coverage, or with survey transects spaced every 40 meters. "Low"-level probability areas (slopes in excess of 50 percent) received 10 percent coverage with survey transects spaced every 230-feet apart.

The results of the stratified sample survey methodology are not complete, but the historic Gray Wolf/Jocko Trail has been identified and discussions with the Confederated Salish and Kootenai Tribes are ongoing and would continue to insure that their concerns for the protection of the trail are satisfied.

# ENVIRONMENTAL CONSEQUENCES

### ALTERNATIVE 1 – NO ACTION
### DIRECT, INDIRECT, AND CUMULATIVE EFFECTS

Implementation of the No Action Alternative would neither directly nor indirectly affect Heritage Resources, because there would be no change to the integrity of Heritage Resources, since no activities would be implemented. An exception is the threat of wildland fire. Failure to reduce fuels as proposed in Alternative 1 – Proposed Action could increase the potential for severe wildland fire, increasing the potential for adverse effects by fire to Heritage Resources through and beyond the project area. Wildland fire also increases the risk of site looting and vandalism due to the exposure through lack of vegetative cover.

### ALTERNATIVES 2 AND 3– ACTION ALTERNATIVES
### DIRECT AND INDIRECT EFFECTS

The Flathead National Forest is working with the Confederated Salish and Kootenai Tribes and the Montana State Historic Preservation Office to insure there are no adverse effects to the historic Native American travel route. Potential adverse effects to the trail would be avoided through project re-design and or specific Design Criteria.

The Flathead National Forest participates in the Region One Programmatic Agreement with the Montana State Historic Preservation Office and the Advisory Council that provides for a more efficient process for conducting cultural resource inventories and meeting Section 106 compliance. Under the R1PA, if there are no eligible properties affected by the undertaking either through project redesign or because there are no properties located within the undertaking, then the undertaking is included in an annual report to the Montana State Historic Preservation Office and compliance is completed without project consultation. On the other hand, if an eligible property is affected by the proposed undertaking, then compliance is completed in the standard way with consultation with the Montana Historic Preservation Office.

### ALTERNATIVES B AND C– PROPOSED ACTION
### CUMULATIVE EFFECTS

There would be no cumulative effects to identified Heritage Resources in the Beaver Creek Project Area from any past, present, and reasonably foreseeable activities as presented at the beginning of this chapter. Please refer to the Cumulative Effects Worksheet (Project File Exhibit P-1) for more information.

# EFFECTS OF A FOREST PLAN AMENDMENT TO ASSIGN MANAGEMENT AREAS TO ACQUIRED LANDS

The Beaver Creek Project includes a Forest Plan Amendment to assign interim management areas (MAs) to approximately 5,457 acres of former PCTC lands acquired by the USDA Forest Service to be managed as part of the Flathead National Forest. These interim management areas will be in effect on acquired lands until the ongoing Forest Plan Revision effort is completed, anticipated in 2 years.

The effects of the Forest Plan Amendment to the heritage resource within the analysis area are minor under all alternatives because the standards in place to protect heritage resources apply to all lands managed by the Flathead National Forest regardless of management areas. The management areas that allow less timber harvest may reduce the potential effects to heritage resources but cultural assessments and surveys are conducted prior to any ground disturbing activities occurring on the Flathead National Forest.

The cumulative effects of this forest plan amendment are very limited due to the geographic scope and expected duration of the amendment. At the Flathead National Forest scale, this amendment is only addressing management area direction on less than 1 percent of the NFS acreage on the Flathead National Forest. Additionally, the duration of this amendment is expected to be short-term since forest plan revision is ongoing with a decision expected in 2017. When the revision effort is completed, new management areas will be assigned across the entire Flathead National Forest, including the Beaver Creek project area, and will supersede any of the interim management areas proposed in this amendment. Reasonably foreseeable activities identified on the lands associated with the amendment is very limited as identified in Table 17 in Chapter 3 of this EA. If future land management activities occur on these lands they will be subject to forest-wide direction found in the Flathead National Forest Land and Resource Management Plan, federal and state laws, and other Forest Service regulations, as they are now, and will be guided by the proposed management area direction. Future land management activities such as timber harvest, road work, changes to public access etc. would be subject to site-specific NEPA analysis in the future.

# REGULATORY FRAMEWORK

The Forest Service has obligations under the American Indian Religious Freedom Act of 1978 to "protect and preserve for American Indians their inherent right of freedom to believe, express, and exercise the traditional religions of the American Indian" [Public Law 95-442]. The tribes also have rights under the Hellgate Treaty of 1855, including hunting, gathering, and grazing rights.

The Confederated Salish and Kootenai Tribes of Montana have been identified as a Tribal group concerned about the management of Heritage Resources on the Flathead National Forest. The Tribes were contacted in the initial planning stages of the Beaver Creek Project to establish lines of communication, to advise them on the scope of the undertaking including potential effects, and to make their resource concerns (if any) an official part of the project file. Consultation with recognized Tribal governments is further defined and required by the Native American Graves Protection and Repatriation Act of 1990 [Public Law 101-106], the 1992 amendments to the National Historic Preservation Act, and the 1999 revisions to the implementing regulations in 36 CFR Part 800; Protection of Historic Properties.

Besides the American Indian Religious Freedom Act, the USDA Forest Service is also mandated to comply with the National Historic Preservation Act of 1966 (Public Law 89-665). Section 106 of the National Historic Preservation Act requires that Federal agencies with direct or indirect jurisdiction over Federal, Federally-assisted, or Federally-licensed undertakings, afford the Advisory Council on Historic Preservation a reasonable opportunity for comment on such undertakings that affect properties included in or eligible for inclusion in the National Register of Historic Places prior to the agency's approval of any such undertaking" (36 CFR 800.1). Historic properties are identified by a cultural resource inventory and are determined as either eligible or not eligible for the National Register. Eligibility is reviewed and concurrence given by the Montana State Historic Preservation Office. Sites determined as eligible are then either protected in place or adverse impacts must be mitigated. This process takes place prior to any decisions relative to the project.

The American Indian Religious Freedom Act (1978) and the National Historic Preservation Act (1966) requirements are carried forward in the Forest Plan standards for Heritage Resources (Forest Plan, pages II-18 to II-21).

## INVENTORY PROCEDURES

"Cultural resource inventories will be conducted on all ground disturbing projects that are generated, licensed, permitted, or allowed to occur by the Forest Service."

## EVALUATION PROCEDURES

"Identified cultural resources will be evaluated in relation to published criteria for eligibility to the NRHP."

## PROTECTION/PRESERVATION MEASURES

"Known, significant cultural resource sites on the Forest will be protected from inadvertent or intentional damage or destruction."

## COORDINATION/CONSULTATION PROCEDURES

"The Forest will make an effort to coordinate cultural resource issues and concerns with appropriate Native American groups, other Federal and State agencies, the historical and archaeological communities, and the general public."

Protection of historic and prehistoric Heritage Resources is prescribed under a number of laws including the National Historic Preservation Act. Implementing regulations for the National Historic Preservation Act are codified in 36 CFR 800. Forest Plan standards and guidelines are designed to meet the requirements of these regulations. All Beaver Creek Project alternatives are consistent with the laws and regulations listed above and incorporated into the requirements of the Flathead Forest Plan. Section 106 compliance and consultation with the Montana State Historic Preservation Office for this project has been completed.

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# TRANSPORTATION

## INTRODUCTION

The Flathead National Forest Plan identifies the following Forest-wide goals that apply to roads:

1. Construct the minimum number of roads necessary to permit the efficient removal of timber and mineral resources; construct and reconstruct roads only to the minimum standards necessary to prevent soil loss, maintain water quality, minimize safety hazards for a reasonable and prudent Forest user, and provide access for fire protection where needed to meet MA goals; and
2. Maintain a balance of open and closed roads to continue present levels of motorized access, insure big-game habitat security, insure grizzly bear security to meet recovery goals, and reduce road maintenance costs (USDA 2001a).

Forest roads are an essential part of the transportation system designed to support multiple use of our NFS lands. They help meet recreational demands and facilitate access for forest management. National Forest System roads provide access needed to manage the many resources of the forest ecosystem. It is important to develop a long-term transportation plan that provides for a forest road system that best serves management objectives and public uses while protecting the health of our watersheds.

On November 9, 2005, the Forest Service issued the Final Travel Management Rule. This rule revises regulations at 36 CFR parts 212, 251, 261, and 295. The first part of the travel management regulations (36 CFR Part 212, Subpart A) requires that the Forest Service "identify the minimum road system needed for safe and efficient travel and for administration, utilization, and protection of National Forest System lands;" and to identify the roads that "are no longer needed to meet resource management objectives and that, therefore, should be decommissioned or considered for other uses, such as for trails." The second part of the regulations (36 CFR Part 212, Subpart B) requires that the Forest Service designate roads, trails, and areas for motor vehicle use.

The Flathead National Forest completed a science based roads analysis in December 2014, which is documented in a travel analysis report with appendices and is located on the Flathead National Forest internet website at: Travel Analysis Report for the Flathead National Forest. http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprd3826855.pdf). A project-level Travel Analysis Process (TAP) Report (Project File Exhibit R-3) was completed for the Beaver Creek Analysis Area following the recommended six-step process as directed in FSM 7712 (Project File Exhibit R-9) and outlined in FSH 7709.55, Ch. 20 (Project File Exhibit R-8). A TAP was prepared for the Beaver Creek Project to provide information to the responsible official about the transportation system located in the project area. The Swan Lake Ranger District has a system of designated roads and trails in place, as well as a prohibition on cross-country motorized travel.

## ANALYSIS AREA

### SPATIAL BOUNDS

The analysis area for determining the direct, indirect, and cumulative effects for transportation are the NFS lands within the Beaver Creek Project Area. It is on these lands that all road management activities would occur and where effects to the resource, if any, would most likely occur.

## DATA SOURCES, METHODS, AND ASSUMPTIONS USED

A risk/benefit analysis was completed for each road in the Beaver Creek Project Area. The ID Team developed criteria to rate each road by assessing the risk/benefit for the road by each resource. Each road was rated based on need for access and resource environmental concerns. This became the starting point for analyzing the road system for the Beaver Creek Project Area and identifying the issues that would drive the Travel Analysis. As we assessed the benefits and environmental effects of the road system, we identified opportunities for decommissioning, watershed restoration, and road maintenance.

Field reconnaissance revealed that some of the roads may not meet current best management practices (BMPs). Opportunities exist to improve the quality of the watersheds by bringing existing roads up to current BMP standards. This work usually involves structure installation, such as additional culverts, drainage dips, or surface cross drains. Meeting BMPs on all the roads in the project area would be expensive. This work has been prioritized in the Beaver Creek Travel Analysis to ensure the BMPs for roads with the highest environmental risks are accomplished first.

## MEASUREMENT INDICATORS

Road miles are the measurement indicator used to assess the effects of the transportation system proposed in the alternatives.

## AFFECTED ENVIRONMENT

There are approximately 80.2 miles of road with various standards and ownerships within the transportation system of the Beaver Creek Project Area. The Forest Service has jurisdiction over approximately 70.4 miles of road, which includes approximately 14.4 miles of road that were recently acquired from TNC through the Montana Legacy Project. Montana State Highway 83 accounts for 1.6 miles, special use roads under Forest Service jurisdiction account for 0.4 miles, and private landowners have jurisdiction on approximately 7.8 miles of road.

Currently, approximately 9.3 miles of the NFS roads are managed as open yearlong and approximately 61.1 miles are restricted yearlong. The Legacy roads are all being managed as restricted yearlong. The following table displays information about the existing road system within the analysis area.

**TABLE 110. BEAVER CREEK TRANSPORTATION SYSTEM EXISTING CONDITION FOR ALL ROADS WITHIN THE PROJECT AREA.**

| FEATURE | MILES | REMARKS |
|---|---|---|
| Forest Service Jurisdiction | 70.4 | Forest Service jurisdiction includes approximately 14.4 miles acquired from TNC through the MT Legacy Project |
| Private | 7.8 | |
| State Hwy | 1.6 | |
| Special use Roads | 0.4 | |
| **Total miles of all Roads within the Beaver Creek Analysis Area** | **80.2** | |

**TABLE 111. BEAVER CREEK TRANSPORTATION SYSTEM EXISTING CONDITION FOR NFS ROADS, INCLUDING LEGACY ROADS.**

| FEATURE | MILES | REMARKS |
|---|---|---|
| Collector | 9.0 | NFS roads #906 and #9563 are collector roads, all other NFS roads are local roads. |
| Local | 61.4 | |
| Operating Maintenance Level 1 | 61.5 | |
| Operating Maintenance Level 2 | 0.7 | |
| Operating Maintenance Level 3 | 8.2 | |
| Operating Maintenance Levels 3, 4, and 5 (Subject to Highway Safety Act) | 8.2 | |
| Road Management – Open | 9.3 | |
| Road Management – Yearlong Restrictions | 61.1 | |
| Native Road Surfacing | 70.4 | |
| **Total Miles of NFS roads, including, Legacy roads** | **70.4** | |

# ENVIRONMENTAL CONSEQUENCES

Several activities have been proposed in order to maintain and manage a cost-effective long-term road system that meets present and future resource management needs, increases security for wildlife, and insures safe access. The activities proposed in the project area include road maintenance, road decommissioning, placing roads in intermittent stored service (ISS), temporary road construction, and a small amount of new permanent road construction. Below is a brief definition and description of each of these activities. Please refer to the Project File for a complete road-by-road list of these proposed activities. Please refer to Maps 2-1 through 2-4 in Chapter 2 for a display of the access management proposed for the action alternatives.

## ROAD MAINTENANCE

Road maintenance is the ongoing upkeep of a road necessary to meet the approved road management objectives. The present focus of the road management objectives is to meet current BMPs for each road.

Best Management Practices help reduce the concentration of sub-surface and surface water runoff, minimize road surface erosion, filter ditch water before entering streams, and decrease the risk of culvert failures during peak runoff events. Road maintenance work could include culvert installation, replacement of existing culverts with larger culverts, installation of drainage dips and surface water deflectors, placement of rip-rap to armor drainage structures, aggregate surface replacement, aggregate placement to reinforce wet surface areas, ditch construction and cleaning where needed, and surface grading to restore the drainage efficiency of the road surface. These actions would bring the roads up to current BMP standards and provide benefits to the streams in the analysis area (refer to the Aquatics Resources Section of this EA). A list of the haul routes with proposed maintenance activity is located in the Transportation Section of the project file.

## ROAD DECOMMISSIONING

Road decommissioning is defined as activities that result in the stabilization and restoration of unneeded roads to a more natural state (36 CFR 212.1) (FSM 7703).

Decommissioning removes roads from the NFS database of roads that are no longer needed for current or future resource management or which pose a threat to water quality or wildlife security. This action would restore the natural drainage patterns interrupted when the roads were constructed. Methods for decommissioning include active and passive restoration. All decommissioned roads will include:

1. Removing all stream-aligned culverts,
2. Blocking the road entrance and abandoning the road to allow re-vegetation.

In addition, other active treatment could include any combination of the following:

1. Total re-contouring that would restore the road template to the natural hill slope,
2. Partial re-contouring to fill ditches or remove unstable road shoulders, removing culverts and other drainage structures,
3. Ripping the roadbed to reduce compaction,
4. Installing water bars,
5. Out-sloping the road prism, and
6. Seeding and fertilizing disturbed soil.

Passive treatment would not involve any ground-disturbing work, but would remove the road from the NFS road database. These roads typically haven't been used in 20+ years and have reclaimed themselves naturally.

## INTERMITTENT STORED SERVICE

Intermittent Stored Service (ISS) roads are roads closed to traffic that have been put into a condition that there is little resource risk if maintenance is not performed. Roads put in ISS status will be monitored to maintain motorized closure and wildlife security effectiveness, and maintain BMP effectiveness. Treatment activities for roads put into ISS are similar to decommissioning treatments and would include:

1. Removing all stream-aligned culverts,
2. Blocking the road entrance and abandoning the road to allow re-vegetation.

In addition, other active treatment could include any combination of the following:

1. Partial re-contouring to fill ditches or remove unstable road shoulders, removing culverts and other drainage structures,
2. Recontouring the first 200 to 600 feet of the road template,
3. Installing water bars,
4. Out-sloping the road prism, and
5. Seeding and fertilizing disturbed soil.

Placing roads into ISS, rather than decommissioning, allows the watershed and wildlife risks posed by roads to be minimized, while maintaining the road on the NFS road system for future use.

## ROAD CONSTRUCTION

During project development, several areas were identified that would need to be accessed by temporary roads. The proposed road construction would allow temporary access to proposed treatment activities in the area. There are two types of temporary road construction as defined below.

1. **Temporary Roads on Historic Template:** These roads would be constructed on historic templates to the minimum standard needed for log hauling. An historic template can be defined as a constructed road surface that was once used for a transportation need, but is not currently a part of the forest transportation system. It has an overall template that has not been re-contoured, and is in a state that is impassible to full-sized motor vehicles due to waterbars, culvert removals, closure by vegetation, earth berm, or other natural features.
2. **Temporary Roads Requiring New Construction:** New temporary roads would be constructed to the minimum standards necessary for log hauling. Temporary road surface width would be limited to truck bunk width plus four feet.

During project development, one area was identified for new system road construction. Both alternatives propose to construct 0.15 miles of road connecting NFS roads 90191 and 91160. The construction of 0.15 miles of new road would allow 0.38 miles of NFS road 91160 to be decommissioned, while maintaining needed access for future management.

# ALTERNATIVE A – NO ACTION
# DIRECT, INDIRECT, AND CUMULATIVE EFFECTS

The desired future condition of the Beaver Creek transportation system is a condition where the transportation system meets or exceeds the following criteria:

- Provides for safe access for forest users,
- Is responsive to public needs,
- Allows for economical and efficient management,
- Meets current and future resource management objectives,
- Is environmentally sound and begins to reverse adverse ecological impacts.

If no management occurs as a result of the No Action Alternative, the Forest Service Engineering Maintenance Crew would still maintain the roads for safe user access. However, with limited maintenance funds, work that would make the transportation system more economical, efficient, and environmentally sound would not occur as timely as with other action alternatives. The current trend of road maintenance is to bring the roads up to current BMP standards; past funding has limited that work to high-risk priorities or after-the-fact repairs. However, CFLRP has helped reduce this trend. The Beaver Creek bridge replacement project discussed in the cumulative effects section is an example of CFLRP funding used towards landscape restoration. The work needed to economically and efficiently meet road and resource management objectives and reduce ecological impacts could take 10 to 20 years to achieve under the No Action Alternative. Under the action alternatives, this work would take place much sooner.

# ALTERNATIVES B AND C
# DIRECT AND INDIRECT EFFECTS

Direct and indirect effects on the transportation system are described below for proposed activities identified in Chapter 2. Cumulative effects were considered for all past, proposed, current, and reasonably foreseeable activities listed in Chapter 3 and are described at the end of this section.

A more detailed analysis of the impacts of roads on the Aquatics Resource is contained in that section of this EA. The impact of roads on the Wildlife Resource is addressed in the Wildlife Sections of this document.

## ROAD MAINTENANCE (BMPS)

Alternatives B and C each propose road maintenance on portions of haul roads within the Beaver Creek Project Area. The maintenance would reduce the direct and indirect effects roads have on water quality and produce immediate and long-term benefits to streams in the analysis area.

The BMP work would be designed with an emphasis on restoring natural drainage patterns that were altered during road construction. The proposed work would not only reduce the effects of non-point source sediment problems to streams, but would also help reduce the risk of effects due to peak flow runoff events. Please refer to the Aquatic Resources Section of this EA for more discussion of BMP work.

Based on the premise that timely completion of BMPs would maximize benefits to water quality, the alternatives with the most miles of haul routes would provide the greatest benefits. Table 112 below displays the estimated miles of haul routes for each alternative that would be evaluated for BMPs to be applied where necessary prior to timber sale haul. Two other roads, #9653 (MP 3.126 - 3.563) and #91202 (0 - 1.030), were also identified for BMP improvements and not associated with vegetation management haul routes. On NFS road # 9653 at mile point 3.23 there is an old deteriorating native log timber bridge that will be removed and replaced with a new bridge or structural bottomless arch culvert. The existing native log bridge was built in the 1980’s by PCTC. Native log bridges typically have a design life of about 20 years.

**TABLE 112. ROAD MAINTENANCE BEST MANAGEMENT PRACTICES.**

| TYPE | ALT. 1 | ALT. 2 | ALT. 3 |
|---|---|---|---|
| Haul Routes to Receive BMPs | 0.00 | 48.22 | 40.95 |
| Other Proposed Road BMPs | 0.00 | 1.47 | 1.47 |
| **Total Best Management Practices** | **0.00** | **49.69** | **42.42** |

## ROAD DECOMMISSIONING

Alternative A proposes to decommission 0 miles of road and Alternatives B and C propose to decommission 4.5 miles of road. Currently, all roads proposed for decommissioning are closed yearlong. The activities associated with decommissioning roads have the potential risk of exposing mineral soil and increasing short-term erosion. Sections of road proposed for decommissioning that parallel or cross streams within riparian areas total less than 0.1 miles. The only ground-disturbing work for these roads that are located in riparian areas are located at the beginning of NFS road #91221, where a barrier or partial re-contouring is recommended and #9656 where several stream-aligned culverts would be removed. All roads would be surveyed by engineering prior to implementation. All areas of soil disturbance would be seeded and fertilized in a timely manner. The risk of any potential effects to water quality during ground-disturbing implementation of this work would be reduced with soil erosion control protection measures. Table 113 displays all the roads proposed for decommissioning and the type of decommissioning anticipated by alternative.

**TABLE 113. BEAVER CREEK PROJECT AREA ROAD DECOMMISSIONING ACTIVITIES.**

| NFS ROAD # | BMP (MI) | EMP (MI) | EXISTING CONDITION | PASSIVE OR ACTIVE RESTORATION/TYPE OF WORK ANTICIPATED | ALT. 1 (MI) | ALT. 2 (MI) | ALT. 3 (MI) |
|---|---|---|---|---|---|---|---|
| 91221 | 0.000 | 0.238 | Road begins to brush in at MP 0.10. | **Active**: Barrier/partial re-contouring needed at beginning of road. No work needed after MP 0.10 | 0.000 | 0.238 | 0.238 |
| 9658C | 0.000 | 0.270 | Road is brushed in and very rocky. | **Active**: Barrier/partial re-contouring needed at beginning of road. Water bars needed since road will be opened up for haul. | 0.000 | 0.270 | 0.270 |
| 10740 | 0.000 | 0.230 | Road is overgrown. | **Active**: Barrier/partial re-contouring needed at beginning of road. No work needed besides barrier. | 0.000 | 0.230 | 0.230 |
| 91160 | 0.000 | 0.382 | Road is open. Rutting and rilling present on roadway. | **Active**: Barrier/partial re-contouring needed at beginning of road. Water bars recommended. | 0.000 | 0.382 | 0.382 |
| 90255 | 0.000 | 0.050 | Road is overgrown with 3 – 4 inch diameter trees. | **Passive**: No ground disturbing work anticipated. | 0.000 | 0.050 | 0.050 |
| 90258 | 0.000 | 0.100 | No road template found. | **Passive**: No ground disturbing work anticipated. | 0.000 | 0.100 | 0.100 |
| 90259 | 0.000 | 0.150 | No road template found. | **Passive**: No ground disturbing work anticipated. | 0.000 | 0.150 | 0.150 |
| 90132 | 0.185 | 0.400 | Road is very overgrown. | **Passive**: No ground disturbing work anticipated. | 0.000 | 0.215 | 0.215 |
| 90190 | 0.000 | 0.350 | Road is moderately overgrown 2-inch minus trees and alder. Old slash pile is an effective barrier at beginning of road. | **Passive**: No ground disturbing work anticipated. | 0.000 | 0.350 | 0.350 |
| 91204 | 0.000 | 0.550 | End of road is Overgrown | **Active**: Barrier/partial re-contouring needed at beginning of road. Construct water bars as needed. No stream aligned culverts present. | 0.000 | 0.550 | 0.550 |
| 91162 | 0.000 | 0.716 | Road fill slope is failing/slumping off beginning at MP .30. First half of road is stable. | **Re-contour**: Remove all stream aligned and ditch relief culverts. | 0.000 | 0.716 | 0.716 |
| 9656 | 1.550 | 2.800 | Road has several stream aligned culverts. | **Re-contour**: Remove all stream aligned and ditch relief culverts. | 0.000 | 1.250 | 1.250 |
| **Total** | **0.000** | **4.501** | | | | | |

## INTERMITTENT STORED SERVICE

Alternative A proposes to place 0 miles of road into ISS; Alternatives 2 and 3 propose to place 12.58 miles of road into ISS. Several roads were identified during project development for evaluation and placement into ISS, also known as road storage. Currently, these roads are all closed yearlong roads. All roads were reviewed in the field to identify work items needed for placement into ISS. Some of the roads would require active work, such as removing stream-aligned culverts and constructing water bars, while others are already in a self-maintaining state and would not require any active work (passive). The type of work anticipated for each road is shown below in Table 114. All roads would be surveyed by an Engineering Crew prior implementation. If additional ground-disturbing work is identified, these activities would have the potential risk of exposing mineral soil and increasing short-term erosion. All areas of soil disturbance would be seeded and fertilized in a timely manner. The risk of any potential effects to water quality during ground-disturbing implementation of this work would be reduced with BMPs.

**TABLE 114. BEAVER CREEK PROJECT AREA ROAD INTERMITTENT STORED SERVICE ACTIVITIES.**

| NFS Road # | BMP (Mi) | EMP (Mi) | Existing Condition | Passive Or Active Restoration / Type of Work Anticipated | Alt. 1 (Mi) | Alt. 2 (Mi) | Alt. 3 (Mi) |
|---|---|---|---|---|---|---|---|
| 9570 | 5.335 | 6.05 | 18-inch diameter culverts are located at MP 5.332 and 5.536 that are to be removed. | **Active**: Remove stream-aligned culverts. Construct water bars as needed. | 0.000 | 0.715 | 0.715 |
| 9658 | 2.942 | 3.820 | Road is moderately overgrown. | **Active**: Remove stream aligned culverts. Construct water bars as needed after haul. | 0.000 | 0.878 | 0.878 |
| 10577 | 0.501 | 0.913 | Road already in ISS. Stream-aligned culverts are removed, road is outsloped with rolling dips, and road bed is well vegetated with grass. | **Active**: Barrier needed at junction with NFS road #11644. | 0.000 | 0.412 | 0.412 |
| 10589 | 0.000 | 1.450 | Road currently has an effective barrier. | **Active**: Remove stream-aligned culverts. Construct water bars as needed after haul. | 0.000 | 1.450 | 1.450 |
| 10590 | 0.000 | 0.900 | Road is impassable due to vegetation. | **Active**: Remove 24-inch stream-aligned culvert at MP 0.160. Construct water bars as needed after haul. | 0.000 | 0.900 | 0.900 |
| 10737 | 0.693 | 1.371 | Road is impassable after junction with the Jocko Trail #34 due to vegetation. | **Active**: Barrier needed before junction with Jocko Trail #34. No existing stream-aligned culverts. Construct water bars as needed after haul. No work needed beyond Trail #34 if road isn't re-opened and used for haul. | 0.000 | 0.678 | 0.678 |
| 10739 | 0.409 | 0.800 | Road is impassable after junction with the Jocko Trail #34 due to vegetation. | **Active**: Barrier needed before junction with Jocko Trail #34. No existing stream-aligned culverts. Construct water bars as needed after haul. No work needed beyond Trail #34 if road isn't re-opened and used for haul. | 0.000 | 0.391 | 0.391 |
| 10742 | 0.440 | 1.050 | Stream-aligned culvert is removed at MP 0.839. Road is impassable/overgrown with vegetation starting just before removed culvert. | **Active**: Barrier needed at MP 0.440/Jct. with NFS road #10745. No work needed past culvert removal at MP 0.839. Construct water bars as needed. | 0.000 | 0.610 | 0.610 |
| 10744 | 0.000 | 0.300 | Road is impassable due to culvert removal on NFS road #10745 at MP 0.027. | **Active**: Barrier needed at junction with NFS road #10742. No other work anticipated. | 0.000 | 0.300 | 0.300 |
| 10745 | 0.000 | 0.250 | Road is impassable due to culvert removal at MP 0.027. | **Active**: Barrier needed at junction with NFS road #10742. No other work anticipated. | 0.000 | 0.250 | 0.250 |
| 11641 | 0.000 | 0.500 | Currently overgrown with 2 to 3-inch diameter trees. | **Passive**: No additional work anticipated. | 0.000 | 0.500 | 0.500 |
| 11645 | 0.000 | 0.556 | Road already in ISS. Stream aligned culverts are removed, road is outsloped with rolling dips, and road bed is well vegetated with grass. | **Passive**: Barrier needed at Jct. with NFS ROAD # 11644. | 0.000 | 0.556 | 0.556 |

**TABLE 114. BEAVER CREEK PROJECT AREA ROAD INTERMITTENT STORED SERVICE ACTIVITIES.**

| NFS Road # | BMP (Mi) | EMP (Mi) | Existing Condition | Passive Or Active Restoration / Type of Work Anticipated | Alt. 1 (Mi) | Alt. 2 (Mi) | Alt. 3 (Mi) |
|---|---|---|---|---|---|---|---|
| 11646 | 0.000 | 0.250 | Intermittent stream crossing at MP 0.123 has been removed. | **Active**: Barrier needed at junction with NFS road #10735. Install crossing at MP 0.123 and remove after haul. | 0.000 | 0.250 | 0.250 |
| 11647 | 0.000 | 0.740 | Intermittent stream crossing at MP 0.203 has been removed. | **Active**: Barrier needed at junction with NFS road #10735. Install crossings at MP 0.203 if needed and remove after haul. | 0.000 | 0.740 | 0.740 |
| 90131 | 0.000 | 0.450 | Road is currently passable. | **Active**: Remove stream-aligned culverts. Construct water bars as needed. | 0.000 | 0.450 | 0.450 |
| 90132 | 0.000 | 0.185 | Road is very overgrown. | **Passive**: No ground disturbing work anticipated. | 0.000 | 0.185 | 0.185 |
| 91203 | 0.000 | 1.558 | Road is currently passable. | **Active**: Construct water bars as needed. No stream-aligned culverts present. | 0.000 | 1.558 | 1.558 |
| 91205 | 0.000 | 0.268 | Road is very overgrown. | **Passive**: No ground-disturbing work anticipated. | 0.000 | 0.268 | 0.268 |
| 11644A | 0.000 | 0.463 | Road already in ISS. Stream-aligned culverts are removed, road is outsloped with rolling dips, and road bed is well vegetated with grass. | **Passive**: Barrier needed at junction with NFS road #11644. | 0.000 | 0.463 | 0.463 |
| 9570Y | 0.544 | 1.570 | MP 0.730 – 1.570 placed in ISS in 2010 as part of the Beaver Creek TMDL Project. | **Active**: Existing stream-aligned culvert at MP 0.580. Construct water bars as needed. | 0.000 | 1.026 | 1.026 |
| **Total** | **0.000** | **12.580** | | | | | |

## TEMPORARY ROAD CONSTRUCTION

Table 115 and Table 116 below display proposed miles of temporary road construction for each alternative. All newly constructed temporary roads would be rehabilitated after timber harvest is completed or as soon as logistically practical. Alternative 1 proposes 0 miles of temporary road construction, Alternative 2 proposes 7.5 miles of temporary road construction that includes 4.7 miles of new construction and 2.8 miles on existing template, and Alternative 3 proposes 5.0 miles of temporary road construction that includes 2.5 miles of new construction and 2.5 miles on existing template. The rehabilitation of all temporary roads would include:

- Re-contouring the entire road template to the natural ground contour.
- Where re-contouring is unnecessary, scarify with excavator teeth to a depth equally sufficient to ameliorate the presence of detrimental soil compaction (usually between 2 and 12 inches)

Additionally, all temporary roads would be rehabilitated by any site-appropriate combination of the following:

- Removing any installed culverts or temporary bridges.
- Installing erosion control features.
- Revegetation with native shrubs or native seed mix (specified by the Forest Botanist) after soil is replaced as soon as feasible after disturbance to provide for site protection until native species are established.
- Placing woody material on the template.

Roads should be rehabilitated as soon as access is no longer required, before the close of the project.

**TABLE 115. TEMPORARY ROAD NEEDS FOR ALTERNATIVE 2.**

| UNIT | TEMPORARY ROAD NAME | ACCESS | NEW CONSTRUCTION (MI) | EXISTING TEMPLATE (MI) |
|---|---|---|---|---|
| 3 | A | Access via HWY 83/Private road #9557Y | | 0.17 |
| 1 | A | Access via Private road #9557Y | 0.07 | |
| 76, 84, 102, 238, 250, 251, 252 | A1 | Access via NFS road #10735 | | 1.18 |
| 251, 252 | A1 | Access via NFS road #10735 | 0.15 | |
| 93, 94, 96, 97, 257, 258 | B1 | Access via NFS road #91201 | 0.45 | |
| 3,5, 6, 7 | C | Access via HWY 83 | 0.45 | |
| 93, 96, 256, 257, 258 | C1 | Access via NFS road #9654 | 0.37 | |
| 16, 210 | D | Access via NFS road #11636 | | 0.34 |
| 90, 91 | D1 | Access via NFS road #90257 | 0.18 | |
| 19, 419 | E | Access via NFS road #9563 | 0.14 | |
| 259, 260 | E1 | Access via NFS road #9658 | 0.30 | |
| 25, 28 | F | Access via NFS road #10590 | 0.21 | |
| 116, 118 | F1 | Access via NFS road #9658B | 0.41 | |
| 21, 25 | G | Access via NFS road #9563 | 0.20 | |
| 114 | G1 | Access via NFS road #9658 | 0.21 | |
| 23 | H | Access via NFS road #10742 | 0.13 | |
| 252 | H1 | Access via NFS road #91203 | 0.43 | |
| 45 | K | Access via Private road | 0.04 | |
| 45 | K | Access via Private road | 0.02 | |
| 39, 449 | L | Access via NFS road #906 | 0.11 | |
| 51 | M | Access via PCTC road #90272 | | 0.49 |
| 51 | N | Access via PCTC road #90272 | | 0.12 |
| 51 | N | Access via PCTC road #90272 | 0.07 | |
| 51 | O | Access via PCTC road #90272 | | 0.13 |
| 55, 229 | P | Access via PCTC road #90262 | 0.08 | |
| 59, 245 | Q | Access via NFS road #11647 | 0.23 | |
| 62, 245 | R | Access via NFS road #11647 | | 0.08 |
| 62, 245 | R | Access via NFS road #11647 | 0.29 | |
| 62, 230, 231 | S | Access via NFS road #11647 | 0.12 | |
| 76, 79, 231 | Z | Access via NFS road #10735 | | 0.30 |
| Total Temporary Roads | | | 4.7 | 2.8 |

**TABLE 116. TEMPORARY ROAD NEEDS FOR ALTERNATIVE 3.**

| UNIT | TEMPORARY ROAD NAME | ACCESS | NEW CONSTRUCTION (MI) | EXISTING TEMPLATE (MI) |
|---|---|---|---|---|
| 1, 3 | A | Access via HWY 83/Private road #9557Y | | 0.17 |
| 1, 3 | A | Access via Private road #9557Y | 0.07 | |
| 76, 84, 102, 252 | A1 | Access via NFS road #10735 | | 1.18 |
| 252 | A1 | Access via NFS road #10735 | 0.15 | |
| 3, 5, 6 | C | Access via HWY 83 | 0.45 | |
| 16 | D | Access via NFS road #11636 | | 0.34 |
| 90, 91 | D1 | Access via NFS road #90257 | 0.18 | |
| 19 | E | Access via NFS road #9563 | 0.14 | |
| 116, 118 | F1 | Access via NFS road #9658B | 0.41 | |
| 21, 25 | G | Access via NFS road #9563 | 0.20 | |

**TABLE 116. TEMPORARY ROAD NEEDS FOR ALTERNATIVE 3.**

| UNIT | TEMPORARY ROAD NAME | ACCESS | NEW CONSTRUCTION (MI) | EXISTING TEMPLATE (MI) |
|---|---|---|---|---|
| 114 | G1 | Access via NFS road #9658 | 0.21 | |
| 254 | H1 | Access via NFS road #91203 | 0.09 | |
| 45 | K | Access via Private Road | 0.04 | |
| 45 | K | Access via Private road | 0.02 | |
| 39 | L | Access via NFS road #906 | 0.11 | |
| 51 | M | Access via PC road #90272 | | 0.49 |
| 51 | O | Access via PC road #90272 | | 0.12 |
| 55 | P | Access via PC road #90262 | 0.08 | |
| 62 | R | Access via NFS road #11647 | | 0.08 |
| 62 | R | Access via NFS road #11647 | 0.29 | |
| 76 | Z | Access via NFS road #10735 | | 0.12 |
| Total Temporary Roads | | | 2.5 | 2.5 |

## RESOURCE ENHANCEMENT PROJECTS

Alternative 2 proposes to construct a fish barrier on a perennial stream of Beaver Creek off of NFS road #91202 at MP 0.67. Access would be required to conduct instream construction and would likely pass through an old landing area on relatively flat topography. The access point would be rehabilitated shortly after construction is completed by ripping the roadbed to reduce compaction, seeding and mulching, and placing slash and woody debris over the road surface. The barrier would consist of a concrete dam approximately 3.5 to 6.5 feet in height and 16 to 24 feet in length. Water would flow through a notch onto a concrete splash pad and, then, drop again to the natural stream channel. This double-drop structure would block upstream passage for fish at all flow levels. Additionally, an aquatic organism passage (AOP) pipe would be installed approximately 0.7 miles upstream of the proposed fish barrier on NFS road #9658 at MP 1.12. The new structure would be designed to pass the 100-year flood event and would be either an oversized squash pipe with stream simulation material placed inside or a bottomless arch structure. The expected duration of this work would take 4 to 8 weeks. Instead of the double drop structure in Alternative 2, Alternative 3 proposes to construct the barrier at MP 1.12 on NFS road #9658. The barrier would be a shot-gunned culvert with a drop of at least 12 inches and splash pad at the outlet to prevent non-native brook trout from passing further upstream.

Alternatives 2 and 3 propose to install a culvert on NFS road #11636 at MP 1.661 as a fish barrier. Currently, the culvert at this location has been removed. The barrier would be provided by installing a new culvert with a drop of at least 3 inches at the outlet to prevent non-native fish from passing further upstream. The other stream-aligned culverts on NFS road #11636 have been removed and would be reinstalled for access to Unit 37. These culverts would remain after project completion. The existing culvert removals at MP 1.43 and 1.86 would not need to be installed because that section of road isn’t needed for vegetation management access.

A culvert replacement is proposed for Alternatives 2 and 3 on NFS road #906 at MP 1.15. The existing crossing has had ongoing maintenance problems with debris clogging the culvert inlet and has backed up the upstream wetland. Currently, the roadway is acting as a dam that has created voids in the road fill over time. Large cracks have been observed in the roadway within the past 10 years. The new culvert would be designed to pass the 100-year flood event, and the inlet elevation lowered to its natural elevation. This would prevent the roadway from acting as a dam by lowering the water elevation and, therefore, alleviate the water pressure on the roadway fill. This culvert would also be designed to act as a barrier to prevent non-native fish from entering the inter-basin wetland, which is connected to the Clearwater Drainage. The barrier would be shot gunned with a drop of at least 4 inches. A more detailed analysis of these Resource Enhancement Projects can be found in the Aquatics Resource Section of this EA.

Alternatives 2 and 3 propose additional work on historic road #10736. This road is located in Sections 25 and 26, T19N R17W on LWCF lands and was decommissioned and removed from the NFS road system in 2002. An effective barrier is still needed at the beginning of the road. Other erosion control measures, such as waterbars, may also be needed.

# ALTERNATIVES 2 AND 3 – ACTION ALTERNATIVES CUMULATIVE EFFECTS

Activities that cumulatively affect the Transportation Resource are discussed below.

## NATIONAL FOREST SYSTEM ROAD ACTIVITIES

Routine road maintenance would occur as needed on roads in the project area, separate from any road maintenance identified in this EA. This would minimize road surface erosion, lessen the risk of culvert failures during peak runoff events, and retain the traffic safety standards for the road. Activities would include ditch and culvert cleaning, brushing, gate repair/replacement, road grading, and debris removal. Additional culverts are likely to be installed as needed.

Ongoing travel management has taken place on acquired LWCF lands within the Beaver Creek Project Area. In September 2008, in Section 17, T19N R16W, 1.4 miles of roads were placed into ISS by removing stream-aligned culverts, constructing rolling dips, and post work seeding and soil stabilization. This included NFS roads #10577, #11644, #11644A, and #11645. Another 2.2 miles of roads were decommissioned and removed from the NFS road system within Section 17. Similarly, in T19N R17W, Sections 13, 25, 26, 4.6 miles of road were decommissioned; and in Section 19, T19N, R16W, 1.3 miles of roads were also decommissioned.

During the summer of 2010, the Beaver Creek TMDL Project implemented approximately 6 miles of road BMPs within the project area. This work included road reconditioning, building drain dips, installing/replacing ditch relief pipes, upsizing stream-aligned culverts, and constructing culvert catch basins. This work took place on NFS roads #9656, #9563, #9570, and #9570Y. Also, approximately 1 mile of road was placed in ISS on NFS road #9570Y by removing 3 stream-aligned culverts and constructing waterbars. These projects, along with routine road maintenance activities, have a beneficial cumulative effect to Aquatic Resources.

Currently, there is a CFLR project to replace a deteriorating timber bridge on NFS road #906 at MP 3.185 on Beaver Creek. The project would be expected to take place the summer or early fall of 2015 and take 2 to 3 weeks.

All planned and proposed road-related work in the project area would contribute to the restoration efforts of the watersheds within Beaver Creek. Design Criteria (See Table 16) to reduce the effects of erosion would be implemented with all projects. The long-term effects of roads to the hydrology of the watersheds would be greatly reduced from that of our current existing condition. Our analysis concludes that beneficial gains to watershed restoration would result from the implementation of any action alternative listed in this document, and reductions in the direct, indirect, and cumulative effects of the road system on the environment would be achieved.

Combined with this road activity, the work proposed in the action alternatives would cumulatively reduce the long-term effects of the road system on water quality, wildlife security, riparian areas, and road maintenance costs.

## NATURE CONSERVANCY PROPOSALS

There are 0.4 miles of tertiary roads identified within the Two Bears (TNC) harvest plans. These activities have been completed and the tertiary routes used for the sale have been rehabilitated.

All roads being used for haul would receive post-harvest road blading to smooth ruts, clear slash from road, and ensure drainage features are functioning properly. There are no other reasonably foreseeable road management actions in this analysis area. The road network on Legacy lands is encumbered by the Fiber Agreement until 2018. The Forest Service would not change transportation system access rights granted under the TNC Legacy lands transfer.

# EFFECTS OF A FOREST PLAN AMENDMENT TO ASSIGN MANAGEMENT AREAS TO ACQUIRED LANDS

The Beaver Creek Project includes a Forest Plan Amendment to assign interim management areas (MAs) to approximately 5,457 acres of former Plum Creek Timber Company (PCTC) lands acquired by the U.S. Forest Service to be managed as part of the Flathead National Forest. These interim management areas will be in effect on acquired lands until the ongoing Forest Plan Revision effort is completed, anticipated in 2 years.

The effects of the Forest Plan Amendment to transportation within the analysis area under Alternative 1 – No Action Alternative are minor because the National, Regional, and Forest standards and guidelines for the transportation network apply to all lands managed by the Flathead National Forest even if management areas are not assigned. The transportation network in place on the acquired lands was constructed for industrial timber management purposes and the transportation analysis report identifies the benefit and resource concerns of each existing road to inform future management decisions. The effects of the Forest Plan Amendment under Alternative 2 and 3 are also minor in scale because although they allow for timber management to occur on some lands they will maintain consistency with the forest-wide standards and guidelines that are in place to manage an efficient transportation system. These MA assignments are consistent with the existing condition of these lands and the management direction assigned to adjacent lands and will not preclude future MA assignment under the Flathead Forest Plan Revision effort.

The cumulative effects of this forest plan amendment are very limited due to the geographic scope and expected duration of the amendment. At the Flathead National Forest scale, this amendment is only addressing management area direction on less than 1 percent of the NFS acreage on the Flathead National Forest. Additionally, the duration of this amendment is expected to be short-term since forest plan revision is ongoing with a decision expected in 2017. When the revision effort is completed, new management areas will be assigned across the entire Flathead National Forest, including the Beaver Creek project area, and will supersede any of the interim management areas proposed in this amendment. Reasonably foreseeable activities identified on the lands associated with the amendment is very limited as identified in Table 17 in Chapter 3 of this EA. If future land management activities occur on these lands they will be subject to forest-wide direction found in the Flathead National Forest Land and Resource Management Plan, federal and state laws, and other Forest Service regulations, as they are now, and will be guided by the proposed management area direction. Future land management activities such as timber harvest, road work, changes to public access etc. would be subject to site-specific NEPA analysis in the future.

# REGULATORY FRAMEWORK AND CONSISTENCY

The process of this analysis and the road management proposals listed in this document comply with all laws, EOs, Forest Service directives, MOUs, and with the current Forest Plan goals, objectives, guidelines and standards.

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# SOCIAL AND ECONOMIC RESOURCE

## INTRODUCTION

The management of the Flathead National Forest has the potential to affect local economies. People are an important part of the ecosystem. Use of resources and recreational visitation to the Flathead National Forest generates employment and income in the surrounding communities and counties and generates revenues that are returned to the Federal Treasury or are used to fund additional activities to accomplish resource management objectives.

This section presents concepts used to delineate an affected area and describes the methods and results of analyzing the economic effects of the project, including project feasibility, financial efficiency, and economic impacts. Project feasibility and financial efficiency relate to the costs and revenues of doing the action. Economic impacts relate to how the action affects the local economy in the surrounding area.

The NEPA requires that consequences to the human environment be analyzed and disclosed, based on issues. It does not require a monetary benefit-cost analysis. If an agency prepares an economic analysis, then one must be prepared and displayed for all alternatives [40 CFR 1502.23]. The preparation of NEPA documents is also guided by CEQ regulations for implementing NEPA [40 CFR 1500-1508].

Office of Management and Budget (OMB) Circular A-94 promotes efficient resource use through well-informed decision-making by the Federal government. It suggests agencies prepare an efficiency analysis as part of project decision-making. It prescribes present net value as the criterion for an efficiency analysis.

The development of timber sale programs and individual timber sales is guided by agency direction found in FSM 2430 (USDA 2014a). Forest Service Handbook 2409.18 (USDA 1990) guides the financial and, if applicable, economic efficiency analysis for timber sales.

## ANALYSIS AREA

### SPATIAL AND TEMPORAL BOUNDS

The efficiency analysis includes all proposed activities and locations described for the Beaver Creek Project Area. All costs and revenues associated with the project were included. The time frame for this analysis is from the beginning of implementation of activities to the completion of the project. This project is expected to be completed over a 5-year period, with the harvest activity occurring primarily within the first 3 years.

To estimate the potential impact on jobs and income, a zone of influence (or economic impact area) was delineated. The impact area was chosen using suggested USDA Forest Service protocols for delineating economic impact areas (Meti Corporation 2010), which bases the selection of the impact area on commuting data and where the timber is likely to be processed (log flows). This analysis suggested that Missoula and Flathead Counties were the appropriate counties to include in the economic impact analysis area.

# DATA SOURCES, METHOD, AND ASSUMPTIONS

## METHODOLOGIES

Three measures are appropriate for this economic analysis:

1. Financial efficiency,
2. Economic impacts, and
3. Timber Sale feasibility.

These measures, including methodologies, are described below.

### FINANCIAL EFFICIENCY

Financial efficiency considers anticipated costs and revenues that are part of Forest Service monetary transactions. Present net value (PNV) is used as an indicator of financial efficiency and is one tool to be used in conjunction with many other factors in the decision-making process. Present net value 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. Present net value was calculated using a 4 percent real discount rate. Costs for non-timber harvest activities, such as pre-commercial thinning, are based on recent experienced costs and professional estimates. Non-harvest related costs, such as prescribed burning as proposed in the Mission Mountains, are included in the PNV analysis, but they are not included in the appraised timber value.

Financial efficiency analysis is not intended to be a comprehensive analysis that incorporates monetary expressions of all known market and non-market benefits and costs. Many of the values associated with natural resource management are best handled apart from, but in conjunction with, a more limited financial efficiency framework. These non-market benefits and costs associated with the project are discussed throughout the various resource sections of this document.

### ECONOMIC IMPACTS

Economic Impacts are used to evaluate 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 examination of the effect of a change in one or several economic activities on an entire economy, all else are constant. This examination is called Impact Analysis. The IMPLAN Modeling System (Minnesota IMPLAN Group 2004) allows the user to build regional economic models of one or more counties for a particular year. The model for this analysis used the 2010 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 economic impact effects are measured by estimating the direct jobs and labor income generated by:

1. Processing of the timber volume from the project, and
2. Forest Service expenditures for contracted restoration activities included as part of the proposed treatments.

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. Indirect effects are felt by the producers of materials used by the directly affected industries. Induced effects occur when employees of the directly and indirectly affected industries spend their wages. Together the direct and multiplier effects comprise the total economic impacts to the local economy.

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) (Morgan et al. 2008). 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) was used for this analysis. The BBER data represents the results of mill censuses that correlate production, employment, and labor income.

Potential limitations of these estimates are the time lag in IMPLAN data and the data intensive nature of the 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 BBER.

### TIMBER SALE FEASIBILITY

Timber sale feasibility is used to determine if the timber sale portions of each action alternative are feasible, that is, will a contract receive bids given current market conditions. The determination of feasibility relies on a residual value (stumpage = revenues - costs) feasibility analysis that uses local delivered log prices, and stump to mill costs to determine if a project is feasible. The appraised stumpage rate from this analysis is compared to the base rate (revenues considered essential to cover regeneration plus minimum return to the Federal Treasury). The timber sale is considered to be feasible if the appraised stumpage rate exceeds the base rates. If the feasibility analysis indicates that the project is not feasible, the timber sale portions of the project would need to be modified to drop activities, redesigned to utilize stewardship or other contractual authorities, and/ or supplemented with other funds if actual bids do not exceed base rates at the time of project award. Infeasibility indicates an increased risk that the project may not attract bids and may not be fully implemented or would require additional funding to accomplish. Greater stumpage amounts generated mean that additional project activities not generating revenue or affecting feasibility of timber sale portions of the project can be accomplished using that value as allowed given stewardship authorities.

# AFFECTED ENVIRONMENT

## THE ECONOMIC COMMUNITY

The Flathead National Forest includes parts of six Montana counties: Flathead, Lincoln, Lake, Missoula, Powell, and Lewis and Clark. About three-fourths of the area of the Flathead National Forest and most of the economic effects of its programs and projects occur in Flathead County. The Flathead National Forest has lesser effects in Lake County and only minimal effects in the other four counties. Within Missoula County, activity on the Flathead National Forest has some effects; however, within the Swan Valley portion of Missoula County, the effects of Flathead National Forest activities are somewhat magnified, although empirical data is lacking. This is due to the high proportion of NFS lands, and few services with little or no manufacturing located in the Swan Valley as compared to the rest of Missoula County.

The Beaver Creek Project Area is located on the Swan Lake Ranger District of the Flathead National Forest, and within Missoula County. Based upon the location of the sale, the most affected counties, in terms of economic effects, would be Missoula and Flathead. Since the closest log processing facilities are in Flathead and Missoula Counties, there would be lesser effects expected to Lake County.

The Flathead National Forest is an important part of the Northern Continental Divide Ecosystem, which covers most of northwest Montana. This area has substantial economic value on a regional, national, and international scale when recreation and tourism, wildlife, and aesthetic values are considered along with a substantial timber management program. However, it is beyond the scope of this analysis to evaluate markets for all these resources, because they have not been identified as substantial economic issues with respect to the Beaver Creek Project. The emphasis is on the economic effects that the Proposed Action and alternatives would have on the timber industry and the local communities that would be primarily affected by implementing those activities.

## TIMBER INDUSTRY TRENDS

### HISTORICAL PRODUCTION AND CAPACITY

Historically, annual timber harvest from NFS land in Montana peaked at greater than 800 million board feet at the end of the 1960s (Spoelma et al. 2008). In 2009, the annual timber harvest from NFS lands in Montana was about 93 million board feet or about 25 percent of the total harvest in the state (McIver et al. 2013).

In 2009, of the 219 million board feet (43.9 MMCF) of timber harvested in Flathead, Lake, and Missoula Counties, approximately 33 million board feet, or about 15 percent, came from the Flathead National Forest. Current capacity, as of 2011, in the nine county Flathead National Forest timber processing area is approximately 560 million board feet (112 million cubic feet) for sawtimber, veneer, and house logs of which mills are utilizing roughly 50 percent. A substantial amount of the capacity capable of utilizing smaller diameter trees is being used to process larger trees or going unused (Sorenson et al. 2012).

The percentage of milling capacity that is actually used or remains available for use affects the demand for logs and is a variable affecting log prices, which in turn, affects the quantity of logs supplied to mills.

### TIMBER INDUSTRY OUTLOOK

The global economic downturn in 2008 caused significant impacts to the timber industry in Montana and elsewhere. Since that time, slow but steady recovery continues with new home starts continuing to grow modestly in 2014. Lumber production saw slight increases and prices were steady during 2014. Neither new home starts, nor lumber prices have reached pre-recession highs, but both appear to have recovered and stabilized (Morgan et al. 2014).

Total sales value of primary wood products in Montana in 2014 was up approximately 8 percent to $600 million over the revised figures from 2013. Estimated total employment in the wood products industry was about 7,660 workers, up a little over 4 percent from 2013 with labor income estimated at $335 million, about 10 percent higher than 2013 (Morgan et al. 2013).

Montana’s wood products markets are generally expected to make modest gains in 2015; however, uncertainty remains a considerable factor. Recovery in housing starts should keep prices high, but supply issues remain leaving many mills with unutilized capacity. Delivered log prices have been generally increasing since 2011 since raw material availability has been a limiting factor. The vast majority (90%) of Montana’s forest products industry expect 2015 to be the same or better than 2014 for their business (Morgan et al. 2013).

The following effects indicators were used to focus the economic analysis and disclose relevant environmental or social effects:

- Effects on Financial Efficiency.
- Effects on Employment.
- Timber Sale Feasibility.

## FINANCIAL EFFICIENCY

The financial efficiency analysis is specific to both the commercial harvest activities, as well as all other activities associated with the alternatives (as directed in FSM 2400, found in the FSH 2409.18). All costs, timing, and amounts were developed with input from the Specialists on the ID Team. The expected revenue for each alternative is the corresponding predicted high bid ($/CCF) from the sale feasibility analysis times the amount of timber 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 would depend on the market when the timber is sold and could be higher or lower than the predicted high bid. Present net value was calculated using a 4 percent real discount rate over the 8-10 year expected project lifespan for completion of all activities (2016 through 2026). For more information on the values or costs, refer to the Project File Exhibits S-7 and S-8.

This analysis is not intended to be a comprehensive benefit-cost or PNV analysis incorporating a monetary expression of all known market and non-market benefits and costs generally used when economic efficiency is the sole or primary criteria upon which a decision is made. Many of the values associated with natural resource management are best handled apart from, but in conjunction with, a more limited benefit-cost framework. These values are discussed throughout this document, for each resource area. Changes to resources like fisheries and wildlife habitat have been measured using changes to habitat conditions and will not be described in financial or economic terms for the Beaver Creek Project. Planning costs were not included in any of the alternatives, since they are sunk costs at the point of alternatives selection.

Table 117 summarizes the project feasibility and financial efficiency, including the predicted high bid (and appraised stumpage value), total revenue, and PNV for each alternative. Because not all costs of the project are related to the commercial component of the project, two PNVs were calculated. One PNV indicates the financial efficiency of the commercial harvest and related activities including revenues and costs for harvest actions, sale preparation, sale administration, brush disposal, regeneration, planting, and monitoring. A second PNV includes all costs for each alternative, including other activities that are non-commercial harvest related, such as planting of trees outside of regeneration areas, pre-commercial thinning, fuels reduction, aquatic restoration activities, and road decommissioning. The Flathead National Forest may use dollars received from timber sale receipts to fund a portion of these other project activities using stewardship contracting authorities. Project costs in excess, or not covered by those authorities, would have to be paid for with appropriated dollars.

Alternatives 2 and 3 are both financially inefficient when all project activities are considered, with Alternative 2 being slightly less inefficient, as indicated by negative PNV values for all activities. This indicates that in order to accomplish the activities as proposed in each alternative appropriated funds would need to be expended. Given the availability of funding through the Southwestern Crown of the Continent CFLR project, this project was not designed with the objective of maximizing PNV or minimizing costs of restoration work, rather work was prioritized based on meeting a multitude of resource objectives. In that regard, financial efficiency may be a poor measure for this project. Alternative 1 – No Action would not harvest or implement any additional management and would, therefore, incur no costs.

With regards to the timber sale portions of the project, as described above, both of the action alternatives are financially efficient with Alternative 2 being the most efficient.

The PNV of any alternative as compared to the most efficient solution is a component of the economic trade-off, or opportunity cost, of achieving that alternative. As indicated earlier, many of the values associated with natural resource management are non-market benefits and costs. These trade-offs should be considered in conjunction with the financial efficiency information presented here.

**TABLE 117. PROJECT FEASIBILITY AND FINANCIAL SUMMARY (2014 DOLLARS).**

| CATEGORY | MEASURE | ALTERNATIVE 1 | ALTERNATIVE 2 | ALTERNATIVE 3 |
|---|---|---|---|---|
| Timber Harvest Information[8] | Acres to be treated with commercial component | 0 | 2,351 | 1,586 |
| | Sawtimber Volume Harvested (CCF) | 0 | 14,933 | 9,099 |
| | Non-sawtimber Volume Harvested (CCF) | 0 | 6,421 | 3,912 |
| | Base Rates ($/CCF) | $0 | $20.28 | $6.60 |
| | Appraised Stumpage Rate ($/CCF) | $0 | $37.65 | $26.39 |
| | Predicted High Bid ($/CCF) | $0 | $56.86 | $45.60 |
| | Non-sawtimber Rate ($/CCF) | $0 | $1.00 | $1.00 |
| | Total Revenue (Thousands of $) | 0 | $849 | $415 |
| Timber Harvest & Required Design Criteria | PNV (Thousands of $) | 0 | $374 | $195 |
| Timber Harvest & All Other Planned Non-timber Activities | PNV (Thousands of $) | 0 | -$928 | -$958 |

The effects of timing play an important role in implementing projects of this size. The numbers listed in Table 117 were generated using logging price indexes reflecting the volatility of timber markets from 2014 to early 2015. The targeted completion date for the timber sale portions of this project is approximately 2019; market variability can and would have a large difference on costs and revenues in that time.

When evaluating trade-offs and opportunity costs, the use of financial efficiency measures is one tool used by the decision maker in making the decision. Many things cannot be quantified directly or in monetary terms, such as effects on wildlife, impacts on local communities, and restoration of watersheds and vegetation.

## ECONOMIC IMPACTS

The analysis calculated the jobs and labor income associated with the processing of timber products harvested and activities that are anticipated to be contracted out. Timber products harvested from the proposed project and the non-timber activities would have direct, indirect, and induced effects on local jobs and labor income.

In order to estimate jobs and labor income associated with timber harvest, the timber harvest levels were proportionally broken out by product type, estimating 60 percent to be processed as sawtimber and 15 percent to be processed as pulp and post and pole products each, with 10 percent to veneer. The direct employment and labor income response coefficients (jobs and labor income per million cubic feet) for timber harvest activities were derived by the University of Montana's BBER. In order to estimate jobs and labor income associated with other activities, expenditures for these activities were developed by the Resource Specialists on the ID Team. The indirect and induced multiplier effects were estimated using the IMPLAN Model for the economic impact area. Only the expenditures associated with the contracted activities are included in the impact analysis, rather than work to be completed by Forest Service personnel.

[8] Acreage listed represents those acres on which recoverable commercial products are expected to be generated by the various treatments in the alternatives and may differ slightly from other summaries. See Project File Exhibits S-5 and S-7 for detailed acreage and cost summary spreadsheets.

Table 118 displays the direct, indirect and induced, and total estimates for employment (part and full-time) and labor income that could be attributed to each alternative. Since the expenditures occur over time, the estimated impacts of jobs and labor income would be spread out over the expected 8-10 year life of the project (2016 to 2026). It is important to note that these may not be new jobs or income, but rather jobs and income that are supported by this project. These impacts are shown both in total (over the life of the project) and on an annual basis. It is anticipated that the timber harvest would occur over a 3-year period, with other activities spread out over the remainder. However, complete implementation could take longer or be accomplished earlier.

**TABLE 118. ECONOMIC IMPACTS (EMPLOYMENT AND LABOR INCOME, TOTAL AND ANNUAL) (2014 $).**

| ALTERNATIVES | ALT. 2 | ALT. 2 | ALT. 3 | ALT. 3 | NO ACTION |
|---|---|---|---|---|---|
| INCOME | TOTAL | ANNUAL | TOTAL | ANNUAL | TOTAL |
| **Part and Full Time Jobs Contributed for Non Timber Harvest Activities** | | | | | |
| Direct | 33 | 5 | 23 | 3 | 0 |
| Indirect and Induced | 14 | 2 | 11 | 2 | 0 |
| Total | 47 | 7 | 34 | 5 | 0 |
| **Labor Income Contributed ($M 2012) for Non Timber Harvest Activities** | | | | | |
| Direct | $1,582 | $226 | $1,151 | $164 | $0 |
| Indirect and Induced | $518 | $74 | $400 | $57 | $0 |
| Total | $2,100 | $300 | $1,550 | $221 | $0 |
| **Part and Full Time Jobs Contributed for Timber Harvest Activities** | | | | | |
| Direct | 59 | 15 | 36 | 9 | 0 |
| Indirect and Induced | 64 | 16 | 39 | 10 | 0 |
| Total | 123 | 31 | 75 | 19 | 0 |
| **Labor Income Contributed ($M 2012) for Timber Harvest Activities** | | | | | |
| Direct | $2,735 | $684 | $1,667 | $417 | $0 |
| Indirect and Induced | $3,599 | $900 | $2,193 | $548 | $0 |
| Total | $6,335 | $1,584 | $3,860 | $965 | $0 |
| **Part and Full Time Jobs Contributed for All Activities** | | | | | |
| Direct | 91 | 19 | 59 | 12 | 0 |
| Indirect and Induced | 78 | 18 | 50 | 11 | 0 |
| Total | 169 | 37 | 109 | 24 | $0 |
| **Labor Income Contributed ($M 2012) for All Activities** | | | | | |
| Direct | $4,317 | $910 | $2,817 | $581 | $0 |
| Indirect and Induced | $4,117 | $974 | $2,593 | $605 | $0 |
| Total | $8,435 | $1,884 | $5,410 | $1,186 | $0 |

Alternative 2 results in the most jobs created or maintained on a total and annual basis, as well as the highest labor income. Alternative 2 results in 169 total jobs and $8.4 million in labor income spread over the life of the project, with 37 jobs and $1.8 million annually. Of that total, 123 jobs and $6.3 million are associated with the timber harvest activities. Alternative 3 follows, with the largest single factor affecting income and jobs being commercial volume removed. For non-timber harvest related activities, Alternative 2 generates $2.1 million in labor income and creates 47 jobs. Alternative 1 – No Action creates no jobs and no labor income.

A job (as defined in IMPLAN) is an annual average of monthly jobs. Thus, 1 job lasting 12 months = 2 jobs lasting 6 months each = 3 jobs lasting 4 months each. Each of those examples would appear as 1 job. That 1 job lasting 12 months can be either full-time or part-time; but it does last for 12 months. When jobs are counted this way, one cannot tell from the data the number of hours worked or the proportion that are full or part-time or anything about seasonality; only that they are yearlong. These jobs are different than full time equivalent (FTE) jobs. However, they can be converted to average FTE jobs by using industry-specific FTE to employment ratios (number of FTE jobs in an industry divided by total employment in the industry). These ratios are all less than 1 because employment contains part-time jobs (so there are more jobs than there are FTEs).

Estimates of average year-long part-time and full-time jobs shown in Table 118 are heavily dependent upon the implementation period of the project. The estimates shown in Table 118 reflect the average over an estimated implementation time of 8 years (3 years for the timber portion of the project). If the actual implementation period is shorter than this, more jobs would be supported over a shorter period of time. Conversely, if the implementation period is expanded, fewer jobs would be supported annually, but for a longer period of time. Also, within the implementation period of a project, numbers of jobs supported may or may not be distributed evenly over time depending upon the nature of the project. The analysis also assumes that the timber volume is processed within Flathead and Missoula timber processing areas, and if some or all of the timber were processed outside the region, a portion of the jobs and income would be lost by this region's economy but gained elsewhere.

The Beaver Creek Project lies within the Southwestern Crown of the Continent area. Recently, a study determined that during the time period from 2005 to 2011, a large proportion of both the money invested in restoration work and timber volumes offered by the Forest Service within the five county local area were captured by contractors within that area. For that study Flathead, Lake, Lewis & Clark, Powell, and Missoula counties were defined as the local area. In that timeframe 60 percent of restoration investments made as service contracts were captured by local firms as was 71 percent of timber volume offered (McIver 2013).

## TIMBER SALE FEASIBILITY

The estimation of timber sale feasibility was based on a residual value appraisal model for the timber harvest portion of the Beaver Creek Project and associated activities only, which is based on logging system, timber volume removed per acre, delivered log prices, costs for slash treatment, cost of specified road construction and reconstruction, temporary road construction, and road maintenance. The appraised stumpage rates (a conservative estimate of the timber value), predicted high bid (which incorporates competition factors and average experienced overbid), and base rates for each alternative are displayed in Table 117 above. The appraised stumpage rate is positive for all action alternatives based upon the residual value model and above the adjusted base rates, indicating that the timber harvest portions of the project would not require additional modification or funding to be feasible given current markets. Additionally, the predicted high bid (the best estimate of the high bid resulting from the timber sale auction) for all alternatives is greater than the adjusted base rate, indicating that the timber sales resulting from these alternatives would most likely sell and generate revenue.

Several factors affect the feasibility of these alternatives:

- Quantities and types of work needed on system roads,
- Reforestation costs,
- Treatment of non-sawtimber, and
- Brush disposal are costs affecting the bottom line feasibility of the action alternatives.

The revenue estimates (based upon the predicted high bid) from the feasibility analysis are brought forward for use in the financial efficiency analysis. Revenue estimates are based upon the Montana Sawlog and Veneer Log Price Report for April – June 2015 (Project File Exhibit S-15; [Bureau of Business and Economic Research](http://www.bber.umt.edu/pubs/forest/prices/sawlog2015q2.pdf) ([http://www.bber.umt.edu/pubs/forest/prices/sawlog2015q2.pdf](http://www.bber.umt.edu/pubs/forest/prices/sawlog2015q2.pdf)).

It should be mentioned that the Beaver Creek Project has the potential to provide resources that could be converted into a variety of wood products. This could include but would not be limited to biomass, posts and poles, rails, bio-char, house logs, bio-fuels, hog fuel, utility poles, and specialty beam products. Due to a variety of current limitations in those markets ranging from extreme restrictions in production to non-existent re-sale markets in the Beaver Creek economic area, these products and possible revenues are not included in this analysis. However, the actualization of these products could occur as a result of prospective purchaser marketing and ingenuity, thus positively affecting the feasibility of the project. Conversely, a prospective purchaser may find that prices have lowered, or markets have declined, which could negatively affect the feasibility. Feasibility for all other activities not related to the timber sale portions of this project depend on availability of appropriated funds during the life of the project.

## ALTERNATIVE 2 – PROPOSED ACTION DIRECT AND INDIRECT EFFECTS

Alternative 2 treats the most acreage, generates the most jobs and labor income, volume of sawtimber and non-sawtimber, and the highest total revenues. With an appraised stumpage rate of $37.65/CCF, the timber sale portions of this alternative are feasible. Receipts generated in excess would be available to accomplish stewardship activities and other activities in the alternative; however, additional funding from appropriated dollars would need to be made available to accomplish all planned activities.

## ALTERNATIVE 3 DIRECT AND INDIRECT EFFECTS

The most significant changes to Alternative 3 from Alternative 2 include: reducing acreage treated in many activity types, reducing intensity of activities on some acres (regeneration harvest to thinning), reductions in volume of sawtimber and non-sawtimber, increased cost for some prescribed burns, and the dropping of a concrete fish barrier in favor of replacing a culvert higher upstream with a redesigned structure to act as a barrier. This decreases the appraised stumpage rate to $26.39/CCF by reducing some costs, but maintains enough total revenues to remain feasible. This alternative generates less jobs and labor income, volume of timber and non-sawtimber, and total revenues, while treating fewer acres than Alternative 2. The timber sale portions of this alternative are feasible, and would generate some excess receipts available to accomplish stewardship and other activities included in this alternative; however, additional funding from appropriated dollars would need to be made available to accomplish all planned activities.

## ALTERNATIVES 2 AND 3 – ACTION ALTERNATIVES CUMULATIVE EFFECTS

Management of the Flathead National Forest has an impact on the economies of local counties. There are many additional factors that would influence and affect the local economies:

- Changes to industry technologies,
- Management of adjacent national forests and private lands,
- Economic growth, and
- International trade.

The jobs and labor income associated with timber harvest, restoration, and reforestation activities in the action alternatives, would contribute to the stability of the local economy during the life of the project. The magnitude of these effects derived from the action alternatives is represented in the Economic Impacts Section of the Direct and Indirect Effects Section above.

Beneficial cumulative economic effects would be seen within the local community as a result of other ongoing and reasonably foreseeable federal projects within the economic impact area.

# EFFECTS OF A FOREST PLAN AMENDMENT TO ASSIGN MANAGEMENT AREAS TO ACQUIRED LANDS

The Beaver Creek Project includes a Forest Plan Amendment to assign interim management areas (MAs) to approximately 5,457 acres of former Plum Creek Timber Company (PCTC) lands acquired by the U.S. Forest Service to be managed as part of the Flathead National Forest. These interim management areas will be in effect on acquired lands until the ongoing Forest Plan Revision effort is completed, anticipated in 2 years.

The effects of the Forest Plan Amendment on the ability to provide a sustained yield of timber products to the local economy are minor because the management area assignments are interim in nature until the forest plan revision effort is completed. The MA assignments proposed in Alternative 2 and 3 are consistent with the existing condition of these lands and the management direction assigned to adjacent lands and will not preclude future MA assignment under the Flathead Forest Plan Revision effort.

The cumulative effects of this forest plan amendment are very limited due to the geographic scope and expected duration of the amendment. At the Flathead National Forest scale, this amendment is only addressing management area direction on less than 1 percent of the NFS acreage on the Flathead National Forest. Additionally, the duration of this amendment is expected to be short-term since forest plan revision is ongoing with a decision expected in 2017. When the revision effort is completed, new management areas will be assigned across the entire Flathead National Forest, including the Beaver Creek project area, and will supersede any of the interim management areas proposed in this amendment. Reasonably foreseeable activities identified on the lands associated with the amendment is very limited as identified in Table 17 in Chapter 3 of this EA. If future land management activities occur on these lands they will be subject to forest-wide direction found in the Flathead National Forest Land and Resource Management Plan, federal and state laws, and other Forest Service regulations, as they are now, and will be guided by the proposed management area direction. Future land management activities such as timber harvest, road work, changes to public access etc. would be subject to site-specific NEPA analysis in the future.

# REGULATORY FRAMEWORK AND CONSISTENCY

One goal of the Flathead National Forest Plan is to provide a sustained yield of timber products that is cost effective and responsive to the needs of the local economy (USDA Forest Service 1985). The action alternatives offer varying levels of commercial harvest and are consistent with being both cost effective and responsive to the needs of the local economy.

## CIVIL RIGHTS AND ENVIRONMENTAL JUSTICE

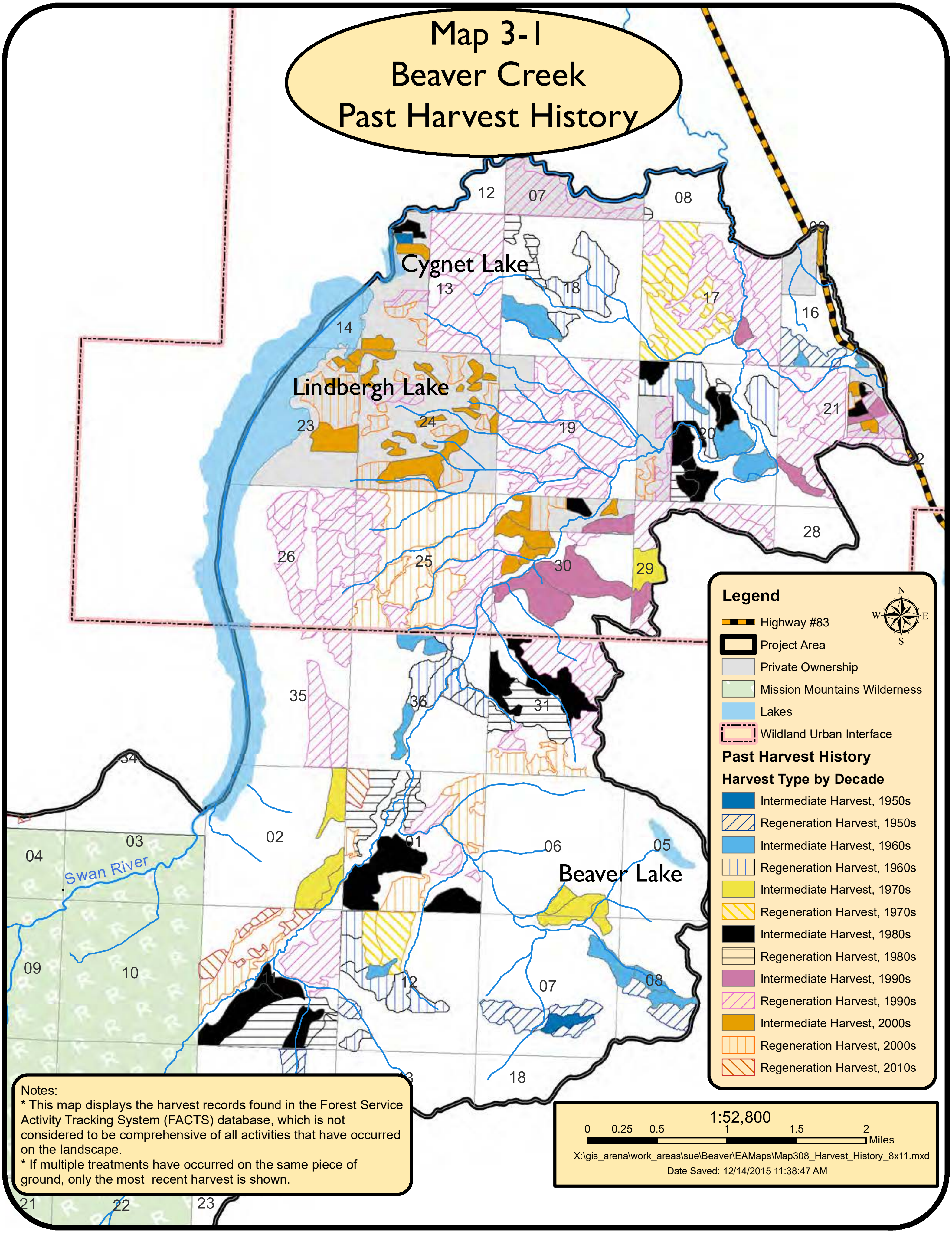
Neither of the action alternatives would be expected to negatively affect the civil rights of consumers, minority groups, low-income groups, women, or American Indian Tribes. Subsistence activities would not be disproportionately reduced for any of the identified groups. The Flathead Indian Reservation is less than 25 miles from the Beaver Creek Project Area. No environmental health hazards are expected to result from implementation of any alternative. This project should not disproportionately affect one income group over another.

This project is in compliance with EO 12898, “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations.” Environmental justice issues were considered in all steps of the NEPA process including public participation, alternative development, determining the affected environment, project design, and analysis of environmental consequences. At no step were minority, low-income, or Tribal populations negatively affected by any of the proposed actions in any of the alternatives.

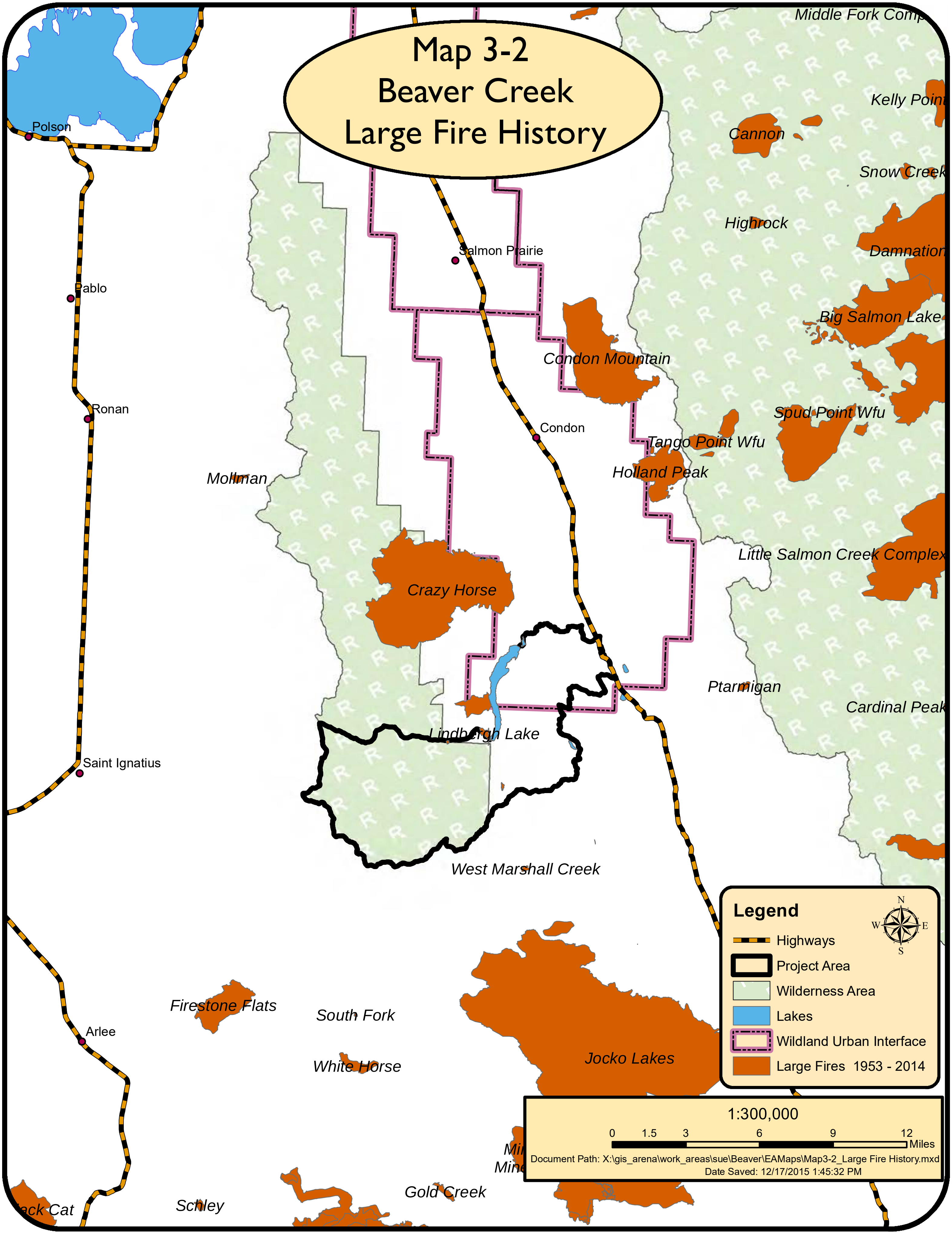
# Final Environmental Assessment - Beaver Creek Landscape Restoration Project

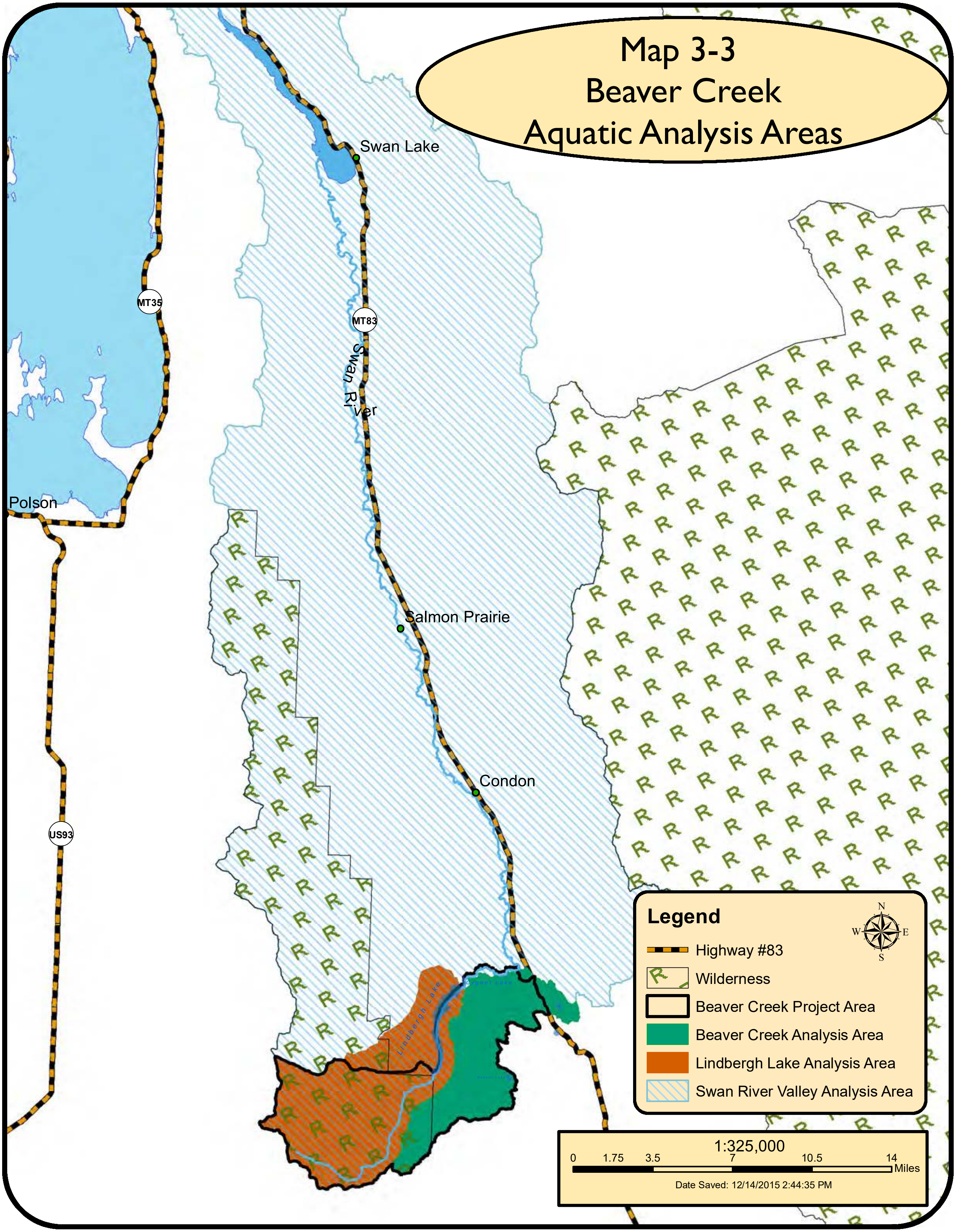
## Chapter 3 – Maps

**Swan Lake Ranger District, Flathead National Forest, Missoula County, Montana**




Notes:
* This map displays the harvest records found in the Forest Service Activity Tracking System (FACTS) database, which is not considered to be comprehensive of all activities that have occurred on the landscape.
* If multiple treatments have occurred on the same piece of ground, only the most  recent harvest is shown.


Map 3-2
Beaver Creek
Large Fire History
Middle Fork Comp
Kelly Point
Cannon
Snow Creek
Highrock
Damnation
Big Salmon Lake
Polson
Salmon Prairie
Pablo
Condon Mountain
Spud Point Wfu
Ronan
Condon
Tango Point Wfu
Holland Peak
Mollman
Little Salmon Creek Complex
Crazy Horse
Ptarmigan
Cardinal Peak
Lindbergh Lake
Saint Ignatius
West Marshall Creek
Legend
Highways
Project Area
Wilderness Area
Lakes
Wildland Urban Interface
Large Fires 1953 - 2014
N
W
E
S
Firestone Flats
South Fork
Arlee
Jocko Lakes
White Horse
1:300,000
0 1.5 3 6 9 12 Miles
Document Path: X:\gis_arena\work_areas\sue\Beaver\EAMaps\Map3-2_Large Fire History.mxd
Date Saved: 12/17/2015 1:45:32 PM
Mi
Mine
Gold Creek
Schley
ack Cat


Map 3-3
Beaver Creek
Aquatic Analysis Areas
Swan Lake
MT35
MT83
Swan River
Polson
Salmon Prairie
Condon
US93
Legend
Highway #83
Wilderness
Beaver Creek Project Area
Beaver Creek Analysis Area
Lindbergh Lake Analysis Area
Swan River Valley Analysis Area
N
W
E
S
1:325,000
0
1.75
3.5
7
10.5
14
Miles
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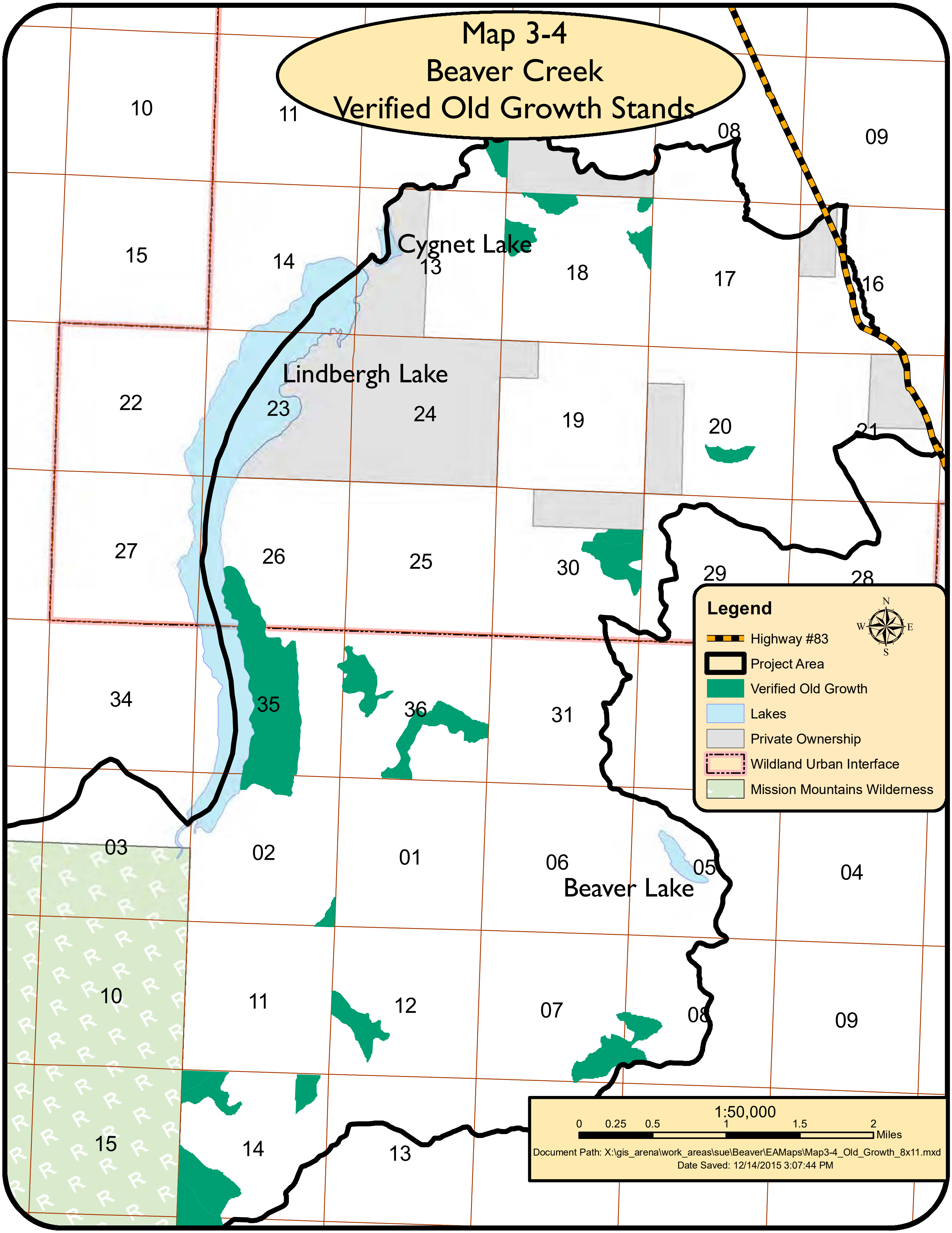

Map 3-4
Beaver Creek
Verified Old Growth Stands
10
11
08
09
15
14
Cygnet Lake
13
18
17
16
Lindbergh Lake
22
23
24
19
20
21
27
26
25
30
29
28
34
35
36
31
03
02
01
06
Beaver Lake
05
04
10
11
12
07
08
09
15
14
13
Legend
Highway #83
Project Area
Verified Old Growth
Lakes
Private Ownership
Wildland Urban Interface
Mission Mountains Wilderness
N
S
E
W
1:50,000
0 0.25 0.5 1 1.5 2 Miles
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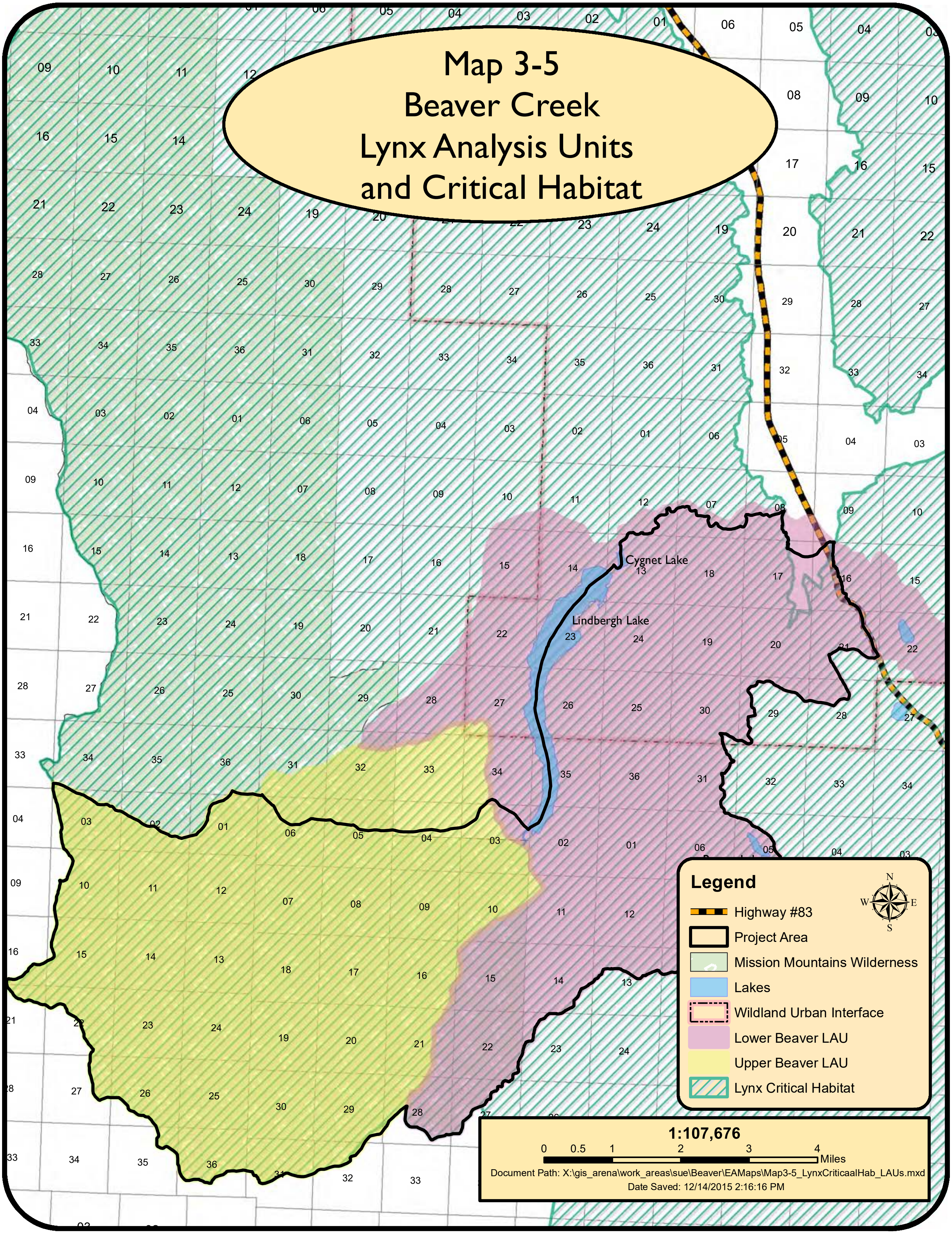

Map 3-5
Beaver Creek
Lynx Analysis Units
and Critical Habitat
Cygnet Lake
Lindbergh Lake
Legend
Highway #83
Project Area
Mission Mountains Wilderness
Lakes
Wildland Urban Interface
Lower Beaver LAU
Upper Beaver LAU
Lynx Critical Habitat
1:107,676
0 0.5 1 2 3 4
Miles
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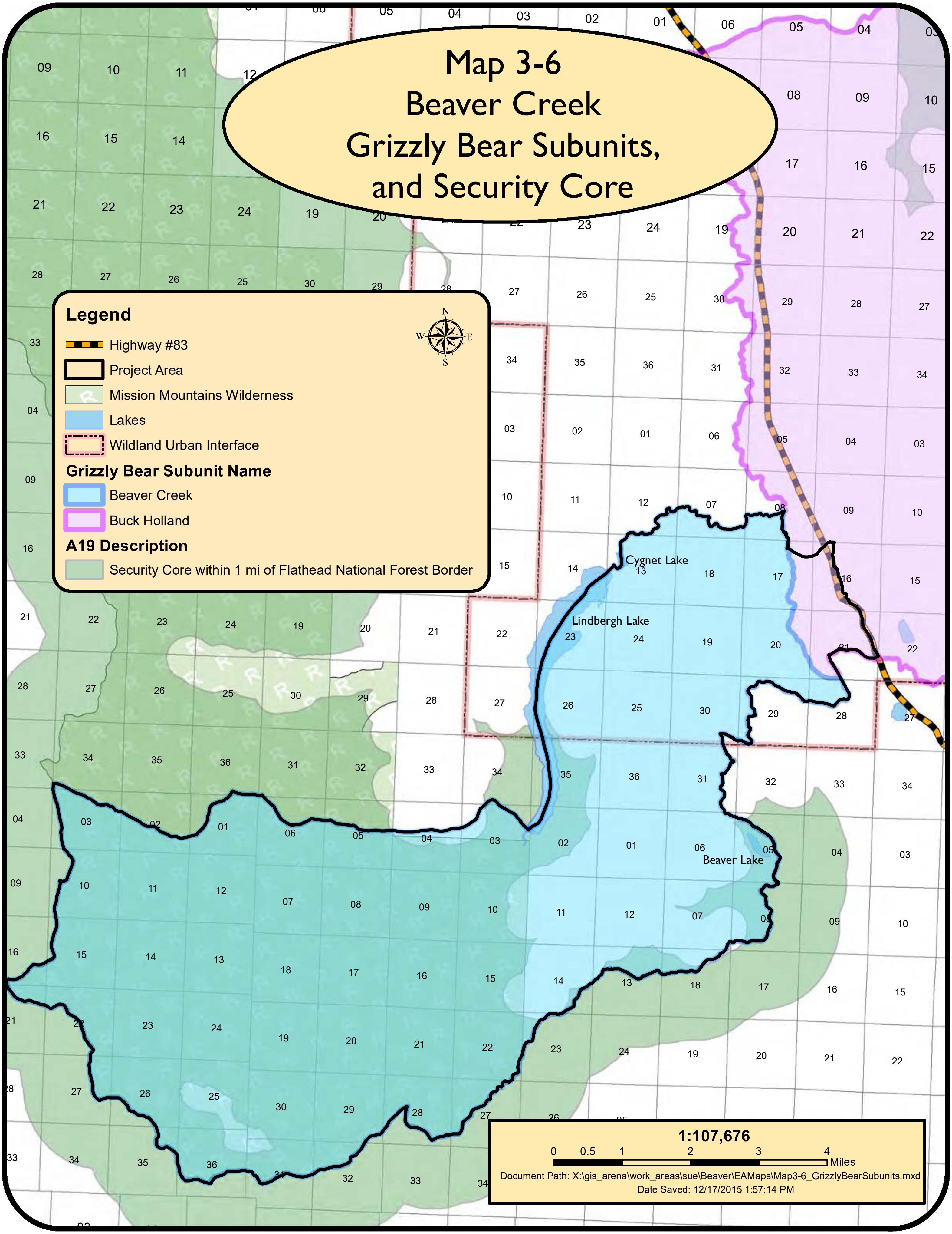

Map 3-6
Beaver Creek
Grizzly Bear Subunits,
and Security Core
Legend
Highway #83
Project Area
Mission Mountains Wilderness
Lakes
Wildland Urban Interface
Grizzly Bear Subunit Name
Beaver Creek
Buck Holland
A19 Description
Security Core within 1 mi of Flathead National Forest Border
N
S
E
W
Cygnet Lake
Lindbergh Lake
Beaver Lake
1:107,676
0 0.5 1 2 3 4 Miles
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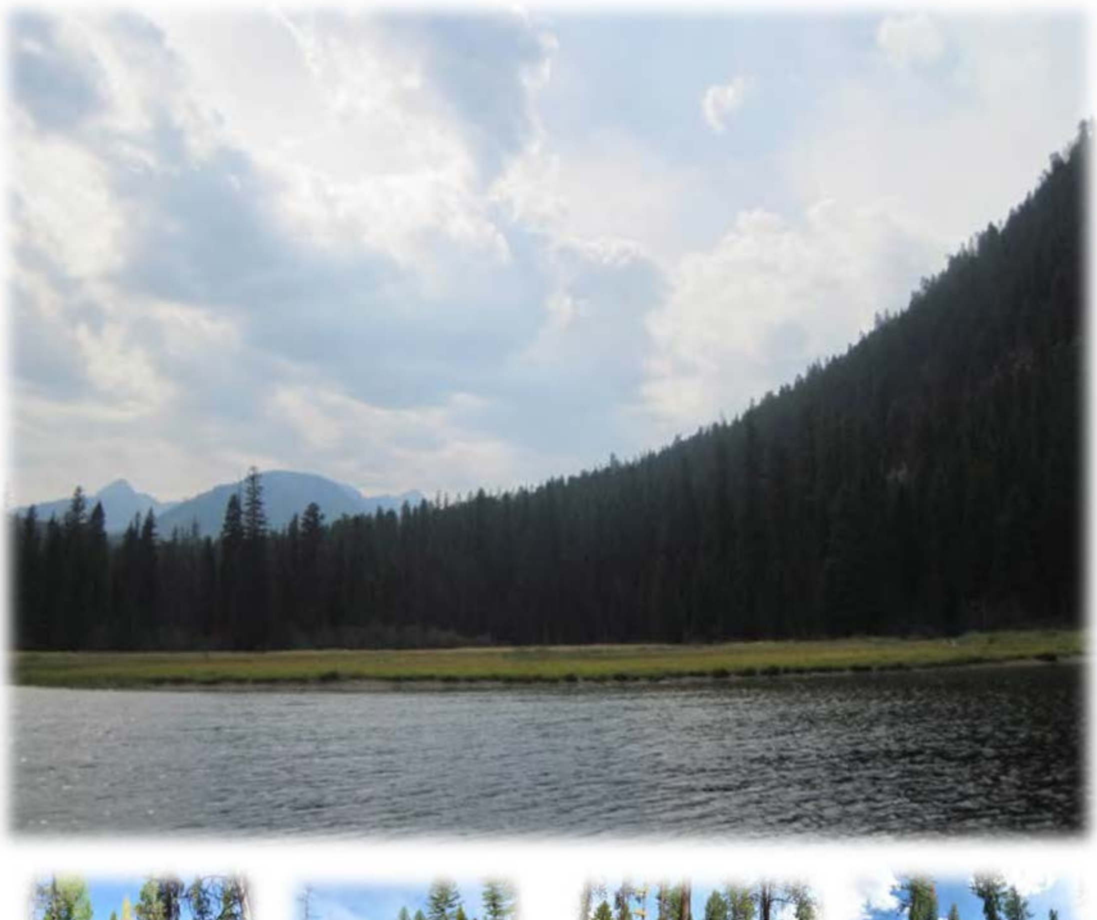
# Final Environmental Assessment - Beaver Creek Landscape Restoration Project

## Appendices

**Swan Lake Ranger District, Flathead National Forest, Missoula County, Montana**



# APPENDIX A
# VEGETATION RESTORATION TREATMENT SUMMARY

This table provides information about the proposed treatment units including the existing conditions, the proposed treatment, the objectives of the proposed treatment, and which part of the purpose and need that the treatment is contributing too. More information about silvicultural prescriptions, habitat types, the insects and diseases affecting forest stands in the project area, and the potential effects of proposed treatments on forest stands can be found in Chapter 3 – Forest Vegetation section. Information about Management Areas can be found in Chapter 2, and detailed descriptions of the purpose and needs for the project can be found in Chapter 1.

## ABBREVIATIONS USED IN THE HARVEST TREATMENT SUMMARY TABLES

### PLANT SPECIES:

AF= subalpine fir; DF = Douglas-fir; ES = Engelmann spruce; GF = grand fir; LP = lodgepole pine; MH = mountain hemlock; PB = paper birch; PP = ponderosa pine; RC = red cedar; WbP = whitebark pine; WL = western larch; WP = white pine; CW = cottonwood

### RESOURCE PROTECTION MEASURES:

HOAQ buffer = 300 foot buffer around occupied and unoccupied water howellia habitat; RHCA buffer = riparian habitat conservation areas, buffers can range between 50 – 300 feet (see Chapter 3 – Aquatics report for more information).

### INSECT & DISEASE:

DFB = Douglas-fir beetle; MPB = mountain pine beetle; DMT = dwarf mistletoe; RR= root rot; WGR = western gall rust; WPBR = white pine blister rust; WSBW = western spruce bud worm; SPM = sequoia pitch moth

### LOGGING METHOD AND SLASH TREATMENT:

WTY = whole tree yarding

### PURPOSE & NEED – REDUCE RISK OF UNCHARACTERISTIC WILDFIRE

BB = Broadcast Burn

- Using fire for ecological restoration and to modify fire behavior.

W = Wildland Urban Interface

- Recommendations from the Seeley-Swan Community Wildfire Protection Plan to reduce fuels near and adjacent to private land and residences within the WUI.
- Reducing stocking in forest stands within the WUI and along strategic fuel breaks, where modeling shows flame lengths greater than 4 feet in order to protect private property and provide for firefighter safety.

### PURPOSE AND NEED – IMPROVE FISH AND WILDLIFE HABITAT

SE = Stem Exclusion

- Protecting and creating lynx habitat by treating stem exclusion stands to recruit dense patches of understory vegetation.
- QA = Aspen
- Designing management activities, such as planting or burning, to increase aspen presence on appropriate sites.

Sh = Shrubs

- Designing management activities, such as regeneration harvests or burning, to increase shrub and huckleberry production.

## PURPOSE AND NEED – IMPROVE FOREST HEALTH AND ECOLOGICAL RESILIENCE

M = Stand Modification

- Reducing stocking in stands where densities are high to promote tree vigor, alter species composition, and reduce susceptibility of loss due to insect attack and disease.
- Modifying stand structure to reduce risk of loss to white pine blister rust and mountain pine beetle.
- Reducing densities and promoting diversity in young stands that are regenerating after past regeneration harvests.

R = Regeneration/Replacement of Stand

- Replacing (regenerating) stands heavily affected by current and past mountain pine beetle infestations with fire-adapted early-seral species.
- Replacing (regenerating) stands heavily infested with and badly degraded by root disease using species resistant to the extant disease.

LT = Enhance/Protect Large Tree Component

- Reducing understory ingrowth in stands containing large, healthy legacy trees, especially western larch and to a lesser extent, ponderosa pine.
- Maintaining large legacy trees where they occur on the landscape.
- Promoting structure and composition of stands containing old trees to place them on a better trajectory toward old growth conditions characteristic of the forest type, taking into account the contribution of the stand to landscape fire adaptation and watershed health.

WbP\WP = Enhance/Protect/Establish Whitebark Pine/Western white pine

- Restoring health and vigor of western white pine and whitebark pine through strict stocking control (“daylighting”); re-establishing both species on suitable sites using rust-resistant planting stock.
- Create “nutcracker openings” of 1 to 5 acres and even up to 30 acres to mimic patchy, mixed-severity fires, which are favored by nutcrackers to cache whitebark pine seeds.

## PURPOSE AND NEED – BENEFIT LOCAL ECONOMY

B = Biomass Opportunity

- Utilizing woody biomass and small-diameter trees produced from the project.

C = Convertible Products

- Capturing the value of convertible products resulting from forest health and fuels treatments, especially those declining in value due to forest health issues.

SCO = Service Contracting Opportunities

- Providing local employment or training opportunities through contracts, grants, or agreements.
- Utilizing local contractors to support economic sustainability.

**TABLE A-1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 2.**

| UNIT | ALT. 2 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | IMPROVE FISH & WILDLIFE HABITAT | IMPROVE FOREST HEALTH | BENEFIT LOCAL ECONOMY |
| 1 | 5 | 4 | Mixed-conifer DF, WL, ES, LP, PP, AF. Large-diameter WL, PP, DF with dense understory/ladder fuels. MPB and WSBW. WUI. | Commercial thin via ground-based, mechanized equipment, daylighting around large-diameter PP, WL, and DF and thinning throughout stand. WTY and mechanical slashing. | Maintain large tree component. Thin to reduce stocking to improve health and vigor of overall stand, reduce ladder fuels and fuel load. | W | SE | LT, M | C |
| 3 | 5 | 24 | Mixed-conifer DF, WL, ES, LP, PP, AF. Large-diameter WL, PP, DF with dense understory/ladder fuels. MPB and WSBW. WUI. | Commercial thin via ground-based, mechanized equipment, daylighting around large-diameter PP, WL, and DF and thinning throughout stand. WTY and mechanical slashing. Broadcast burn. | Maintain large tree component. Thin to reduce stocking to improve health and vigor of overall stand, reduce ladder fuels and fuel load, and promote shrub and huckleberry production. | BB, W | QA,Sh | LT, M | C |
| 4 | 5 | 19 | Mixed-conifer DF, WL, LP, PP. Large-diameter WL, PP, DF with patches of dense understory/ladder fuels. WSBW. WUI. | Commercial thin via ground-based, mechanized equipment, daylighting around large-diameter PP, WL, and DF and thinning throughout stand. WTY and mechanical slashing. | Maintain large tree component. Thin to reduce stocking to improve health and vigor of overall stand, reduce ladder fuels and fuel load. | W | SE | LT, M | C |
| 5 | 11C | 47 | Younger stand of mixed-conifer LP, PP, WL, DF, AF with shade-tolerant species coming in beneath. Large-diameter WL in northeast portion of unit. Active MPB in LP. WGR and SPM infecting LP. WUI. | Improvement cut via ground-based, mechanized equipment, daylighting around large-diameter WL and thinning throughout stand. WTY, pile and mechanical slashing. | Maintain large tree component. Thin to reduce stocking to improve health and vigor of overall stand, making stand more resilient to MPB, promote PP and WL, reduce ladder fuels and fuel load. | W | SE | LT, M | B, C |
| 6 | 5 | 5 | Two-storied stand of mixed-conifer LP, DF, WL, AF with shade-tolerant species coming in beneath. Old MPB and WGR in LP. WSBW impacting understory. Dense understory/ladder fuels in places. WUI. | Improvement cut via ground-based, mechanized equipment, thinning throughout stand. WTY. Broadcast burn. | Thin to reduce stocking to improve health and vigor of overall stand, promote DF and WL, reduce ladder fuels and fuel load, and promote shrub and huckleberry production. | BB, W | QA,Sh | M | C |

**TABLE A-1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 2.**

| UNIT | ALT. 2 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | IMPROVE FISH & WILDLIFE HABITAT | IMPROVE FOREST HEALTH | BENEFIT LOCAL ECONOMY |
| 7 | 5 | 3 | Plantation dominated by PP and LP with DF and WL 4-9 inches DBH. DF coming in underneath. MPB active WUI. | Pre-commercial thin via ground-based, mechanized equipment, thinning throughout stand. Mechanical slash treatment. | Reduce stocking density to improve health and vigor of overall stand, making stand more resilient to MPB, reduce ladder fuels and fuel load. | W | | M | B, SCO |
| 12 | 11C | 55 | Mixed-conifer unit. East dominated by LP with WL. LP has MPB, WGR. Low fuel loading. West dominated by WL, ES, LP. Large tree component of WL. LP in decline. MPB. Heavy fuel loading. WUI. | Improvement cut via ground-based, mechanized equipment, thinning throughout stand. WTY and mechanical slashing. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB, salvage declining LP, reduce ladder fuels and fuel load. | W | SE | LT, M | B, C |
| 16 | 11C, 15C | 163 | Mixed-conifer unit – DF, ES, WL dominate with LP. Dense portions experiencing mortality due to competition and MPB. Schweinitzii root rot also present. Fuel loadings vary from low to high. WUI. | Commercial thin via ground-based, mechanized equipment, daylighting around large tree component - PP and thinning throughout stand. WTY, pile and mechanical slashing. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall unit, making it more resilient to MPB, reduce ladder fuels and fuel load. | W | SE | LT, M | C |
| 19 | 15C | 48 | Mixed-conifer PP, DF, WL, LP with ES, AF. MPB mortality in PP, LP. Root rot and DFB infecting DF. Moderate to heavy fuel loading. WUI. | Improvement cut via ground-based, mechanized equipment, thinning throughout stand. WTY, pile and mechanical slashing. Broadcast burn | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB, DFB and root rot, reduce ladder fuels and fuel load, and promote shrub and huckleberry production. | BB, W | QA, Sh | LT, M | C |
| 21 | 15C | 103 | Mixed-conifer LP, WL, DF, and PP. MPB, WGR, DMT, and SPM affecting LP causing mortality throughout – heavy in places. Fuel loading is, therefore, variable low to heavy. WUI. | Seed tree with reserves via ground-based, mechanized equipment. WTY. Plant PP, WL, and WPBR resistant WP. | Initiate regeneration to improve overall health and vigor, and re-establish PP, WL, and WPBR resistant WP. Reduce fuel load, and promote shrub and huckleberry production. Maintain large-diameter WL, PP, and DF to provide for structural diversity. | W | Sh | LT, M, R, WP | C, SCO |

**TABLE A-1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 2.**

| UNIT | ALT. 2 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | IMPROVE FISH & WILDLIFE HABITAT | IMPROVE FOREST HEALTH | BENEFIT LOCAL ECONOMY |
| 23 | 15 | 10 | Mixed-conifer dominated by LP and WL, with AF and some PP. MPB in LP. Moderate fuel loading. WUI. | Improvement cut via ground-based, mechanized equipment, thinning throughout stand. WTY and mechanical slashing. | Thin to reduce stocking to improve health and vigor of overall stand, making stand more resilient to MPB, promote PP and WL, reduce ladder fuels and fuel load. | W | SE | M | C |
| 25 | 15C | 38 | Stand dominated by LP and WL with DF. Large-diameter WL and PP present. MPB killing LP. Patches of dense DF understory/ladder fuels. Moderate fuel loading. WUI. | Commercial thin via ground-based, mechanized equipment, daylighting around large tree component – PP and WL. Thinning throughout stand. WTY, pile and broadcast burn. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB, salvage declining LP, reduce ladder fuels and fuel load, and promote shrub and huckleberry production. | BB, W | QA, Sh | LT, M | C |
| 28 | 15C | 140 | LP dominated stand with WL, DF, PP. MPB attacking LP, PP. LP also has WGR, SPM. Southeast portion more variable with addition of ES and large tree component of PP, WL, DF. DFB and RR pockets. Patches of MPB killed trees falling down. WUI. | Commercial thin via ground-based, mechanized equipment, daylighting around large tree component – PP and WL. Thinning throughout stand. WTY, pile and mechanical slashing. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB, DFB, RR, reduce ladder fuels and fuel load. | W | SE | LT, M | C |
| 31 | 15C | 1 | Mixed-conifer stand of WL, DF, LP ES, and PP. MPB killing LP. Few large-diameter PP, WL, DF. Moderate fuel loading. WUI. | Commercial thin via ground-based, mechanized equipment, daylighting around large tree component – PP, WL, DF. Thinning throughout stand. WTY and mechanical slashing. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Reduce ladder fuels and fuel load. | W | SE | LT, M | C |
| 32 | 15C | 12 | Mixed-conifer stand dominated by LP with WL, DF, ES. Large-diameter WL and PP present. DF in understory. MPB killing LP. Moderate fuel loading. WUI. | Commercial thin via ground-based, mechanized equipment, daylighting around large tree component – PP, WL. Thinning throughout stand. WTY and mechanical slashing. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Reduce ladder fuels and fuel load. | W | SE | LT, M | C |

| Table A-1. Vegetation Restoration Treatment Summary for Alternative 2. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Unit | Alt. 2 Proposed MA | Acres | Existing Condition | Proposed Treatment | Objectives | Purpose and Need | | | |
| | | | | | | Reduce Risk of Uncharac-teristic Wildfire | Improve Fish & Wildlife Habitat | Improve Forest Health | Benefit Local Economy |
| 34 | 15C | 10 | Heavily stocked young stand of predominantly LP with a few large-diameter WL. MPB in LP. Low to moderate fuel loading. WUI. | Combination of commercial and pre-commercial thin via ground-based, mechanized equipment, daylighting around large tree component – WL. Thinning throughout stand. WTY and mechanical slashing. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Reduce ladder fuels and fuel load. | W | | LT, M | C |
| 36 | 15C | 29 | Mixed-conifer stand dominated by LP, WL, DF with AF. Large-diameter WL, PP. MPB and DMT in LP. Some heavily infested DMT WL. Moderate fuel loading. WUI. | Commercial thin via ground-based, mechanized equipment, daylighting around large tree component – PP, WL. Thinning throughout stand. WTY and mechanical slashing. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB and DMT. Reduce ladder fuels and fuel load. | W | | LT, M | C |
| 37 | 15C | 5 | Mixed-conifer of WL, LP, and DF beneath a few large-diameter PP. Few QA, CW. WUI | Commercial thin via ground-based, mechanized equipment, daylighting around large tree component – PP. Thinning throughout stand. WTY and broadcast burn. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand. Reduce ladder fuels and fuel load, promote QA, shrub and huckleberry production. | BB, W | QA, Sh | LT, M | C |
| 39 | 11C | 45 | Predominantly WL, LP with DF, ES. Few large-diameter WL. MPB in LP. Moderate fuel loading. WUI. | Commercial thin via ground-based, mechanized equipment, daylighting around large tree component – WL. Thinning throughout stand. WTY. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Reduce ladder fuels and fuel load. | W | SE | LT, M | C |
| 40 | 11C | 9 | Mixed-conifer stand with WL, LP, DF with AF, DF coming in below. Few large-diameter WL, DF. MPB in LP. Moderate fuel loading. WUI. | Commercial thin via ground-based, mechanized equipment, daylighting around large tree component – DF, WL. Thinning throughout stand. WTY, pile and broadcast burn | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Reduce ladder fuels and fuel load, promote QA, shrub and huckleberry production. | BB, W | QA, Sh | LT, M | C |

**TABLE A-1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 2.**

| UNIT | ALT. 2 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | IMPROVE FISH & WILDLIFE HABITAT | IMPROVE FOREST HEALTH | BENEFIT LOCAL ECONOMY |
| 42 | 11C | 11 | Two storied stand of predominantly DF with WL, PP and DF seedling/saplings in openings. Moderate fuel loading. WUI. | Commercial thin via ground-based, mechanized equipment, Thinning throughout stand. WTY, broadcast burn | Reduce stocking density to improve health and vigor of overall stand, Favor WL, PP for retention. Reduce ladder fuels and fuel load, promote QA, shrub and huckleberry production. | BB, W | QA, Sh | M | C |
| 44 | 11C | 35 | Mixed-conifer dominated by DF with WL, LP, ES. WGR in LP. RR affecting patches of DF. Patches of dense regeneration of DF, AF, DF, LP, WL, GF, PP. Low fuel loading. WUI. | Combination of commercial and pre-commercial thin via ground-based, mechanized equipment, thinning throughout stand. WTY, pile mechanical slashing. | Reduce stocking density to improve health and vigor of overall stand, Favor WL, PP for retention. Reduce ladder fuels. | W | SE | M | B, C |
| 45 | 15C | 10 | Decadent LP with few scattered large-diameter WL. LP has MPB, WGR, DMT and starting to fall down. High fuel loading. WUI. | Clearcut with reserves via ground-based, mechanized equipment, retaining WL and best LP. WTY, pile. | Initiate regeneration to improve overall health and vigor, and re-establish WL, WP, PP. Maintain large-diameter WL and best phenotypic LP to provide for structural diversity. | W | Sh | R, WP | C, SCO |
| 51 | 11C | 68 | Mixed-conifer dominated by LP, with WL, DF, AF, ES, Scattered MPB, WGR, SPM in LP. WSBW attacking firs. Fuel loading variable. WUI. | Improvement cut via ground-based, mechanized equipment, Commercial and noncommercial thinning throughout stand. WTY. | Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor WL, DF for retention. Reduce ladder fuels and fuel load. | W | SE | M | B, C |
| 54 | 11C | 8 | Mixed-conifer LP, WL, DF, AF, ES. Stand previously cut with patches of regen coming in. Few large-diameter WL. Fuel loading moderate to very high. WUI. | Improvement cut via ground-based, mechanized equipment, Commercial and pre-commercial thinning throughout stand. WTY/mechanical. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor WL, DF for retention. Reduce ladder fuels and fuel load. | W | SE | LT, M | B, C |

**TABLE A-1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 2.**

| UNIT | ALT. 2 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED: REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | PURPOSE AND NEED: IMPROVE FISH & WILDLIFE HABITAT | PURPOSE AND NEED: IMPROVE FOREST HEALTH | PURPOSE AND NEED: BENEFIT LOCAL ECONOMY |
|---|---|---|---|---|---|---|---|---|---|
| 55 | 11C | 82 | Mixed-conifer dominated by LP, with WL. Shade-tolerant species establishing. Combination of old and new scattered MPB in LP. Few large-diameter WL. Fuel loading low to moderate. WUI. | Commercial thin via ground-based, mechanized equipment, daylighting around large tree component – WL. Thinning throughout stand. WTY, pile. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor WL for retention. Reduce ladder fuels and fuel load. | W | SE | LT, M | C |
| 57 | 15C | 3 | Mixed-conifer dominated by LP and WL with DF and ES. Shade-tolerant species establishing underneath. Combination of old and new scattered MPB in LP. Fuel loading high. Adjacent to private property. WUI. | Seed tree with reserves via ground-based, mechanized equipment. WTY. Plant PP, WL, and WPBR resistant WP. | Initiate regeneration to improve overall health and vigor, and re-establish PP, WL, and WPBR resistant WP. Reduce fuel load, and promote shrub and huckleberry production. Maintain larger diameter WL to provide for structural diversity. | W | Sh | R, WP | C, SCO |
| 59 | 11C | 10 | Two-storied stand of predominantly LP with WL and ES. Understory of ES, AF, and GF. Old to recent MPB in LP. Fuel loading moderate. WUI. | Commercial thin via ground-based, mechanized equipment, thinning throughout stand. WTY. | Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor WL for retention. Reduce ladder fuels and fuel load. | W | SE | M | C |
| 62 | 15C | 44 | Mixed-conifer dominated by LP and WL with DF and some PP and ES. Few large-diameter WL. Combination of old and new scattered MPB and Atropellis canker in LP. Fuel loading moderate to high. Adjacent to private property. WUI. | Seed tree with reserves via ground-based, mechanized equipment. WTY. Plant PP, WL, and WPBR resistant WP. | Initiate regeneration to improve overall health and vigor, and re-establish PP, WL, and WPBR resistant WP. Reduce fuel load, and promote shrub and huckleberry production. Maintain large-diameter WL to provide for structural diversity. | W | Sh | LT, R | C |
| 72 | 15 | 4 | Dense LP susceptible to MPB. Low to medium fuel loading. WUI. | Commercial thin via ground-based, mechanized equipment, thinning throughout stand. WTY. | Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Reduce fuel load. | W | SE | M | C |

**TABLE A-1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 2.**

| UNIT | ALT. 2 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | IMPROVE FISH & WILDLIFE HABITAT | IMPROVE FOREST HEALTH | BENEFIT LOCAL ECONOMY |
| 73 | 15 | 4 | Mixed-conifer of WL, LP, and DF. LP is dense with small crown ratios. Old MPB. Low to medium fuel loading. WUI | Commercial thin via ground-based, mechanized equipment, thinning throughout stand. WTY. | Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Reduce fuel load. | W | | M | C |
| 74 | 15 | 1 | Declining LP stand with some DF, AF, and WL. Fuel load is moderate to high. WUI | Combination of commercial and pre-commercial thin via ground-based, mechanized equipment, thinning throughout stand. WTY, mechanical, BB. | Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor WL. Reduce fuel load. | BB, W | QA, Sh | M | C |
| 76 | 15 | 69 | Variable stand. Dense areas dominated by LP with WL, DF, AF, and DF. Other areas of sparser overstory of WL, DF, and AF with WL, DF, AF, and LP coming in below. DMT in some WL and DF. Low fuel loading. WUI. | Combination of commercial and pre-commercial thin via ground-based, mechanized equipment, thinning throughout stand. Mechanical slash treatment. | Reduce stocking density to improve health and vigor of overall stand, removing DMT DF and WL and making it more resilient to MPB. Favor healthy WL and DF. Reduce fuel load. | W | SE | M | B, C, SCO |
| 79 | 15 | 10 | Mixed-conifer stand dominated by DF and LP with WL and AF. MPB attacking LP. Medium to high fuel load. WUI. | Commercial thin via ground-based, mechanized equipment, thinning throughout stand. WTY, mechanical. | Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor WL and DF. Reduce fuel load. | W | SE | M | C |
| 83 | 15 | 34 | Dominated by DF with LP, WL, and GF, stand is on steep slope facing Lindbergh Lake. MPB in LP, WSBW affecting foliage of DF and true fir, RR evident on south end of unit. Fuel loading is medium to high. WUI. | Commercial thin via skyline equipment, thinning throughout unit. WTY, pile. | Reduce stocking density to reduce the chance of a crown fire and provide opportunity to restrict the growth of fire moving north towards homes on private land. Favor WL which is more fire and RR resistant. Reduce fuel load. | W | SE | LT, M | C |

| TABLE A-1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 2. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| UNIT | ALT. 2 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED | | | |
| | | | | | | REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | IMPROVE FISH & WILDLIFE HABITAT | IMPROVE FOREST HEALTH | BENEFIT LOCAL ECONOMY |
| 84 | 15 | 6 | LP dominated with WL and DF. Shade-tolerant species coming in beneath. DMT in both LP and WL. Fuel loading high. WUI. Jocko Trail along west boundary. | Clearcut with reserves via ground-based, mechanized equipment. Slash cleanup mechanical, pile. | Regenerate stand with DMT-free WL as reserve trees and plant long-lived seral species – WL and WP to create a two-aged stand. | W | Sh | R, WP | C, SCO |
| 86 | 11C | 10 | Variable unit of dense LP, DF, and WL to more open WL regen beneath scattered WL, DF and AF seed trees. DMT in some overstory WL. WSBW affecting understory. Moderate to high fuel loading. WUI. | Improvement cut via ground-based, mechanized equipment, commercial and pre-commercial thinning throughout stand. WTY/mechanical. | Reduce stocking density to improve health and vigor of overall stand, and making it more resilient to MPB. Favor DMT-free WL for retention. Reduce ladder fuels. | W | SE | M | B, C |
| 87 | 11C | 4 | Patchy unit of WL, LP, and AF with dense regeneration of WL and LP within the holes. DMT in some overstory WL. WSBW affecting understory. Moderate to high fuel loading. WUI. | Commercial and pre-commercial thin via ground-based, mechanized equipment, thinning throughout stand. WTY/mechanical. | Reduce stocking density to improve health and vigor of overall stand, and making it more resilient to MPB. Favor DMT-free WL for retention. Reduce ladder fuels. | W | | M | B, C |
| 89 | 11C | 41 | Predominantly LP with scattered WL. Shade-tolerant species coming beneath. Few large-diameter WL. Some DMT in WL, MPB has killed some LP. Fuel load is low to moderate. WUI. | Seed tree with reserves via ground-based, mechanized equipment. WTY. Plant PP, WL, and WPBR-resistant WP. | Initiate regeneration to improve overall health and vigor, and re-establish PP, WL, and WPBR-resistant WP. Reduce fuel load, and promote shrub and huckleberry production. Maintain large-diameter WL to provide for structural diversity. | W | Sh | LT, R, WP | C, SCO |
| 90 | 11C | 8 | Mixed-conifer stand dominated by DF, LP and WL with shade-tolerant species coming in from below. Few large-diameter WL and PP. Some DMT in DF and WL. Low fuel load on the ground, but ladder fuels present. | Commercial thin via ground-based, mechanized equipment, thinning throughout unit. Daylight around large tree component – WL and PP. WTY. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor WL for retention. Reduce ladder fuels and fuel load. | | SE | LT, M | C |

**TABLE A-1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 2.**

| UNIT | ALT. 2 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | IMPROVE FISH & WILDLIFE HABITAT | IMPROVE FOREST HEALTH | BENEFIT LOCAL ECONOMY |
| 91 | 11C | 16 | Mixed-conifer stand dominated by DF, LP and WL with shade-tolerant species coming in from below. Few large-diameter WL. Some DMT in DF and WL. Low fuel load on the ground, but ladder fuels present. | Commercial thin via skyline equipment, thinning throughout unit. Daylight around large tree component – WL. WTY. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor WL for retention. Reduce ladder fuels and fuel load. | | SE | LT, M | C |
| 93 | 11C | 13 | Stagnating LP with WL and DF. Few large-diameter WL. Fuel loading is high. | Improvement cut via ground-based, mechanized equipment, including pre-commercial thinning throughout stand. Daylight around large tree component – WL. WTY/pile. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor WL for retention. Reduce ladder fuels and fuel load. | | SE | LT, M | B, C |
| 94 | 11C | 12 | Stagnating LP with WL and DF. Few large-diameter WL. Fuel loading is high. | Improvement cut via skyline equipment, including pre-commercial thinning throughout stand. Daylight around large tree component – WL. WTY/pile. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor WL for retention. Reduce ladder fuels and fuel load. | | SE | LT, M | C |
| 95 | 11C | 1 | Stagnating LP with WL and DF. Few large-diameter WL. Fuel loading is high. | Improvement cut via ground-based, mechanized equipment, including pre-commercial thinning throughout stand. Daylight around large tree component – WL. WTY/pile. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor WL for retention. Reduce ladder fuels and fuel load. | | SE | LT, M | B, C |
| 96 | 11C | 10 | Mixed-conifer dominated by LP with DF, WL, AF, and PP. Variable stocking. Few large-diameter WL. Fuel loading is low to moderate. | Commercial thin via ground-based, mechanized equipment, thinning throughout unit. Daylight around large tree component – WL and PP. WTY. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor WL, PP, and DF for retention. Reduce ladder fuels and fuel load. | | SE | LT, M | C |

**TABLE A-1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 2.**

| UNIT | ALT. 2 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED: REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | PURPOSE AND NEED: IMPROVE FISH & WILDLIFE HABITAT | PURPOSE AND NEED: IMPROVE FOREST HEALTH | PURPOSE AND NEED: BENEFIT LOCAL ECONOMY |
|---|---|---|---|---|---|---|---|---|---|
| 97 | 11C | 6 | Mixed-conifer dominated by LP with DF, WL, AF, and PP. Variable stocking. Few large-diameter WL. Fuel loading is low to moderate. | Commercial thin via skyline equipment, thinning throughout unit. Daylight around large tree component – WL and PP. WTY. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor WL, PP, and DF for retention. Reduce ladder fuels and fuel load. | | SE | LT, M | C |
| 98 | 11C | 3 | Mixed-conifer dominated by LP with DF, WL, AF, and PP. Variable stocking. Few large-diameter WL. Fuel loading is low to moderate. | Commercial thin via ground-based, mechanized equipment, thinning throughout unit. Daylight around large tree component – WL and PP. WTY. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor WL, PP, and DF for retention. Reduce ladder fuels and fuel load. | | SE | LT, M | C |
| 99 | 15 | 26 | Mixed-conifer of LP, DF, and WL. Patches of older dead LP from MPB. Some DMT in DF and WL. RR affecting DF. Fuel loading is moderate to high. | Seed tree with reserves via ground-based, mechanized equipment. WTY. Plant PP, WL, and WPBR-resistant WP. | Initiate regeneration to improve overall health and vigor, and re-establish PP, WL, and WPBR resistant WP. Reduce fuel load, and promote shrub and huckleberry production. Maintain larger diameter WL to provide for structural diversity. | | Sh | LT, R, WP | C |
| 100 | 15 | 14 | Mixed-conifer dominated by LP and DF, with WL and AF. Patches of older dead LP from MPB. Some DMT in DF. Few large diameter WL. Fuel loading is moderate to high. | Seed tree with reserves via skyline equipment. WTY. Plant PP, WL, and WPBR resistant WP. | Initiate regeneration to improve overall health and vigor, and re-establish PP, WL, and WPBR-resistant WP. Reduce fuel load, and promote shrub and huckleberry production. Maintain larger diameter WL to provide for structural diversity. | | Sh | LT, R, WP | C |

**TABLE A-1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 2.**

| UNIT | ALT. 2 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | IMPROVE FISH & WILDLIFE HABITAT | IMPROVE FOREST HEALTH | BENEFIT LOCAL ECONOMY |
| 102 | 15 | 95 | Northern portion is dominated by declining LP that is susceptible to MPB. Few large-diameter WL. Patches of dead LP due to MPB. Southern portion mixed-conifer of LP, DF, and WL. Patches of older dead LP from MPB. Some DMT in DF and WL. RR affecting DF. Fuel loading is moderate to high. Jocko Trail cuts through north end of unit. | Commercial thin via ground-based, mechanized equipment, thinning throughout unit. Daylight around large tree component – WL. WTY/pile. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor healthy WL for retention. Reduce ladder fuels and fuel load. | | SE | LT, M | C |
| 105 | 15 | 27 | Mixed-conifer consisting of WL, LP, and DF. Few large-diameter WL. DMT infecting some WL. RR prevalent throughout unit. MPB has killed a good portion of LP. Fuel loading is moderate to high, especially where dead LP has fallen over. | Seed tree with reserves via skyline equipment. WTY/pile. | Initiate regeneration to improve overall health and vigor, and re-establish WL, WP, and PP. Maintain large-diameter DMT-free WL and healthy DF to provide for structural diversity. Promote shrub and huckleberry production. | | Sh | LT, R, WP | C |
| 109 | 11C | 7 | Overstocked stand of predominantly DF with scattered WL. Fuel loading is low. | Commercial thin via ground-based, mechanized equipment, thinning throughout unit. WTY. Broadcast Burn. | Reduce stocking density to improve health and vigor of overall stand. Favor WL, for retention. Reduce ladder fuels and fuel load, promote shrub and huckleberry production. | BB | QA, Sh | M | C |
| 110 | 11C | 4 | Overstocked stand of predominantly DF with scattered WL. Fuel loading is low. | Commercial thin via skyline equipment, thinning throughout unit. WTY. Broadcast Burn. | Reduce stocking density to improve health and vigor of overall stand. Favor WL, for retention. Reduce ladder fuels and fuel load, promote shrub and huckleberry production. | BB | QA, Sh | M | C |

**TABLE A-1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 2.**

| UNIT | ALT. 2 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | IMPROVE FISH & WILDLIFE HABITAT | IMPROVE FOREST HEALTH | BENEFIT LOCAL ECONOMY |
| 113 | 11C | 8 | Mixed-conifer of predominantly LP with receding live crown ratios and with WL, AF, and DF also present. Few large-diameter WL. Patches of MPB-killed LP. WSBW affecting AF. Fuel loading is low to high. | Improvement cut via skyline equipment, thinning throughout stand. Daylight around large tree component – WL. WTY. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor WL for retention. Reduce ladder fuels and fuel load. Unit above 5500 ft. elevation | | SE | LT, M, WbP | C |
| 114 | 11C | 74 | NE and SW ends of unit are dominated by overstocked LP with WL, DF, ES, and AF also present. Patches of MPB-killed LP and WSBW affecting AF. The middle is also dominated by LP with ES and AF and a minor amount of DF. Patches of MPB-killed LP, DMT affecting LP and WSBW affecting AF and DF. There is a large tree component of WL and ES. Fuel loading varies from low to high. | Group selection via ground-based mechanical equipment. Approximately 20% of unit will be “nutcracker openings.” WTY/pile/mechanical. | Provide openings for the regeneration of white pine blister rust-resistant WbP. Favor WL and any healthy WbP for retention. Maintain larger diameter WL to provide for structural diversity. Promote shrub and huckleberry production. Unit above 5500 ft. elevation | | Sh | LT, M, R, WbP | B, C |

**TABLE A-1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 2.**

| UNIT | ALT. 2 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | IMPROVE FISH & WILDLIFE HABITAT | IMPROVE FOREST HEALTH | BENEFIT LOCAL ECONOMY |
| 116 | 11C | 124 | LP dominated stands with WL, DF, AF, and ES. LP generally have low live crown ratios. There is a large tree component of scattered WL, DF, and ES. WbP regenerating in the understory. Patches of MPB-killed LP. Fuel loading varies from medium to high. | Group selection cut via ground-based mechanical equipment. Approximately 20 percent of unit will be “nutcracker openings”[1] with the remaining matrix (~80% percent) being thinned. Daylight around large tree component – WL, DF, and ES. WTY/pile. | Provide openings for the regeneration of blister rust-resistant WbP. Daylight around older mature WbP and other large-tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor healthy WbP and WL for retention. Reduce ladder fuels and fuel load, promote shrub and huckleberry production. Unit above 5500 ft. elevation | | Sh | LT, M, R, WbP | B, C |
| 118 | 11C | 17 | Mixed-conifer of LP, AF, DF, WL, and ES. There is a large tree component of scattered WL and DF. LP with low live crown ratios. Patches of MPB-killed LP. WSBW affecting understory DF and AF. Fuel loading moderate. | Improvement cut via ground-based mechanical equipment, thinning throughout stand. Daylight around large tree component – WL. WTY. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor WL and any healthy WbP for retention. Reduce ladder fuels and fuel load. Unit above 5500 ft. elevation | | SE | LT, M, WbP | C |
| 119 | 11C | 26 | Heavily stocked mixed-conifer stand of DF, WL, and AF with minor amounts of ES and LP. WSBW affecting AF. Low fuel loading. | Commercial thin via ground-based, mechanized equipment, thinning throughout unit. WTY. | Reduce stocking density to improve health and vigor of overall stand. Favor WL, DF, and any healthy WbP for retention. Reduce ladder fuels and fuel load. Unit above 5500 ft. elevation | | SE | M, WbP | C |

[1] Nutcracker openings are a cutting treatment that attempts to mimic patchy, mixed severity wildfires.

**TABLE A-1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 2.**

| UNIT | ALT. 2 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | IMPROVE FISH & WILDLIFE HABITAT | IMPROVE FOREST HEALTH | BENEFIT LOCAL ECONOMY |
| 120 | 11C | 14 | Densely-stocked young AF stand with ES, DF, and WL. | Improvement cut via skyline equipment, including pre-commercial thinning throughout stand. WTY. | Remove AF in overstory and reduce stocking density to improve health and vigor of overall stand. Favor WL and DF for retention. Reduce ladder fuels and fuel load. Unit above 5500 ft. elevation | | SE | M | C |
| 200 | 15C | 7 | Predominantly young LP with young WL and few scattered large WL. MPB has attacked larger LP. Low fuel load. WUI. | Pre-commercial thin by hand throughout stand. Daylight around large tree component – WL. Lop and scatter slash. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Daylight around large tree component. Favor WL and PP for retention. Reduce ladder fuels and fuel load. | W | | LT, M | SCO |
| 201 | 15C | 4 | Predominantly young LP with young WL and PP. Dense stocking. Low fuel load. WUI. | Pre-commercial thin via ground-based, mechanized equipment, thinning throughout unit. Mechanical slash treatment. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Favor WL and PP for retention. Reduce ladder fuels and fuel load. | W | | M | B, SCO |
| 202 | 15C | 7 | Two-storied stand of predominantly young LP with WL, DF, and few PP under seed trees of PP, WL, and DF. WGR on LP. Low fuel load. WUI. | Pre-commercial thin by hand throughout stand. Lop and scatter slash. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Favor WL and PP for retention. Reduce ladder fuels and fuel load. | W | | M | SCO |
| 203 | 15C | 11 | Young stand of PP, LP, DF, and WL. MPB mortality in LP. Low fuel load. WUI. | Improvement cut via ground-based, mechanized equipment, mainly pre-commercial thinning throughout unit. Mechanical/pile. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Favor WL and PP for retention. Reduce ladder fuels and fuel load. | W | SE | M | B, SCO |

**TABLE A-1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 2.**

| UNIT | ALT. 2 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | IMPROVE FISH & WILDLIFE HABITAT | IMPROVE FOREST HEALTH | BENEFIT LOCAL ECONOMY |
| 204 | 11C | 83 | Mixed stand of ES, DF, WL, AF, LP, PP, QA, and CW. Some WGR and MPB affecting LP. Low fuel load. WUI. | Improvement cut via ground-based, mechanized equipment, mainly pre-commercial thinning throughout unit. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Favor PP, WL, QA, and CW for retention. Reduce ladder fuels and fuel load, promote QA. | W | SE, QA | M | B, SCO |
| 208 | 11C | 4 | Dense understory of ES, LP, WL, DF, and AF beneath WL and ES seed trees. Some WGR on LP. Dense ladder fuels. WUI. | Pre-commercial thin by hand throughout stand. Lop and scatter slash. | Reduce stocking density to improve health and vigor of overall stand. Favor WL for retention. Reduce ladder fuels and fuel load. | W | | LT, M | SCO |
| 209 | 11C | 13 | Understory of DF, WL, LP, ES and PP beneath DF. Fuel load is low. WUI. | Pre-commercial thin via ground-based, mechanized equipment, throughout unit. Mechanical/pile. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Favor WL and PP for retention. Reduce ladder fuels and fuel load. | W | | M | B, SCO |
| 210 | 15C | 36 | LP widely scattered over dense regeneration, predominately LP with ES, WL, DF, and AF. WGR in LP. Moderate fuel loading. WUI. | Pre-commercial thin via ground-based, mechanized equipment, throughout unit. Mechanical/pile. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Favor WL for retention. Reduce ladder fuels and fuel load. | W | | M | B, SCO |
| 211 | 15C | 26 | Widely-scattered WL and LP (DF and PP minor) over predominately LP, with WL, DF, and ES regeneration. Fuel load is low. WUI. | Pre-commercial thin by hand throughout stand. Lop and scatter slash. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Favor WL for retention. Reduce ladder fuels and fuel load. | W | | M | SCO |
| 212 | 15C | 40 | Scattered LP, WL, DF and PP over predominately LP regeneration with DF and AF. WGR on LP. Low fuel load. WUI | Pre-commercial thin via ground-based, mechanized equipment, throughout unit. Mechanical/pile | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Favor WL and PP for retention. Reduce ladder fuels and fuel load. | W | | M | B, SCO |

**Table A-1. Vegetation Restoration Treatment Summary for Alternative 2.**

| Unit | Alt. 2 Proposed MA | Acres | Existing Condition | Proposed Treatment | Objectives | Purpose and Need: Reduce Risk of Uncharac-teristic Wildfire | Improve Fish & Wildlife Habitat | Improve Forest Health | Benefit Local Economy |
|---|---|---|---|---|---|---|---|---|---|
| 214 | 15C | 17 | Predominately scattered WL with some LP over dense LP, WL, DF, and AF regeneration. WGR on LP. Moderate fuel load. WUI. | Pre-commercial thin via ground-based, mechanized equipment, throughout unit. Mechanical. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Favor WL for retention. Reduce ladder fuels and fuel load. | W | | M | B, SCO |
| 216 | 15C | 36 | Widely scattered WL over dense regeneration of predominately LP with WL and AF. WGR and SPM on LP. Low fuel loading. WUI. | Pre-commercial thin via ground-based, mechanized equipment, throughout unit. Mechanical/pile. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Favor WL for retention. Reduce ladder fuels and fuel load. | W | | M | B, SCO |
| 217 | 15C | 168 | Scattered WL, PP DF, AF, and ES over dense regeneration of predominately LP with WL, DF, ES, and AF. WGR and SPM on LP. Low fuel loading. WUI. | Pre-commercial thin by hand throughout stand. Lop and scatter slash. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Favor WL and PP for retention. Reduce ladder fuels and fuel load. | W | | M | SCO |
| 219 | 12, 11C | 7 | Dense mixed-conifer stand of predominantly ES with DF, WL, and PP over an understory of ES, DF, and AF. Within RHCA. Moderate to heavy fuel load. WUI. | Stand improvement – daylighting (approximately 5 feet wider than crown radius) around large DF, WL and PP (approximately 2/acre) trees by hand. Lop and scatter slash. | Maintain large tree component of WL, PP and DF. Reduce stocking density around large trees to improve their health and vigor making them less susceptible to insects by changing the microenvironment. Reduce ladder fuels beneath the large trees. | W | | LT, M | SCO |
| 220 | 11C | 10 | Predominately LP in both sparse overstory and dense understory with some WL in both levels. WGR and SPM on LP. Low fuel loading. WUI. | Pre-commercial thin via ground-based, mechanized equipment, throughout unit. Mechanical/pile. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Favor WL for retention. Reduce ladder fuels and fuel load. | W | | M | B, SCO |

**TABLE A-1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 2.**

| UNIT | ALT. 2 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | IMPROVE FISH & WILDLIFE HABITAT | IMPROVE FOREST HEALTH | BENEFIT LOCAL ECONOMY |
| 221 | 11C | 24 | Widely scattered WL in overstory, over dense regeneration of predominately LP with WL, and DF. Low fuel loading. WUI. | Improvement cut via ground-based, mechanized equipment, mainly pre-commercial thinning throughout unit. Mechanical slash treatment. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Favor WL and DF for retention. Reduce ladder fuels and fuel load. | W | SE | LT, M | B, SCO |
| 222 | 11C | 1 | Old PCTC landing with sparse vegetation. | Fill plant by hand with WL, WP, and PP. | Restore the site by re-establishing long-lived seral species. | | | WP | SCO |
| 224 | 11C | 18 | Widely scattered WL and LP over predominately LP with WL, DF, and ES. Some DMT in older LP. Low to moderate fuel load. WUI. | Pre-commercial thin via ground-based, mechanized equipment, throughout unit. Mechanical slash treatment. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Remove DMT infected LP. Favor WL and DF for retention. Reduce ladder fuels and fuel load. | W | | M | B, SCO |
| 226 | 11C | 10 | Widely scattered WL, DF, and LP over predominately LP with WL, PP, DF, AF, and ES. Some DMT in older LP.LP also has WGR. Low fuel load. WUI. | Pre-commercial thin via ground-based, mechanized equipment, throughout unit. Mechanical slash treatment. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Remove DMT-infected LP. Favor WL and DF for retention. Reduce ladder fuels and fuel load. | W | | M | B, SCO |
| 229 | 11C | 32 | Scattered residual DF, WL, and LP over patchy regeneration of LP, DF, WL, ES, and AF. Some DMT in both WL and LP. MPB and WGR have affected LP. Some DF affected by RR. Fuel model is low, but plenty of ladder fuels. WUI. | Pre-commercial thin via ground-based, mechanized equipment, throughout unit. Mechanical slash treatment. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Remove DMT-infected LP. Favor healthy WL for retention. Reduce ladder fuels and fuel load. | W | | M | B, SCO |

| TABLE A-1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 2. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| UNIT | ALT. 2 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED | | | |
| | | | | | | REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | IMPROVE FISH & WILDLIFE HABITAT | IMPROVE FOREST HEALTH | BENEFIT LOCAL ECONOMY |
| 230 | 15 | 10 | Few WL and DF over patchy regeneration, predominately LP with DF, ES, WL, and AF. Low fuel load. WUI. | Pre-commercial thin by hand throughout stand. Lop and scatter slash. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Favor WL and DF for retention. Reduce ladder fuels and fuel load. | W | | M | SCO |
| 231 | 15 | 221 | Variable unit with areas of WL, DF, and/or LP over LP, AF, WL, ES, and DF regeneration. Some remnant LP with MPB. DMT in some WL. RR. Low fuel load. WUI. | Pre-commercial thin, via ground-based, mechanized equipment, throughout unit. Mechanical slash treatment. Fill plant where needed. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Favor healthy WL for retention. Reduce ladder fuels and fuel load. Fill plant holes with WL, WP, and/or PP. | W | | M, WP | B, SCO |
| 232 | 15 | 13 | Variable unit with areas of WL, DF, and/or LP over LP, AF, and DF regeneration. Low fuel load. WUI. | Pre-commercial thin, via ground-based, mechanized equipment, throughout unit. Mechanical slash treatment. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Favor healthy WL for retention. Reduce ladder fuels and fuel load. | W | | M | B, SCO |
| 233 | 15 | 24 | Sparsely regenerated stand. Few overstory trees. Low fuel load. WUI. | Broadcast burn. Fill plant where needed | Reduce fuel load, stimulate aspen regeneration, and prepare site for planting. Restock site with long-lived seral species - WL, PP, and/or WPBR resistant WP. Maintain overstory for structural diversity. | | QA, Sh | WP | SCO |
| 235 | 15 | 26 | Mixed-conifer WL, LP, DF, and AF. WL has heavy DMT. RR affecting DF. MPB has affected LP. Moderate to high fuel loading. WUI. | Improvement cut via ground-based, mechanized equipment, thinning throughout unit. WTY. | Reduce stocking density to improve health and vigor of overall stand removing insect and diseased trees and making it more resilient to those insect and diseases. Favor healthy WL and DF for retention. Reduce ladder fuels and fuel load. | W | | M | C |

**Table A-1. Vegetation Restoration Treatment Summary for Alternative 2.**

| Unit | Alt. 2 Proposed MA | Acres | Existing Condition | Proposed Treatment | Objectives | Purpose and Need | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Reduce Risk of Uncharac-teristic Wildfire | Improve Fish & Wildlife Habitat | Improve Forest Health | Benefit Local Economy |
| 236 | 15 | 52 | Scattered residual WL (predominate), DF, GF, AF, and LP over patchy regeneration of predominate LP, with DF, WL, and AF. Some WL and LP infected by DMT. Some DF affected by RR. WSBW affecting the understory. Fuel load is low, but plenty of ladder fuels. WUI. | Pre-commercial thin via ground-based, mechanized equipment, throughout unit. Mechanical slash treatment. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Remove DMT-infected LP. Favor healthy WL for retention. Reduce ladder fuels and fuel load. | W | | M | B, SCO |
| 237 | 15 | 10 | Scattered residual WL and LP over patchy regeneration of predominately LP, with DF, WL, and AF. Some WL and LP infected by DMT. Fuel load is low, but plenty of ladder fuels. WUI. Jocko Trail near east side of unit. | Improvement cut via ground-based, mechanized equipment, mainly pre-commercial thinning throughout unit. Mechanical. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Remove DMT-infected LP. Favor healthy WL for retention. Reduce ladder fuels and fuel load. | W | SE | M | B, SCO |
| 238 | 15 | 18 | Few scattered WL and DF over patchy regeneration of LP, DF, WL, and AF. Fuel load is low. WUI. Jocko Trail cuts through unit. | Pre-commercial thin via ground-based, mechanized equipment, throughout unit. Mechanical/pile. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Favor WL for retention. Reduce ladder fuels and fuel load. | W | | M | B, SCO |
| 241 | 15 | 30 | Few healthy WL sparsely scattered over top sparsely regenerated stand of LP, WL, DF, and AF. Low fuel load. WUI. | Broadcast burn. Fill plant where needed. | Reduce fuel load, stimulate aspen regeneration, and prepare site for planting. Restock site with long-lived seral species – WL and WPBR-resistant WP. Maintain overstory WL for structural diversity. | | QA, Sh | M, WP | SCO |

**TABLE A-1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 2.**

| UNIT | ALT. 2 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED: REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | PURPOSE AND NEED: IMPROVE FISH & WILDLIFE HABITAT | PURPOSE AND NEED: IMPROVE FOREST HEALTH | PURPOSE AND NEED: BENEFIT LOCAL ECONOMY |
|---|---|---|---|---|---|---|---|---|---|
| 242 | 15 | 10 | Few healthy WL sparsely scattered over top sparsely regenerated stand of LP, DF, and AF. Some DMT in overstory WL. Low fuel load. WUI. | Broadcast burn. Fill plant where needed. | Reduce fuel load, stimulate aspen regeneration, and prepare site for planting. Restock site with long-lived seral species – WL and WPBR-resistant WP. Maintain healthy overstory WL for structural diversity. | | QA, Sh | M, WP | SCO |
| 243 | 15 | 38 | Scattered WL, PP, and DF over sparsely regenerated stand of LP, DF, and WL. RR affecting DF. Low fuel load. WUI. | Broadcast burn. Fill Plant where needed. | Reduce fuel load, stimulate aspen regeneration, and prepare site for planting. Restock site with long-lived seral species – WL, PP, and/or WPBR resistant WP. Maintain healthy overstory for structural diversity. | | QA, Sh | M, WP | SCO |
| 244 | 15 | 58 | Scattered WL and DF over sparsely regenerated stand of predominately LP with minor amounts of DF, AF, ES, and WL. Low fuel load. WUI. | Broadcast burn. Fill plant where needed. | Reduce fuel load, stimulate aspen regeneration, and prepare site for planting. Restock site with long-lived seral species – WL, PP, and/or WPBR resistant WP. Maintain healthy overstory for structural diversity. | | QA, Sh | M, WP | SCO |
| 245 | 11C | 60 | Scattered WL and LP over dense regeneration of LP and WL. High fuel load. WUI. | Pre-commercial thin via ground-based, mechanized equipment, throughout unit. Mechanical slash treatment. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Favor WL for retention. Reduce ladder fuels and fuel load. | W | | M | B, SCO |
| 251 | 15 | 37 | Few widely scattered WL over predominately LP regeneration with minor amounts of WL, WP, DF, and AF. Some DMT in overstory WL. Fuel load is low. Jocko Trail along west boundary. | Pre-commercial thin via ground-based, mechanized equipment, throughout unit. Mechanical slash treatment. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Favor health WL and WP for retention. Reduce ladder fuels and fuel load. | | | M | B, SCO |

**TABLE A-1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 2.**

| UNIT | ALT. 2 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | IMPROVE FISH & WILDLIFE HABITAT | IMPROVE FOREST HEALTH | BENEFIT LOCAL ECONOMY |
| 252 | 15 | 100 | Mixed-conifer dominated by LP with WL and DF (minor component of ES and AF, as well). There is a large-tree component of widely scattered WL. Evidence of older MPB attacks. Fuel load is low to medium. Jocko Trail along west side. Crystal Lake Trail in south end of unit. | Seed tree with reserves via ground-based, mechanized equipment. WTY. Plant PP, WL, and WPBR-resistant WP. | Initiate regeneration to improve overall health and vigor, and re-establish PP, WL, and WPBR-resistant WP. Reduce fuel load, and promote shrub and huckleberry production. Maintain large-diameter WL to provide for structural diversity. | | Sh | LT, R, WP | B, C, SCO |
| 256 | 11C | 11 | Mixed-conifer of LP, DF, and PP. There is a large-tree component of scattered PP and DF. LP affected by MPB and SPM. WSBW affecting understory DF and AF. Fuel loading moderate. | Improvement cut via ground-based mechanical equipment, thinning throughout stand. Daylight around large tree component – WL. WTY. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor PP for retention. Reduce ladder fuels and fuel load. | | SE | LT, M | B, C |
| 257 | 11C | 11 | Mixed-conifer of LP, DF, and PP. There is a large-tree component of scattered PP and DF. LP affected by MPB and SPM. WSBW affecting understory DF and AF. Fuel loading moderate. | Improvement cut via skyline equipment, thinning throughout stand. Daylight around large-tree component – WL. WTY. | Maintain large-tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor PP for retention. Reduce ladder fuels and fuel load. | | SE | LT, M | C |
| 258 | 11C | 33 | Dense stand of predominantly small diameter LP with DF and WL. LP with small live crown ratios. | Pre-commercial thin, by hand, throughout unit. Lop and scatter. | Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor WL and DF for retention. Reduce ladder fuels and fuel load. | | | M | SCO |

**Table A-1. Vegetation Restoration Treatment Summary for Alternative 2.**

| Unit | Alt. 2 Proposed MA | Acres | Existing Condition | Proposed Treatment | Objectives | Purpose and Need | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Reduce Risk of Uncharac-teristic Wildfire | Improve Fish & Wildlife Habitat | Improve Forest Health | Benefit Local Economy |
| 259 | 11C | 22 | Mixed-conifer of LP, DF, and PP. There is a large-tree component of scattered WL. LP affected by MPB and SPM. WSBW affecting understory DF and AF. Fuel loading moderate. | Seed tree with reserves via skyline equipment. WTY, pile. Plant WL, and WPBR-resistant WbP. | Initiate regeneration to improve overall health and vigor, and re-establish WL, and WPBR-resistant WbP. Reduce fuel load, and promote shrub and huckleberry production. Maintain larger diameter WL and healthy WbP to provide for structural diversity. Unit above 5500 ft. elevation | | Sh | LT, R WbP | C, SCO |
| 260 | 11C | 48 | Mixed-conifer of LP, DF, and PP. There is a large-tree component of scattered WL. LP affected by MPB and SPM. WSBW affecting understory DF and AF. Fuel loading moderate. | Seed tree with reserves, via ground-based mechanical equipment. WTY, pile. Plant WL and WPBR-resistant WbP. | Initiate regeneration to improve overall health and vigor, and re-establish WL, and WPBR-resistant WbP. Reduce fuel load, and promote shrub and huckleberry production. Maintain larger diameter WL and healthy WbP to provide for structural diversity. Unit above 5500 ft. elevation | | Sh | LT, R WbP | B, C, SCO |
| 262 | 11C | 20 | Mixed-conifer stand of dense LP, ES, AF, and WbP. | Stand improvement – daylighting by hand around healthy WbP. Lop and scatter. | Release WbP from competition and improve microclimate around WbP to discourage MPB. | | | M, WbP | SCO |
| 263 | 11C | 117 | Mixed-conifer stand of DF, WL, LP, ES, and AF. WSBW affecting DF, ES, and AF. Old MPB attacks on LP. Low to moderate fuel loading. | Group selection cut via ground-based mechanical equipment. Approximately 20 percent of unit will be nutcracker openings with the remaining matrix (~80%) being thinned. WTY/pile/mechanical. | Provide openings for the regeneration of white pine blister rust-resistant WbP. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor healthy WbP and WL for retention. Reduce ladder fuels and fuel load. | | Sh | M, R, WbP | B, C, SCO |

**TABLE A-1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 2.**

| UNIT | ALT. 2 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | IMPROVE FISH & WILDLIFE HABITAT | IMPROVE FOREST HEALTH | BENEFIT LOCAL ECONOMY |
| 264 | 11C | 32 | Mixed-conifer stand of LP, DF, WL, ES, AF, and WbP. MPB killed most of the LP a few years ago. Low fuel loading. | Improvement cut by hand, mainly pre-commercial thinning throughout unit. Lop and scatter | Reduce stocking density to improve health and vigor of overall stand, especially for WbP, making it more resilient to MPB. Favor WbP, WL, and DF for retention. Reduce ladder fuels and fuel load. Unit above 5500 ft. elevation | | SE | M, WbP | SCO |
| 265 | 11C | 20 | Mixed-conifer stand of dense AF, LP, ES, DF, WL, and WbP. MPB has attacked LP. Low fuel loading. | Stand improvement – daylighting around WbP, via ground-based mechanical equipment. Mechanical slash treatment. | Release WbP from competition to improve health and vigor and improve microclimate around WbP to discourage MPB. Unit above 5500 ft. elevation | | | M, WbP | B, SCO |
| 266 | 11C | 18 | Mixed-conifer stand of dense AF, LP, ES, and DF. Fuel load is low, but lots of ladder fuels. | Group selection cut via ground-based mechanical equipment. Approximately 20% of unit will be nutcracker openings with the remaining matrix (~80%) being thinned. Mechanical/pile. | Provide openings for the regeneration of white pine blister rust-resistant WbP. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor healthy LP and WL for retention, while targeting AF for removal. Reduce ladder fuels and fuel load. Unit above 5500 ft. elevation | | Sh | M, R, WbP | B, C, SCO |
| 267 | 1 | 19 | Mixed-conifer stand of dense AF, WL, ES, DF, MH and WbP. WPBR and MPB affecting WbP. Fuel load is moderate, but lots of ladder fuels. | Stand Improvement – daylighting around WbP by hand. Lop and scatter. | Release WbP from competition to improve health and vigor and improve microclimate around WbP to discourage MPB. Unit above 5500 ft. elevation | | | M, WbP | SCO |
| 268 | 11C | 20 | Mixed-conifer stand of dense AF, ES, WL, MH and WbP. WPBR and MPB affecting WbP. Fuel load is moderate. | Improvement cut by hand, thinning throughout unit, mainly daylighting around WbP. Lop and scatter. Spot plant WbP. | Release WbP from competition to improve health and vigor and improve microclimate around WbP to discourage MPB. Restock holes with WPBR-resistant WbP. Unit above 5500 ft. elevation | | SE | M, WbP | SCO |

**TABLE A-1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 2.**

| UNIT | ALT. 2 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | IMPROVE FISH & WILDLIFE HABITAT | IMPROVE FOREST HEALTH | BENEFIT LOCAL ECONOMY |
| 269 | 11C | 11 | Mixed-conifer stand of dense AF, WL, ES, DF, LP, MH and WbP. WPBR and MPB affecting LP and WbP. Fuel load is low, but lots of ladder fuels. | Stand improvement – daylighting around WbP by hand. Lop and scatter. | Release WbP from competition to improve health and vigor and improve microclimate around WbP to discourage MPB. Unit above 5500 ft. elevation | | | M, WbP | B, SCO |
| 270 | 11C | 25 | Previous clearcut with sparse regeneration, mainly AF. Low fuel load. | Fill plant where needed with WPBR-resistant WbP. | Fill plant with WPBR-resistant WbP to keep the species on the landscape. Unit above 5500 ft. elevation | | | WbP | SCO |
| 271 | 11C | 39 | Previous regeneration cut with sparse regeneration, mainly AF. Low fuel load. | Fill plant where needed with WPBR-resistant WbP. | Fill plant with WPBR-resistant WbP to keep the species on the landscape. Unit above 5500 ft. elevation | | | WbP | SCO |
| 272 | 11C | 103 | Previous regeneration cut with sparse regeneration, mainly AF. Low fuel load. | Fill plant where needed with WPBR-resistant WbP. | Fill plant with WPBR-resistant WbP to keep the species on the landscape. Unit above 5500 ft. elevation | | | WbP | SCO |
| 300 | 11C | 233 | Previous regeneration cut with WL overstory. Some regeneration is present. Adjacent to private property. WUI | Broadcast Rx burn by hand/helicopter. | Reduce fuels near and adjacent to private land and residences within the WUI. Using fire for ecological restoration and to modify fire behavior. Modifying fire behavior by promoting fire-resistant stands appropriate to the fire regimes found in the Beaver Creek Project Area. Stimulate aspen regeneration and promote shrub and huckleberry production. | BB, W | QA, Sh | | |

**TABLE A-1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 2.**

| UNIT | ALT. 2 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | IMPROVE FISH & WILDLIFE HABITAT | IMPROVE FOREST HEALTH | BENEFIT LOCAL ECONOMY |
| 308 | 22, 2, 15 | 520 | Mixed-conifer stand of dense AF, ES, WL, MH and WbP. High fuel load. Wilderness | Broadcast Rx burn by helicopter. | Use prescribed fire as a tool to mitigate potential threats of natural fire originating in the Mission Mountains Wilderness affecting resources outside the wilderness in areas where natural fires cannot be allowed to burn due to fuel conditions | BB | | | |
| 309 | 22, 15 | 584 | Mixed-conifer stand of dense AF, ES, WL, MH and WbP. High fuel load. Wilderness | Broadcast Rx burn by helicopter. | Use prescribed fire as a tool to mitigate potential threats of natural fire originating in the Mission Mountains Wilderness affecting resources outside the wilderness in areas where natural fires cannot be allowed to burn due to fuel conditions | BB | | | |
| 313 | 15 | 125 | Previous regeneration cut with WL overstory. Some regeneration is present. Adjacent to private property. WUI | Broadcast Rx burn by hand/helicopter. | Reduce fuels near and adjacent to private land and residences within the WUI. Using fire for ecological restoration and to modify fire behavior. Modifying fire behavior by promoting fire-resistant stands appropriate to the fire regimes found in the Beaver Creek Project Area. Stimulate aspen regeneration and promote shrub and huckleberry production. | BB, W | QA, Sh | | |

**TABLE A-1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 2.**

| UNIT | ALT. 2 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | IMPROVE FISH & WILDLIFE HABITAT | IMPROVE FOREST HEALTH | BENEFIT LOCAL ECONOMY |
| 314 | 15 | 180 | Previous regeneration cut with WL overstory. Some regeneration is present. WUI. | Broadcast Rx burn by hand/helicopter | Reduce fuels near and adjacent to private land and residences within the WUI. Using fire for ecological restoration and to modify fire behavior. Modifying fire behavior by promoting fire-resistant stands appropriate to the fire regimes found in the Beaver Creek Project Area. Stimulate aspen regeneration and promote shrub and huckleberry production. | BB, W | QA, Sh | | |
| 412 | 11C | 14 | Mixed-conifer unit. East dominated by LP with WL. LP has MPB, WGR. Low fuel loading. West dominated by WL, ES, LP. Large tree component of WL. LP in decline. MPB. Heavy fuel loading. WUI. In RHCA. | Improvement cut via ground-based, mechanized equipment, thinning throughout stand. WTY and mechanical slashing. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB, salvage declining LP, reduce ladder fuels and fuel load. | W | SE | LT, M | C |
| 419 | 15C, 12 | 4 | Mixed-conifer PP, DF, WL, LP with ES, AF. MPB mortality in PP, LP. Root rot and DFB infecting DF. Moderate to heavy fuel loading. WUI. In RHCA. | Improvement cut via ground-based, mechanized equipment, thinning throughout stand WTY, mechanical slashing. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB, DFB, and root rot, reduce ladder fuels and fuel load. | W | | LT, M | C |
| 429 | 15C | 11 | LP dominated stand with WL, DF, PP. MPB attacking LP, PP. LP also has WGR, SPM. SE portion more variable with addition of ES and large-tree component of PP, WL, DF. DFB and RR pockets. Patches of MPB-killed trees falling down. WUI. In RHCA. | Commercial thin via ground-based, mechanized equipment, daylighting around large tree component – PP and WL. Thinning throughout stand. WTY, mechanical slashing. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB, DFB, RR, reduce ladder fuels and fuel load. | W | SE | LT, M | C |

**TABLE A-1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 2.**

| UNIT | ALT. 2 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | IMPROVE FISH & WILDLIFE HABITAT | IMPROVE FOREST HEALTH | BENEFIT LOCAL ECONOMY |
| 430 | 15C | 4 | LP-dominated stand with WL, DF, PP. MPB attacking LP, PP. LP also has WGR, SPM. SE portion more variable with addition of ES and large-tree component of PP, WL, DF. DFB and RR pockets. Patches of MPB-killed trees falling down. WUI. In RHCA. | Commercial thin via ground-based, mechanized equipment, daylighting around large tree component – PP and WL. Thinning throughout stand. WTY, pile. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB, DFB, RR, reduce ladder fuels and fuel load. | W | SE | LT, M | C |
| 431 | 15C | 1 | Mixed-conifer stand of WL, DF, LP, ES, and PP. MPB killing LP. Few large-diameter PP, WL, DF. Moderate fuel loading. WUI. In RHCA. | Commercial thin via ground-based, mechanized equipment, daylighting around large tree component – PP, WL, DF. Thinning throughout stand. WTY and mechanical slashing. | Maintain large-tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Reduce ladder fuels and fuel load. | W | SE | LT, M | C |
| 432 | 15C | 7 | Mixed-conifer stand dominated by LP with WL, DF, ES. Large-diameter WL and PP present. DF in understory. MPB killing LP. Moderate fuel loading. WUI. In RHCA. | Commercial thin via ground-based, mechanized equipment, daylighting around large tree component – PP, WL. Thinning throughout stand. WTY and mechanical slashing. | Maintain large tree-component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Reduce ladder fuels and fuel load. | W | SE | LT, M | C |
| 449 | 11C | 2 | Predominantly WL, LP with DF, ES. Few large-diameter WL. MPB in LP. Moderate fuel loading. WUI. In RHCA. | Commercial thin via ground-based, mechanized equipment, daylighting around large tree component – PP, WL. Thinning throughout stand. WTY/ pile/ mechanical. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Reduce ladder fuels and fuel load. | W | SE | LT, M | C |
| 459 | 11C | 5 | Two-storied stand of predominantly LP with WL and ES. Understory of ES, AF, and GF. Old to recent MPB in LP. Fuel loading moderate. WUI. In RHCA, but above the road. | Commercial thin via ground-based, mechanized equipment, thinning throughout stand. WTY. | Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor WL for retention. Reduce ladder fuels and fuel load. | W | SE | M | C |

**TABLE A-1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 2.**

| UNIT | ALT. 2 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | IMPROVE FISH & WILDLIFE HABITAT | IMPROVE FOREST HEALTH | BENEFIT LOCAL ECONOMY |
| 491 | 11C | 4 | Mixed-conifer stand dominated by DF, LP and WL with shade-tolerant species coming in from below. Few large-diameter WL. Some DMT in DF and WL. Low fuel load on the ground, but ladder fuels present. In RHCA, but above the road. | Commercial thin via skyline equipment, thinning throughout unit. Daylight around large tree component – WL. WTY. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor WL for retention. Reduce ladder fuels and fuel load. | | SE | LT, M | C |
| 494 | 11C | 3 | Stagnating LP with WL and DF. Few large-diameter WL. Fuel loading is high. Within RHCA, but above road. | Improvement cut via skyline equipment, including pre-commercial thinning throughout stand. Daylight around large-tree component – WL. WTY/pile. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making unit more resilient to MPB. Favor WL for retention. Reduce ladder fuels and fuel load. | | SE | LT, M | C |
| 495 | 11C | 1 | Stagnating LP with WL and DF. Few large-diameter WL. Fuel loading is high. Within RHCA, but above road. | Improvement cut via ground-based, mechanized equipment, including pre-commercial thinning throughout stand. Daylight around large-tree component – WL. WTY/pile. | Maintain large-tree component. Reduce stocking density to improve health and vigor of overall stand, making unit more resilient to MPB. Favor WL for retention. Reduce ladder fuels and fuel load. | | SE | LT, M | B, C |
| 498 | 11C | 3 | Mixed-conifer stand dominated by LP with DF, WL, AF, and PP. Variable stocking. Few large-diameter WL. Fuel loading is low to moderate. Within RHCA, but above road. | Commercial thin via ground-based, mechanized equipment, thinning throughout unit. Daylight around large tree component – WL and PP. WTY. | Maintain large-tree component. Reduce stocking density to improve health and vigor of overall stand, making unit more resilient to MPB. Favor WL, PP, and DF for retention. Reduce ladder fuels and fuel load. | | SE | LT, M | C |
| 4108 | 11C | 16 | Dense mixed-conifer stand dominated by AF and ES with WL, LP, and DF. Few large-diameter WL, DF and ES. Fuel loading is low to moderate. In RHCA. | Commercial thin via ground-based, mechanized equipment, thinning throughout unit. Daylight around large tree component – WL and ES. WTY. | Maintain large-tree component. Reduce stocking density to improve health and vigor of overall stand, making unit more resilient to MPB. Favor WL and DF for retention. Reduce ladder fuels and fuel load. | | SE | LT, M | C |

**TABLE A-1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 2.**

| UNIT | ALT. 2 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED: REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | PURPOSE AND NEED: IMPROVE FISH & WILDLIFE HABITAT | PURPOSE AND NEED: IMPROVE FOREST HEALTH | PURPOSE AND NEED: BENEFIT LOCAL ECONOMY |
|---|---|---|---|---|---|---|---|---|---|
| 4110 | 11C | 14 | Overstocked stand of predominantly DF with scattered WL. Fuel loading is low. | Commercial thin via skyline equipment, thinning throughout unit. WTY. Broadcast Burn. | Reduce stocking density to improve health and vigor of overall stand. Favor WL, for retention. Reduce ladder fuels and fuel load, promote shrub and huckleberry production. | BB | QA, Sh | M | C |
| 4208 | 11C | 1 | Dense understory of ES, LP, WL, DF, and AF beneath WL and ES seed trees. Some WGR on LP. Dense ladder fuels. WUI and RHCA. | Pre-commercial thin by hand throughout stand. Lop and scatter slash. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Favor WL for retention. Reduce ladder fuels and fuel load. | W | | M | SCO |
| 4209 | 11C | 3 | Understory of DF, WL, LP, ES and PP beneath DF. Fuel load is low. WUI and RHCA | Pre-commercial thin via ground-based, mechanized equipment, throughout unit. Mechanical slash treatment. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Favor WL and PP for retention. Reduce ladder fuels and fuel load. | W | | M | B, SCO |
| 4222 | 11C | 1 | Old PCTC landing with sparse vegetation. Within HOAQ buffer, but across the road from the pond. WUI. | Fill plant by hand with WL, WPBR-resistant WP, and PP. | Restore the site by re-establishing long-lived seral species. | | | WP | SCO |
| 4225 | 11C | 3 | Widely scattered WL and LP over predominately LP with WL, DF, and ES. Some DMT in older LP. Low to moderate fuel load. WUI and RHCA. | Improvement cut, mainly pre-commercial thinning throughout unit by hand. Lop and scatter. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Remove DMT infected LP. Favor WL and DF for retention. Reduce ladder fuels and fuel load. | W | | M | SCO |
| 4226 | 11C | 3 | Widely scattered WL, DF, and LP over predominately LP with WL, PP, DF, AF, and ES. Some DMT in older LP.LP also has WGR. Low fuel load. WUI and RHCA. | Pre-commercial thin, by hand, throughout unit. Lop and scatter. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Remove DMT-infected LP. Favor WL and DF for retention. Reduce ladder fuels and fuel load. | W | | M | SCO |

**Table A-1. Vegetation Restoration Treatment Summary for Alternative 2.**

| Unit | Alt. 2 Proposed MA | Acres | Existing Condition | Proposed Treatment | Objectives | Purpose and Need | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Reduce Risk of Uncharac-teristic Wildfire | Improve Fish & Wildlife Habitat | Improve Forest Health | Benefit Local Economy |
| 4262 | 11C | 5 | Mixed-conifer stand of dense LP, ES, AF, and WbP. Within RHCA. | Stand improvement – daylighting by hand around healthy WbP. Lop and scatter. | Release WbP from competition and improve microclimate around WbP to discourage MPB. | | SE | M, WbP | SCO |

**TABLE A- 1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 3.**

| Unit | Alt. 3 Proposed MA | Acres | Existing Condition | Proposed Treatment | Objectives | Purpose and Need: Reduce Risk of Uncharac-teristic Wildfire | Purpose and Need: Improve Fish & Wildlife Habitat | Purpose and Need: Improve Forest Health | Purpose and Need: Benefit Local Economy |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 5 | 4 | Mixed-conifer DF, WL, ES, LP, PP, AF. Large-diameter WL, PP, DF with dense understory/ladder fuels. MPB and WSBW. WUI. | Commercial thin via ground-based, mechanized equipment, daylighting around large-diameter PP, WL, and DF and thinning throughout stand. WTY and mechanical slashing. | Maintain large tree component. Thin to reduce stocking to improve health and vigor of overall stand, reduce ladder fuels and fuel load. | W | SE | LT, M | C |
| 3 | 5 | 24 | Mixed-conifer DF, WL, ES, LP, PP, AF. Large-diameter WL, PP, DF with dense understory/ladder fuels. MPB and WSBW. WUI. | Commercial thin via ground-based, mechanized equipment, daylighting around large-diameter PP, WL, and DF and thinning throughout stand. WTY and mechanical slashing. Broadcast burn. | Maintain large tree component. Thin to reduce stocking to improve health and vigor of overall stand, reduce ladder fuels and fuel load, promote shrub and huckleberry production. | BB, W | Sh | LT, M | C |
| 4 | 5 | 19 | Mixed-conifer DF, WL, LP, PP. Large-diameter WL, PP, DF with patches of dense understory/ladder fuels. WSBW. WUI. | Commercial thin via ground-based, mechanized equipment, daylighting around large-diameter PP, WL, and DF and thinning throughout stand. WTY and mechanical slashing. | Maintain large tree component. Thin to reduce stocking to improve health and vigor of overall stand, reduce ladder fuels and fuel load. | W | SE | LT, M | C |
| 5 | 11C | 47 | Younger stand of mixed-conifer LP, PP, WL, DF, AF with shade-tolerant species coming in beneath. Large diameter WL in northeast portion of stand. Active MPB in LP. WGR and SPM infecting LP. WUI. | Improvement cut via ground-based, mechanized equipment, daylighting around large-diameter WL, thinning throughout stand. WTY, pile and mechanical slashing. | Maintain large tree component. Thin to reduce stocking to improve health and vigor of overall stand, making stand more resilient to MPB, promote PP and WL, reduce ladder fuels and fuel load. | W | SE | LT, M | B, C |
| 6 | 5 | 5 | Two-storied stand of mixed-conifer LP, DF, WL, AF with shade-tolerant species coming in beneath. Old MPB and WGR in LP. WSBW impacting understory. Dense understory/ladder fuels in places. WUI. | Improvement cut via ground-based, mechanized equipment, thinning throughout stand. WTY. Broadcast burn. | Thin to reduce stocking to improve health and vigor of overall stand, promote DF and WL, reduce ladder fuels and fuel load, promote shrub and huckleberry production. | BB, W | Sh | M | C |
| 7 | 5 | 3 | Plantation dominated by PP and LP with DF and WL 4 to 9-inch DBH. DF coming in underneath. MPB active WUI. | Pre-commercial thin via ground-based, mechanized equipment, thinning throughout stand. Mechanical slash treatment. | Reduce stocking density to improve health and vigor of overall stand, making stand more resilient to MPB, reduce ladder fuels and fuel load. | W | | M | B, SCO |

**TABLE A- 1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 3.**

| UNIT | ALT. 3 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED: REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | PURPOSE AND NEED: IMPROVE FISH & WILDLIFE HABITAT | PURPOSE AND NEED: IMPROVE FOREST HEALTH | PURPOSE AND NEED: BENEFIT LOCAL ECONOMY |
|---|---|---|---|---|---|---|---|---|---|
| 12 | 11C | 55 | Mixed-conifer unit. East dominated by LP with WL. LP has MPB, WGR. Low fuel loading. West dominated by WL, ES, LP. Large tree component of WL. LP in decline. MPB. Heavy fuel loading. WUI. | Improvement cut via ground-based, mechanized equipment, thinning throughout stand. WTY and mechanical slashing. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB, salvage declining LP, reduce ladder fuels and fuel load. | W | SE | LT, M | B, C |
| 16 | 11C, 15C | 141 | Mixed-conifer unit – DF, ES, WL dominate with LP. Dense portions experiencing mortality due to competition and MPB. Schweinitzii also present. Fuel loadings vary from low to high. WUI. | Commercial thin via ground-based, mechanized equipment, daylighting around large tree component. PP and thinning throughout stand. WTY, pile and mechanical slashing. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall unit, making it more resilient to MPB, reduce ladder fuels and fuel load. | W | SE | M | C |
| 19 | 15C | 48 | Mixed-conifer PP, DF, WL, LP with ES, AF. MPB mortality in PP, LP. Root rot and DFB infecting DF. Moderate to heavy fuel loading. WUI. | Improvement cut via ground-based, mechanized equipment, thinning throughout stand. WTY, pile and mechanical slashing. Broadcast burn. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB, DFB, and root rot, reduce ladder fuels and fuel load, and promote shrub and huckleberry production. | BB, W | Sh | LT, M | B, C |
| 21 | 15C | 67 | Mixed-conifer LP, WL, DF, and PP. MPB, WGR, DMT, and SPM affecting LP causing mortality throughout – heavy in places. Fuel loading is therefore variable low to heavy. WUI. | Seed tree with reserves via ground-based, mechanized equipment. WTY. Plant PP, WL, and WPBR resistant WP. | Initiate regeneration to improve overall health and vigor, and re-establish PP, WL, and WPBR-resistant WP. Reduce fuel load, and promote shrub and huckleberry production. Maintain large-diameter WL, PP, and DF to provide for structural diversity. | W | Sh | LT, M, R, WP | C, SCO |

**TABLE A- 1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 3.**

| Unit | Alt. 3 Proposed MA | Acres | Existing Condition | Proposed Treatment | Objectives | Purpose and Need: Reduce Risk of Uncharac-teristic Wildfire | Improve Fish & Wildlife Habitat | Improve Forest Health | Benefit Local Economy |
|---|---|---|---|---|---|---|---|---|---|
| 25 | 15C | 27 | Stand dominated by LP and WL with DF. Large-diameter WL and PP present. MPB killing LP. Patches of dense DF understory/ladder fuels. Moderate fuel loading. WUI. | Commercial thin via ground-based, mechanized equipment, daylighting around large tree component – PP and WL. Thinning throughout stand. WTY, pile and broadcast burn. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB, salvage declining LP, reduce ladder fuels and fuel load, promote shrub and huckleberry production. | BB, W | Sh | LT, M | C |
| 28 | 15C | 110 | LP dominated stand with WL, DF, PP. MPB attacking LP, PP. LP also has WGR, SPM. Southeast portion more variable with addition of ES and large-tree component of PP, WL, DF. DFB and RR pockets. Patches of MPB-killed trees falling down. WUI. | Commercial thin via ground-based, mechanized equipment, daylighting around large tree component – PP and WL. Thinning throughout stand. WTY, pile and mechanical slashing. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB, DFB, RR, reduce ladder fuels and fuel load. | W | SE | LT, M | C |
| 31 | 15C | 1 | Mixed-conifer stand of WL, DF, LP ES, PP. MPB killing LP. Few large-diameter PP, WL, DF. Moderate fuel loading. WUI. | Commercial thin via ground-based, mechanized equipment, daylighting around large tree component – PP, WL, DF. Thinning throughout stand. WTY and mechanical slashing. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Reduce ladder fuels and fuel load. | W | SE | LT, M | C |
| 32 | 15C | 12 | Mixed-conifer stand dominated by LP with WL, DF, ES. Large-diameter WL and PP present. DF in understory. MPB killing LP. Moderate fuel loading. WUI. | Commercial thin via ground-based, mechanized equipment, daylighting around large tree component – PP, WL. Thinning throughout stand. WTY and mechanical slashing. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Reduce ladder fuels and fuel load. | W | SE | LT, M | C |
| 34 | 15C | 10 | Heavily stocked young stand of predominantly LP with a few large diameter WL. MPB in LP. Low to moderate fuel loading. WUI. | Combination of commercial and pre-commercial thin via ground-based, mechanized equipment, daylighting around large tree component – WL. Thinning throughout stand. WTY and mechanical slashing. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Reduce ladder fuels and fuel load. | W | | LT, M | C |

**TABLE A- 1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 3.**

| UNIT | ALT. 3 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED: REDUCE RISK OF UNCHARACTERISTIC WILDFIRE | PURPOSE AND NEED: IMPROVE FISH & WILDLIFE HABITAT | PURPOSE AND NEED: IMPROVE FOREST HEALTH | PURPOSE AND NEED: BENEFIT LOCAL ECONOMY |
|---|---|---|---|---|---|---|---|---|---|
| 36 | 15C | 29 | Mixed-conifer stand dominated by LP, WL, DF with AF. Large-diameter WL, PP. MPB and DMT in LP. Some heavily infested DMT WL. Moderate fuel loading. WUI. | Commercial thin via ground-based, mechanized equipment, daylighting around large tree component – PP, WL. Thinning throughout stand. WTY and mechanical slashing. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB and DMT. Reduce ladder fuels and fuel load. | W | | LT, M | C |
| 37 | 15C | 5 | Mixed-conifer of WL, LP, DF beneath a few large diameter PP. Few QA, CW. WUI. | Commercial thin via ground-based, mechanized equipment, daylighting around large tree component – PP. Thinning throughout stand. WTY and broadcast burn. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand. Reduce ladder fuels and fuel load, promote QA, shrub and huckleberry production. | BB, W | QA, Sh | LT, M | C |
| 39 | 11C | 45 | Predominantly WL, LP with DF, ES. Few large diameter WL. MPB in LP. Moderate fuel loading. WUI. | Commercial thin via ground-based, mechanized equipment, daylighting around large tree component – WL. Thinning throughout stand. WTY. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Reduce ladder fuels and fuel load. | W | SE | LT, M | C |
| 40 | 11C | 9 | Mixed-conifer stand with WL, LP, DF with AF, DF coming in below. Few large diameter WL, DF. MPB in LP. Moderate fuel loading. WUI. | Commercial thin via ground-based, mechanized equipment, daylighting around large tree component – DF, WL. Thinning throughout stand. WTY, pile and broadcast burn. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Reduce ladder fuels and fuel load, promote QA, shrub and huckleberry production. | BB, W | QA, Sh | LT, M | C |
| 42 | 11C | 11 | Two-storied stand of predominantly DF with WL, PP and DF seedling/saplings in openings. Moderate fuel loading. WUI. | Commercial thin via ground-based, mechanized equipment, Thinning throughout stand. WTY, broadcast burn. | Reduce stocking density to improve health and vigor of overall stand, Favor WL, PP for retention. Reduce ladder fuels and fuel load, promote QA, shrub and huckleberry production. | BB, W | QA, Sh | M | C |

**TABLE A- 1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 3.**

| UNIT | ALT. 3 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | IMPROVE FISH & WILDLIFE HABITAT | IMPROVE FOREST HEALTH | BENEFIT LOCAL ECONOMY |
| 43 | 11C | 4 | Mixed-conifer dominated by DF with WL, LP, ES. WGR in LP. RR affecting patches of DF. Few large diameter WL. Low fuel loading. WUI | Combination of commercial and pre-commercial thin via ground-based, mechanized equipment, thinning throughout stand. WTY, mechanical slashing. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, Favor WL for retention. Reduce ladder fuels. | W | | LT, M | C |
| 45 | 15C | 10 | Decadent LP with few scattered large-diameter WL. LP has MPB, WGR, DMT and starting to fall down. High fuel loading. WUI. | Clearcut with reserves via ground-based, mechanized equipment, retaining WL and best LP. WTY, pile. | Initiate regeneration to improve overall health and vigor, and re-establish WL, WP, PP. Maintain large diameter WL and best phenotypic LP to provide for structural diversity. | W | Sh | R, WP | C, SCO |
| 51 | 11C | 45 | Mixed-conifer dominated by LP, with WL, DF, AF, ES, Scattered MPB, WGR, SPM in LP. WSBW attacking firs. Fuel loading variable. WUI. | Improvement cut via ground-based, mechanized equipment, Commercial and noncommercial thinning throughout stand. WTY. | Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor WL, DF for retention. Reduce ladder fuels and fuel load. | W | SE | M | C |
| 54 | 11C | 8 | Mixed-conifer LP, WL, DF, AF, ES. Stand previously cut with patches of regen coming in. Few large diameter WL. Fuel loading moderate to very high. WUI. | Improvement cut via ground-based, mechanized equipment, Commercial and pre-commercial thinning throughout stand. WTY/mechanical. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor WL, DF for retention. Reduce ladder fuels and fuel load. | W | SE | LT, M | C |
| 55 | 11C | 82 | Mixed-conifer dominated by LP, with WL. Shade-tolerant species establishing. Combination of old and new scattered MPB in LP. Few large diameter WL. Fuel loading low to moderate. WUI. | Commercial thin via ground-based, mechanized equipment, daylighting around large tree component – WL. Thinning throughout stand. WTY, pile. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor WL for retention. Reduce ladder fuels and fuel load. | W | SE | LT, M | C |
| 57 | 15C | 3 | Mixed-conifer dominated by LP and WL with DF and ES. Shade-tolerant species establishing underneath. Combination of old and new scattered MPB in LP. Fuel loading high. Adjacent to private property. WUI. | Commercial thin via ground-based, mechanized equipment, thinning throughout stand. WTY, mechanical. | Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor WL for retention. Reduce ladder fuels and fuel load. | W | SE | M | C |

**TABLE A- 1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 3.**

| UNIT | ALT. 3 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED: REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | PURPOSE AND NEED: IMPROVE FISH & WILDLIFE HABITAT | PURPOSE AND NEED: IMPROVE FOREST HEALTH | PURPOSE AND NEED: BENEFIT LOCAL ECONOMY |
|---|---|---|---|---|---|---|---|---|---|
| 60 | 11C | 3 | Two-storied stand of predominantly LP with WL and ES. Understory of ES, AF, and GF. Old to recent MPB in LP. Fuel loading moderate. WUI. | Commercial thin via ground-based, mechanized equipment, thinning throughout stand. WTY. | Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor WL for retention. Reduce ladder fuels and fuel load. | W | SE | M | C |
| 62 | 15C | 31 | Mixed-conifer dominated by LP and WL with DF and some PP and ES. Few large-diameter WL. Combination of old and new scattered MPB and *Atropellis* canker in LP. Fuel loading moderate to high. Adjacent to private property. WUI. | Commercial thin via ground-based, mechanized equipment, daylighting around large tree component – WL. Thinning throughout stand. WTY, pile. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor WL and PP for retention. Reduce ladder fuels and fuel load. | W | SE | LT, M | C |
| 74 | 15 | 1 | Declining LP stand with some DF, AF, and WL. Fuel load is moderate to high. WUI, | Combination of commercial and pre-commercial thin via ground-based, mechanized equipment, thinning throughout stand. WTY, mechanical, BB. | Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor WL. Reduce fuel load, promote shrub and huckleberry production. | BB, W | Sh | M | C |
| 76 | 15 | 43 | Variable stand. Dense areas dominated by LP with WL, DF, AF, and DF. Other areas of sparser overstory of WL, DF, and AF with WL, DF, AF, and LP coming in below. DMT in some WL and DF. Low fuel loading. WUI. | Combination of commercial and pre-commercial thin via ground-based, mechanized equipment, thinning throughout stand. Mechanical slash treatment. | Reduce stocking density to improve health and vigor of overall stand, removing DMT DF and WL and making it more resilient to MPB. Favor healthy WL and DF. Reduce fuel load. | W | SE | M | B, C, SCO |
| 84 | 15 | 6 | LP dominated with WL and DF. Shade-tolerant species coming in beneath. DMT in both LP and WL. Fuel loading high. WUI. Jocko Trail along west boundary. | Two-aged stand clearcut via ground-based, mechanized equipment. Slash cleanup mechanical, pile. | Regenerate stand with DMT-free WL as reserve trees and plant long-lived seral species – WL and WP to create a two-aged stand. | W | Sh | R, WP | C, SCO |

**TABLE A- 1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 3.**

| UNIT | ALT. 3 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | IMPROVE FISH & WILDLIFE HABITAT | IMPROVE FOREST HEALTH | BENEFIT LOCAL ECONOMY |
| 89 | 11C | 41 | Predominantly LP with scattered WL. Shade-tolerant species coming beneath. Few large diameter WL. Some DMT in WL, MPB has killed some LP. Fuel load is low to moderate. WUI. | Improvement cut via ground-based, mechanized equipment, commercial and pre-commercial thinning throughout stand. Daylight around large tree component – WL. WTY/pile. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor WL for retention. Reduce ladder fuels and fuel load. | W | SE | LT, M | C, SCO |
| 90 | 11C | 8 | Mixed-conifer stand dominated by DF, LP and WL with shade-tolerant species coming in from below. Few large diameter WL and PP. Some DMT in DF and WL. Low fuel load on the ground, but ladder fuels present. | Commercial thin via ground-based, mechanized equipment, thinning throughout unit. Daylight around large tree component – WL and PP. WTY. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor WL for retention. Reduce ladder fuels and fuel load. | | SE | LT, M | C |
| 91 | 11C | 16 | Mixed-conifer stand dominated by DF, LP and WL with shade-tolerant species coming in from below. Few large diameter WL. Some DMT in DF and WL. Low fuel load on the ground, but ladder fuels present. | Commercial thin via skyline equipment, thinning throughout unit. Daylight around large tree component – WL. WTY. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor WL for retention. Reduce ladder fuels and fuel load. | | SE | LT, M | C |
| 99 | 15 | 26 | Mixed-conifer of LP, DF, and WL. Patches of older dead LP from MPB. Some DMT in DF and WL. RR affecting DF. Fuel loading is moderate to high. | Commercial thin via ground-based, mechanized equipment, thinning throughout unit. WTY. | Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor WL, for retention. Reduce ladder fuels and fuel load. | | SE | M | C |
| 100 | 15 | 14 | Mixed-conifer dominated by LP and DF, with WL and AF. Patches of older dead LP from MPB. Some DMT in DF. Fuel loading is moderate to high. | Commercial thin via skyline equipment, thinning throughout unit. WTY. | Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor WL and DF for retention. Reduce ladder fuels and fuel load. | | SE | M | C |

**TABLE A- 1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 3.**

| UNIT | ALT. 3 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED: REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | PURPOSE AND NEED: IMPROVE FISH & WILDLIFE HABITAT | PURPOSE AND NEED: IMPROVE FOREST HEALTH | PURPOSE AND NEED: BENEFIT LOCAL ECONOMY |
|---|---|---|---|---|---|---|---|---|---|
| 102 | 15 | 95 | Northern portion is dominated by declining LP that is susceptible to MPB. Few large diameter WL. Patches of dead LP due to MPB. Southern portion mixed-conifer of LP, DF, and WL. Patches of older dead LP from MPB. Some DMT in DF and WL. RR affecting DF. Fuel loading is moderate to high. Jocko Trail cuts through north end of unit. | Commercial thin via ground-based, mechanized equipment, thinning throughout unit. Daylight around large tree component – WL. WTY/pile. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor healthy WL for retention. Reduce ladder fuels and fuel load. | | SE | LT, M | C |
| 105 | 15 | 27 | Mixed-conifer consisting of WL, LP, and DF. Few large diameter WL. DMT infecting some WL. RR prevalent throughout unit. MPB has killed a good portion of LP. Fuel loading is moderate to high, especially where dead LP has fallen over. | Seed tree with reserves via skyline equipment. WTY/pile. | Initiate regeneration to improve overall health and vigor, and re-establish WL, WP, and PP. Maintain large-diameter DMT-free WL and healthy DF to provide for structural diversity. | | Sh | LT, R, WP | C, SCO |
| 114 | 11C | 46 | NE and SW ends of unit are dominated by overstocked LP with WL, DF, ES, and AF also present. Patches of MPB-killed LP and WSBW affecting AF. The middle is also dominated by LP with ES and AF and a minor amount of DF. Patches of MPB-killed LP, DMT affecting LP and WSBW affecting AF and DF. There is a large tree component of WL and ES. Fuel loading varies from low to high | Improvement cut via ground-based mechanical equipment, thinning throughout stand. Daylight around large tree component – WL. WTY. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor WL and any healthy WbP for retention. Reduce ladder fuels and fuel load. Unit above 5500 ft. elevation | | SE | LT, M, WbP | B, C |

**TABLE A- 1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 3.**

| UNIT | ALT. 3 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED: REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | IMPROVE FISH & WILDLIFE HABITAT | IMPROVE FOREST HEALTH | BENEFIT LOCAL ECONOMY |
|---|---|---|---|---|---|---|---|---|---|
| 116 | 11C | 92 | LP dominated stands with WL, DF, AF, and ES. LP generally have low live crown ratios. There is a large tree component of scattered WL, DF, and ES. WbP regenerating in the understory. Patches of MPB-killed LP. Fuel loading varies from medium to high | Group selection cut via ground-based mechanical equipment. Approximately 20% of unit will be nutcracker openings with the remaining matrix (~80%) being thinned. Daylight around large tree component – WL, DF, and ES. WTY/pile. | Provide openings for the regeneration of white pine blister rust-resistant WbP. Daylight around older mature WbP and other large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor healthy WbP and WL for retention. Reduce ladder fuels and fuel load, promote shrub and huckleberry production. Unit above 5500 ft. elevation | | Sh | LT, M, R, WbP | B, C, SCO |
| 118 | 11C | 17 | Mixed-conifer of LP, AF, DF, WL, and ES. There is a large tree component of scattered WL and DF. LP with low live crown ratios. Patches of MPB-killed LP. WSBW affecting understory DF and AF. Fuel loading moderate. | Improvement cut via ground-based mechanical equipment, thinning throughout stand. Daylight around large tree component – WL. WTY. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor WL and any healthy WbP for retention. Reduce ladder fuels and fuel load. Unit above 5500 ft. elevation | | SE | LT, M, WbP | C |
| 119 | 11C | 26 | Heavily stocked mixed-conifer stand of DF, WL, and AF with minor amounts of ES and LP. WSBW affecting AF. Low fuel loading. | Commercial thin via ground-based, mechanized equipment, thinning throughout unit. WTY. | Reduce stocking density to improve health and vigor of overall stand. Favor WL, DF, and any healthy WbP for retention. Reduce ladder fuels and fuel load. Unit above 5500 ft. elevation | | SE | M, WbP | C |
| 200 | 15C | 7 | Predominantly young LP with young WL and few scattered large WL. MPB has attacked larger LP. Low fuel load. WUI. | Pre-commercial thin by hand throughout stand. Daylight around large tree component – WL. Lop and scatter slash. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Daylight around large tree component. Favor WL and PP for retention. Reduce ladder fuels and fuel load. | W | | LT, M | SCO |

**TABLE A- 1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 3.**

| UNIT | ALT. 3 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | IMPROVE FISH & WILDLIFE HABITAT | IMPROVE FOREST HEALTH | BENEFIT LOCAL ECONOMY |
| 201 | 15C | 4 | Predominantly young LP with young WL and PP. Dense stocking. Low fuel load. WUI. | Pre-commercial thin via ground-based, mechanized equipment, thinning throughout unit. Mechanical slash treatment. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Favor WL and PP for retention. Reduce ladder fuels and fuel load. | W | | M | B, SCO |
| 203 | 15C | 11 | Young stand of PP, LP, DF, and WL. MPB mortality in LP. Low fuel load. WUI. | Improvement cut via ground-based, mechanized equipment, mainly pre-commercial thinning throughout unit. Mechanical/pile. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Favor WL and PP for retention. Reduce ladder fuels and fuel load. | W | SE | M | B, SCO |
| 204 | 11C | 83 | Mixed stand of ES, DF, WL, AF, LP, PP, QA, and CW. Some WGR and MPB affecting LP. Low fuel load. WUI. | Improvement cut via ground-based, mechanized equipment, mainly pre-commercial thinning throughout unit. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Favor PP, WL, QA, and CW for retention. Reduce ladder fuels and fuel load, promote QA. | W | SE, QA | M | B, C, SCO |
| 210 | 15C | 36 | LP widely scattered over dense regeneration, predominately LP with ES, WL, DF, and AF. WGR in LP. Moderate fuel loading. WUI. | Pre-commercial thin via ground-based, mechanized equipment, throughout unit. Mechanical/pile. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Favor WL for retention. Reduce ladder fuels and fuel load. | W | | M | B, SCO |
| 211 | 15C | 26 | Widely scattered WL and LP (DF and PP minor) over predominately LP, with WL, DF, and ES regeneration. Fuel load is low. WUI. | Pre-commercial thin by hand throughout stand. Lop and scatter slash. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Favor WL for retention. Reduce ladder fuels and fuel load. | W | | M | SCO |
| 212 | 15C | 40 | Scattered LP, WL, DF and PP over predominately LP regeneration with DF and AF. WGR on LP. Low fuel load. WUI. | Pre-commercial thin via ground-based, mechanized equipment, throughout unit. Mechanical/pile. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Favor WL and PP for retention. Reduce ladder fuels and fuel load. | W | | M | B, SCO |

**TABLE A- 1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 3.**

| UNIT | ALT. 3 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED: REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | PURPOSE AND NEED: IMPROVE FISH & WILDLIFE HABITAT | PURPOSE AND NEED: IMPROVE FOREST HEALTH | PURPOSE AND NEED: BENEFIT LOCAL ECONOMY |
|---|---|---|---|---|---|---|---|---|---|
| 214 | 15C | 17 | Predominately scattered WL with some LP over dense LP, WL, DF, and AF regeneration. WGR on LP. Moderate fuel load. WUI | Pre-commercial thin via ground-based, mechanized equipment, throughout unit. Mechanical. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Favor WL for retention. Reduce ladder fuels and fuel load. | W | | M | B, SCO |
| 220 | 11C | 10 | Predominately LP in both sparse overstory and dense understory with some WL in both levels. WGR and SPM on LP. Low fuel loading. WUI. | Pre-commercial thin via ground-based, mechanized equipment, throughout unit. Mechanical/pile. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Favor WL for retention. Reduce ladder fuels and fuel load. | W | | M | B, SCO |
| 221 | 11C | 24 | Widely scattered WL in overstory, over dense regeneration of predominately LP with WL, and DF. Low fuel loading. WUI. | Improvement cut via ground-based, mechanized equipment, mainly pre-commercial thinning throughout unit. Mechanical slash treatment. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Favor WL and DF for retention. Reduce ladder fuels and fuel load. | W | SE | LT, M | B, SCO |
| 222 | 11C | 1 | Old PCTC landing with sparse vegetation. | Fill plant by hand with WL, WP, and PP. | Restore the site by re-establishing long-lived seral species. | | | WP | SCO |
| 224 | 11C | 18 | Widely scattered WL and LP over predominately LP with WL, DF, and ES. Some DMT in older LP. Low to moderate fuel load. WUI. | Pre-commercial thin via ground-based, mechanized equipment, throughout unit. Mechanical slash treatment. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Remove DMT infected LP. Favor WL and DF for retention. Reduce ladder fuels and fuel load. | W | | M | B, SCO |
| 226 | 11C | 10 | Widely scattered WL, DF, and LP over predominately LP with WL, PP, DF, AF, and ES. Some DMT in older LP.LP also has WGR. Low fuel load. WUI. | Pre-commercial thin via ground-based, mechanized equipment, throughout unit. Mechanical slash treatment. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Remove DMT infected LP. Favor WL and DF for retention. Reduce ladder fuels and fuel load. | W | | M | B, SCO |

**TABLE A- 1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 3.**

| UNIT | ALT. 3 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | IMPROVE FISH & WILDLIFE HABITAT | IMPROVE FOREST HEALTH | BENEFIT LOCAL ECONOMY |
| 230 | 15 | 10 | Few WL and DF over patchy regeneration, predominately LP with DF, ES, WL, and AF. Low fuel load. WUI. | Pre-commercial thin by hand throughout stand. Lop and scatter slash. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Favor WL and DF for retention. Reduce ladder fuels and fuel load. | W | | M | SCO |
| 231 | 15 | 221 | Variable unit with areas of WL, DF, and/or LP over LP, AF, WL, ES, and DF regeneration. Some remnant LP with MPB. DMT in some WL. RR. Low fuel load. WUI. | Pre-commercial thin, via ground-based, mechanized equipment, throughout unit. Mechanical slash treatment. Fill plant where needed. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Favor healthy WL for retention. Reduce ladder fuels and fuel load. Fill plant holes with WL, WP, and/or PP. | W | | M, WP | B, SCO |
| 232 | 15 | 13 | Variable unit with areas of WL, DF, and/or LP over LP, AF, and DF regeneration. Low fuel load. WUI. | Pre-commercial thin, via ground-based, mechanized equipment, throughout unit. Mechanical slash treatment. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Favor healthy WL for retention. Reduce ladder fuels and fuel load. | W | | M | B, SCO |
| 233 | 15 | 24 | Sparsely regenerated stand. Few overstory trees. Low fuel load. WUI. | Broadcast burn. Fill Plant where needed | Reduce fuel load, stimulate aspen regeneration, and prepare site for planting. Restock site with long-lived seral species - WL, PP, and/or WPBR-resistant WP. Maintain overstory for structural diversity. | | QA, Sh | WP | SCO |
| 235 | 15 | 26 | Mixed-conifer WL, LP, DF, and AF. WL has heavy DMT. RR affecting DF. MPB has affected LP. Moderate to high fuel loading. WUI. | Improvement cut via ground-based, mechanized equipment, thinning throughout unit. WTY. | Reduce stocking density to improve health and vigor of overall stand removing insect and diseased trees and making it more resilient to those insect and diseases. Favor healthy WL and DF for retention. Reduce ladder fuels and fuel load. | W | | M | C |

**TABLE A- 1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 3.**

| UNIT | ALT. 3 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED: REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | IMPROVE FISH & WILDLIFE HABITAT | IMPROVE FOREST HEALTH | BENEFIT LOCAL ECONOMY |
|---|---|---|---|---|---|---|---|---|---|
| 236 | 15 | 52 | Scattered residual WL (predominate), DF, GF, AF, and LP over patchy regeneration of predominate LP, with DF, WL, and AF. Some WL and LP infected by DMT. Some DF affected by RR. WSBW affecting the understory. Fuel load is low, but plenty of ladder fuels. WUI. | Pre-commercial thin via ground-based, mechanized equipment, throughout unit. Mechanical slash treatment. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Remove DMT infected LP. Favor healthy WL for retention. Reduce ladder fuels and fuel load. | W | | M | B, SCO |
| 238 | 15 | 18 | Few scattered WL and DF over patchy regeneration of LP, DF, WL, and AF. Fuel load is low. WUI. Jocko Trail cuts through unit. | Pre-commercial thin via ground-based, mechanized equipment, throughout unit. Mechanical/pile. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Favor WL for retention. Reduce ladder fuels and fuel load. | W | | M | B, SCO |
| 241 | 15 | 30 | Few healthy WL sparsely scattered over top of sparsely regenerated stand of LP, WL, DF, and AF. Low fuel load. WUI. | Broadcast burn. Fill plant where needed. | Reduce fuel load, stimulate aspen regeneration, and prepare site for planting. Restock site with long-lived seral species – WL and WPBR-resistant WP. Maintain overstory WL for structural diversity. | | QA, Sh | WP | SCO |
| 242 | 15 | 10 | Few healthy WL sparsely scattered over top of sparsely regenerated stand of LP, DF, and AF. Some DMT in overstory WL. Low fuel load. WUI. | Broadcast burn. Fill Plant where needed. | Reduce fuel load, stimulate aspen regeneration, and prepare site for planting. Restock site with long-lived seral species – WL and WPBR-resistant WP. Maintain healthy overstory WL for structural diversity. | | QA, Sh | WP | SCO |
| 243 | 15 | 38 | Scattered WL, PP, and DF over sparsely regenerated stand of LP, DF, and WL. RR affecting DF. Low fuel load. WUI. | Broadcast burn. Fill Plant where needed. | Reduce fuel load, stimulate aspen regeneration, and prepare site for planting. Restock site with long-lived seral species – WL, PP, and/or WPBR-resistant WP. Maintain healthy overstory for structural diversity. | | QA, Sh | WP | SCO |

**TABLE A- 1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 3.**

| UNIT | ALT. 3 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | IMPROVE FISH & WILDLIFE HABITAT | IMPROVE FOREST HEALTH | BENEFIT LOCAL ECONOMY |
| 244 | 15 | 58 | Scattered WL and DF over sparsely regenerated stand of predominately LP with minor amounts of DF, AF, ES, and WL. Low fuel load. WUI. | Broadcast burn. Fill Plant where needed. | Reduce fuel load, stimulate aspen regeneration, and prepare site for planting. Restock site with long-lived seral species – WL, PP, and/or WPBR-resistant WP. Maintain healthy overstory for structural diversity. | | QA, Sh | WP | SCO |
| 245 | 11C | 33 | Scattered WL and LP over dense regeneration of LP and WL. High fuel load. WUI. | Pre-commercial thin via ground-based, mechanized equipment, throughout unit. Mechanical slash treatment. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Favor WL for retention. Reduce ladder fuels and fuel load. | W | | M | B, SCO |
| 251 | 15 | 37 | Few widely scattered WL over predominately LP regeneration with minor amounts of WL, WP, DF, and AF. Some DMT in overstory WL. Fuel load is low. Jocko Trail along west boundary. | Pre-commercial thin via ground-based, mechanized equipment, throughout unit. Mechanical slash treatment. | Reduce stocking density to improve health and vigor of overall stand making it more resilient to MPB. Favor healthly WL and WP for retention. Reduce ladder fuels and fuel load. | | | M | B, SCO |
| 252 | 15 | 29 | Mixed-conifer dominated by LP with WL and DF (minor component of ES and AF, as well). There is a large tree component of widely scattered WL. Evidence of older MPB attacks. Fuel load is low to medium. Jocko Trail along west side. Crystal Lake Trail in south end of unit. | Improvement cut, via ground-based, mechanized equipment, thinning throughout unit. WTY/pile. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor WL and DF for retention. Reduce ladder fuels and fuel load. | | SE | LT, M | C |

**TABLE A- 1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 3.**

| UNIT | ALT. 3 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | IMPROVE FISH & WILDLIFE HABITAT | IMPROVE FOREST HEALTH | BENEFIT LOCAL ECONOMY |
| 254 | 11C | 25 | Mixed-conifer dominated by LP with WL and DF (minor component of ES and AF, as well). There is a large tree component of widely scattered WL. Evidence of older MPB attacks. Fuel load is low to medium. Jocko Trail along west side. Crystal Lake Trail in south end of unit. | Improvement cut, via ground-based, mechanized equipment, thinning throughout unit. WTY/pile. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor WL and DF for retention. Reduce ladder fuels and fuel load. | | SE | LT, M | C |
| 262 | 11C | 20 | Mixed-conifer stand of dense LP, ES, AF, and WbP. | Stand improvement – daylighting by hand around healthy WbP. Lop and scatter. | Release WbP from competition and improve microclimate around WbP to discourage MPB. Unit above 5500 ft. elevation | | | M, WbP | SCO |
| 264 | 11C | 32 | Mixed-conifer stand of LP, DF, WL, ES, AF, and WbP. MPB killed most of the LP a few years ago. Low fuel loading. | Improvement cut by hand, mainly pre-commercial thinning throughout unit. Lop and scatter. | Reduce stocking density to improve health and vigor of overall stand, especially for WbP, making it more resilient to MPB. Favor WbP, WL, and DF for retention. Reduce ladder fuels and fuel load. Unit above 5500 ft. elevation | | SE | M, WbP | SCO |
| 265 | 11C | 20 | Mixed-conifer stand of dense AF, LP, ES, DF, WL, and WbP. MPB has attacked LP. Low fuel loading. | Stand improvement – daylighting around WbP, via ground-based mechanical equipment. Mechanical slash treatment. | Release WbP from competition to improve health and vigor and improve microclimate around WbP to discourage MPB. Unit above 5500 ft. elevation | | | M, WbP | B, SCO |

**TABLE A- 1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 3.**

| Unit | Alt. 3 Proposed MA | Acres | Existing Condition | Proposed Treatment | Objectives | Purpose and Need | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Reduce Risk of Uncharac-teristic Wildfire | Improve Fish & Wildlife Habitat | Improve Forest Health | Benefit Local Economy |
| 266 | 11C | 18 | Mixed-conifer stand of dense AF, LP, ES, and DF. Fuel load is low, but lots of ladder fuels. | Regeneration – group selection cut via ground-based mechanical equipment. Approximately 20% of unit will be nutcracker openings with the remaining matrix (~80%) being thinned. Mechanical/pile. | Provide openings for the regeneration of white pine blister rust-resistant WbP. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor healthy LP and WL for retention, while targeting AF for removal. Reduce ladder fuels and fuel load. Promote shrub and huckleberry production. Unit above 5500 ft. elevation | | Sh | M, R, WbP | B, C, SCO |
| 267 | 1 | 19 | Mixed-conifer stand of dense AF, WL, ES, DF, MH and WbP. WPBR and MPB affecting WbP. Fuel load is moderate, but lots of ladder fuels. | Stand improvement – daylighting around WbP by hand. Lop and scatter. | Release WbP from competition to improve health and vigor and improve microclimate around WbP to discourage MPB. Unit above 5500 ft. elevation | | | M, WbP | SCO |
| 268 | 11C | 20 | Mixed-conifer stand of dense AF, ES, WL, MH and WbP. WPBR and MPB affecting WbP. Fuel load is moderate. | Improvement cut by hand, thinning throughout unit, mainly daylighting around WbP. Lop and scatter. Spot plant WbP. | Release WbP from competition to improve health and vigor and improve microclimate around WbP to discourage MPB. Restock holes with WPBR-resistant WbP. Unit above 5500 ft. elevation | | SE | M, WbP | SCO |
| 269 | 11C | 11 | Mixed-conifer stand of dense AF, WL, ES, DF, LP, MH, and WbP. WPBR and MPB affecting LP and WbP. Fuel load is low, but lots of ladder fuels. | Stand improvement – daylighting around WbP by hand. Lop and scatter. | Release WbP from competition to improve health and vigor and improve microclimate around WbP to discourage MPB. Unit above 5500 ft. elevation | | | M, WbP | SCO |
| 270 | 11C | 25 | Previous clearcut with sparse regeneration, mainly AF. Low fuel load. | Fill plant where needed with WPBR-resistant WbP. | Fill plant with WPBR-resistant WbP to keep the species on the landscape. Unit above 5500 ft. elevation | | | WbP | SCO |
| 271 | 11C | 39 | Previous regeneration cut with sparse regeneration, mainly AF. Low fuel load. | Fill plant where needed with WPBR-resistant WbP. | Fill plant with WPBR-resistant WbP to keep the species on the landscape. Unit above 5500 ft. elevation | | | WbP | SCO |

**TABLE A- 1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 3.**

| UNIT | ALT. 3 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED: REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | IMPROVE FISH & WILDLIFE HABITAT | IMPROVE FOREST HEALTH | BENEFIT LOCAL ECONOMY |
|---|---|---|---|---|---|---|---|---|---|
| 272 | 11C | 103 | Previous regeneration cut with sparse regeneration, mainly AF. Low fuel load. | Fill plant where needed with WPBR-resistant WbP. | Fill plant with WPBR-resistant WbP to keep the species on the landscape. Unit above 5500 ft. elevation | | | WbP | SCO |
| 300 | 11C | 233 | Adjacent to private property. WUI | Broadcast Rx burn by hand/helicopter. | Reduce fuels near and adjacent to private land and residences within the WUI. Using fire for ecological restoration and to modify fire behavior. Modifying fire behavior by promoting fire-resistant stands appropriate to the fire regimes found in the Beaver Creek Project Area. Stimulate aspen regeneration and promote shrub and huckleberry production. | BB, W | QA, Sh | | |
| 308 | 22, 2, 15 | 520 | Wilderness | Broadcast Rx burn by helicopter. | Use prescribed fire as a tool to mitigate potential threats of natural fire originating in the Mission Mountains Wilderness affecting resources outside the wilderness in areas where natural fires cannot be allowed to burn due to fuel conditions. | BB | | | |
| 309 | 22, 15 | 584 | Wilderness | Broadcast Rx burn by helicopter. | Use prescribed fire as a tool to mitigate potential threats of natural fire originating in the Mission Mountains Wilderness affecting resources outside the wilderness in areas where natural fires cannot be allowed to burn due to fuel conditions. | BB | | | |

**TABLE A- 1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 3.**

| UNIT | ALT. 3 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED: REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | PURPOSE AND NEED: IMPROVE FISH & WILDLIFE HABITAT | PURPOSE AND NEED: IMPROVE FOREST HEALTH | PURPOSE AND NEED: BENEFIT LOCAL ECONOMY |
|---|---|---|---|---|---|---|---|---|---|
| 313 | 15 | 125 | Adjacent to private property. WUI | Broadcast Rx burn by hand/helicopter. | Reduce fuels near and adjacent to private land and residences within the WUI. Using fire for ecological restoration and to modify fire behavior. Modifying fire behavior by promoting fire-resistant stands appropriate to the fire regimes found in the Beaver Creek Project Area. Stimulate aspen regeneration and promote shrub and huckleberry production. | BB, W | QA, Sh | | |
| 314 | 15 | 180 | WUI | Broadcast Rx burn by hand/helicopter | Reduce fuels near and adjacent to private land and residences within the WUI. Using fire for ecological restoration and to modify fire behavior. Modifying fire behavior by promoting fire-resistant stands appropriate to the fire regimes found in the Beaver Creek Project Area. Stimulate aspen regeneration and promote shrub and huckleberry production. | BB, W | QA, Sh | | |
| 460 | 11C | 1 | Two-storied stand of predominantly LP with WL and ES. Understory of ES, AF, and GF. Old to recent MPB in LP. Fuel loading moderate. WUI. In RHCA, but above the road. | Commercial thin via ground-based, mechanized equipment, thinning throughout stand. WTY. | Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor WL for retention. Reduce ladder fuels and fuel load | W | SE | M | C |
| 491 | 11C | 4 | Mixed-conifer stand dominated by DF, LP and WL with shade-tolerant species coming in from below. Few large diameter WL. Some DMT in DF and WL. Low fuel load on the ground, but ladder fuels present. In RHCA, but above the road. | Commercial thin via skyline equipment, thinning throughout unit. Daylight around large tree component – WL. WTY. | Maintain large tree component. Reduce stocking density to improve health and vigor of overall stand, making it more resilient to MPB. Favor WL for retention. Reduce ladder fuels and fuel load | | SE | LT, M | C |

**TABLE A- 1. VEGETATION RESTORATION TREATMENT SUMMARY FOR ALTERNATIVE 3.**

| UNIT | ALT. 3 PROPOSED MA | ACRES | EXISTING CONDITION | PROPOSED TREATMENT | OBJECTIVES | PURPOSE AND NEED | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | REDUCE RISK OF UNCHARAC-TERISTIC WILDFIRE | IMPROVE FISH & WILDLIFE HABITAT | IMPROVE FOREST HEALTH | BENEFIT LOCAL ECONOMY |
| 4222 | 11C | 1 | Old PCTC landing with sparse vegetation. Within HOAQ buffer, but across the road from the pond. WUI. | Fill plant by hand with WL, WPBR-resistant WP, and PP. | Restore the site by re-establishing long-lived seral species. | | | WP | SCO |

# APPENDIX B
# MONITORING PLAN

## INTRODUCTION

The following monitoring matrix describes monitoring associated with the Beaver Creek Landscape Restoration Project and summarizes the purpose, methods, and expected results and uses of the proposed monitoring activities. The Forest Service is currently seeking opportunities for multi-party monitoring of post treatment conditions.

**TABLE B-1. SUMMARY OF MONITORING ACTIVITIES FOR THE SELECTED ALTERNATIVE.**

| WHAT | WHERE | WHEN/DURATION | WHY | WHO | EXPECTED RESULTS AND USE |
|---|---|---|---|---|---|
| **WILDLIFE** | | | | | |
| Monitor temporary road rehabilitation and potential post sale use of temporary roads and skid trails by the public. | Units | Post Sale | To determine if roads and skid trails are left in an adequate condition and to see if they are receiving post sale use. | Wildlife Biologist | Determine if temporary road closure expectations are correct. |
| Decommissioned and stored road activities will be monitored to evaluate when conditions meet the “reclaimed” road definition in Appendix D of Forest Plan Amendment 19. | Decommissioned and stored roads | Post Sale | To evaluate when conditions meet the “reclaimed” road definition in Appendix D of Forest Plan Amendment 19 | Wildlife Biologist | To determine if decommissioned and stored road activities meet the “reclaimed” road definition in Appendix D of Forest Plan Amendment 19. |
| **INVASIVE PLANTS** | | | | | |
| Monitor the contracted spraying along roads after spraying is completed. | Roads in project area with identified infestations that can be treated with motorized access. | Post Sale | To ensure proper spraying techniques and compliance with the NIWC DN. | COR or Forest Weed Coordinator | Monitor for noxious weed acres of infestation, effectiveness of control, containment, and prevention measures, and spread and existence of new populations of noxious weeds. |
| Temporary and decommissioned road rehabilitation monitoring. | All temporary and decommissioned road templates with rehabilitation measures. | First, third and fifth year after harvest. | To determine the effectiveness of rehabilitation measures on the prevention of invasive plant spread and the effectiveness of revegetation by native | Forest Botanist, Forest Weed Coordinator, or COR | Substantial prevention of weed spread and revegetation of sites dependent on type of rehab methods, such as recontouring vs seeding only, and to determine which methods will be brought forward in other |

**TABLE B-1. SUMMARY OF MONITORING ACTIVITIES FOR THE SELECTED ALTERNATIVE.**

| WHAT | WHERE | WHEN/DURATION | WHY | WHO | EXPECTED RESULTS AND USE |
|---|---|---|---|---|---|
| | | | plants and seeded grasses/forbs. | | projects. |
| **FIRE/FUELS** | | | | | |
| Monitor fire behavior | Broadcast burn units | During burn implementation | Determine if Silviculture prescriptions are being met | FMO, AFMO, Burn Boss or designated representative | Assure results meet project and silviculture objectives. |
| **FOREST ROADS** | | | | | |
| Monitor and oversee temporary road construction. | Temporary roads | Throughout duration of project implementation. | Insure road construction activities comply with contract specifications. | Contracting Officer, Forest Service Representative, and Timber Sale Administrator | Routinely determine compliance with contract specifications. |
| **SOILS** | | | | | |
| Monitor soil moisture conditions prior to allowing equipment to begin operations in summer | Units | Prior to equipment moving on-site. | Ensure soil moisture conditions are adequate. | SA | Monitoring will be documented in the Timber Sale Daily Report. |
| Monitor all units during management activities. | Units | Throughout duration of project implementation. | Ensure compliance with Region 1 Soil Quality Standards | SA | Assure compliance with Region 1 Soil Quality Standards |
| Post implementation monitoring of harvest units | Randomly Selected Harvest Units | Post-Sale | To assure that skid trails meet specified spacing requirements and that operating conditions are adequate to minimize effects to the soil resource | Soil Scientist | Assure compliance with Region 1 Soil Quality Standards |
| **FOREST VEGETATION** | | | | | |
| Review and Document tree marking and prescription compliance. | All or a sample of treatment units | During Sale Preparation | Ensure compliance with NEPA and FS policy | Silviculturist | Assure project implementation complies with the NEPA decision |
| Develop NEPA to Implementation crosswalk. | SLRD | Prior to contract development | Ensure layout complies with NEPA decision | Presale Forester | Assure layout complies with NEPA decision |
| Review contract prior to advertisement. | SLRD | Prior to contract advertisement | Ensure contract complies with NEPA decision | TMO, Presale Forester, IDT members, Line Officer, Contracting Officer, TSA, ER | Assure project implementation complies with the NEPA decision |
| Monitor and oversee vegetation treatments. | All treatment units | Throughout project implementation | Ensure treatment activities comply with contract specifications | CO, FSR, TSA, HI, and Silviculturist | Assure compliance with contract specifications. |

| Table B-1. Summary of Monitoring Activities for the Selected Alternative. | | | | | |
|---|---|---|---|---|---|
| **What** | **Where** | **When/Duration** | **Why** | **Who** | **Expected Results and Use** |
| Conduct post treatment surveys to monitor changes in forest structure, composition, and insect and disease conditions and to determine in the silvicultural prescription was met. | All treatment units | Immediately following treatment and periodically thereafter as specified in the silvicultural prescription | Determine how well objectives were met and gather data needed to assess possible follow-up treatments | Silviculturist, Culturist, or designated Representative | Determine the effectiveness of treatments, the need to conduct follow-up treatments, and to make future treatment decisions. |
| Conduct reforestation surveys to determine regeneration success and needs. | All regeneration units | First, third, and fifth year after harvest | Determine regeneration success and needs | Silviculturist, Culturist, or designated Representative | Assure adequate stocking of desired species occurs. |
| **Aquatics** | | | | | |
| Field inspect one potentially vulnerable wetland in burning Unit 300 | Wetland in Unit 300 | One year following project implementation | Assess if cattle are impacting wetland | Fisheries Biologist | Determine if mitigation is needed, e.g., a plan or fence, need to be developed to restrict cattle access to the area. |
| Establish Treatment and Control photo plots in RHCAs around wetlands | Photo plots in wetland RHCA proposed for treatment and not proposed for treatment. | Before implementation and 1, 2 and 5 years after implementation | Evaluate effectiveness of treatments in wetland RHCAs and identify any potential unforeseen effects. | Fisheries Biologist, Wildlife Biologist | Use monitoring photos to better evaluate potential effects in Wetland RHCAs in future projects. |
| Monitor cutthroat trout population health after installing a barrier | Sunset Creek, upstream of barrier | 5 and 10 years after implementation (first and second population generation) | Evaluate effectiveness of fish barrier to maintain genetic purity and block brook trout | Fisheries Biologist | Determine effectiveness of fish barrier and evaluate potential for other, similar projects in the future. |

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# APPENDIX C
# BEST MANAGEMENT PRACTICES

## INTRODUCTION

Federal agency compliance with pollution control is addressed through Section 313 of the Clean Water Act, EO 12580 (January 23, 1987), National Nonpoint Source Policy (December 12, 1984), USDA Nonpoint Source Water Quality Policy (December 5, 1986) and the EPA in their guidance "Nonpoint Source Controls and Water Quality Standards" (August 19, 1987). In order to comply with State and local non-point pollution controls, the Forest Service will apply BMPs to all possible non-point sources resulting from management activities proposed in this EA. These BMPs are the Soil and Water Conservation Practices described in the FSH 2509.22.

Best Management Practices are the primary mechanism for achievement of water quality standards (EPA 1987). This appendix describes the Forest Service's BMP process in detail, and lists the key Soil and Water Conservation Practices that have been selected to be used in the action alternatives analyzed in this EA.

Best Management Practices include, but are not limited to, structural, and non-structural controls, operations, and maintenance procedures. Best Management Practices can be applied before, during, or after pollution-producing activities to reduce or eliminate the introduction of pollutants into the receiving watershed (40 CFR 130.2, EPA Water Quality Standards Regulation). Best Management Practices are usually applied as a system of practices rather than a single practice. They are selected based on site-specific conditions that reflect natural background conditions and political, social, economic, and technical feasibility.

The Flathead National Forest emphasizes the application of BMPs "to protect or improve the quality of the water resource" (Forest Plan, page II-40). Practices compiled from the Flathead Drainage 208 Project (May 1980), Flathead National Forest Hydrologic Guidelines (1980), and other sources are listed in the Water and Soils Sections of Chapter II, Forest-Wide Standards portion of the Flathead Forest Plan (pp. II-40 through II-46). Additional BMPs are listed with the descriptions of individual management areas and in Appendix Q, Landtype Guidelines (pp. Q-1 through Q-9). The Water Standards Section further states: "Water quality limits listed in the State Water Quality Standards are coordinated with BMPs" (p. II-40).

Road Maintenance Associated with the Beaver Creek Landscape Restoration Project

Best Management Practices (BMPs) would be applied on **49.7 miles** of haul routes prior to the beginning of salvage logging activities. Completion of BMPs would be required the first season during dry operating conditions. All BMPs required under the Timber Sale Contract would be met following completion of sale activities.

As summarized in the following table, road maintenance (application BMPs) would occur on specified road used for haul of commercial products.

**Table C - 1. Road Maintenance Associated with the Beaver Creek Landscape Restoration Project.**

| Road Number | Miles |
|---|---|
| 646 | 0.600 |
| 906 | 6.816 |
| 9557 | 1.350 |
| 9558 | 0.115 |
| 9563 | 2.150 |
| 9570 | 5.060 |
| 9651 | 1.060 |
| 9652 | 0.621 |
| 9653 | 3.572 |
| 9654 | 3.300 |
| 9656 | 1.268 |
| 9658 | 3.820 |
| 10752 | 0.176 |
| 10574 | 0.710 |
| 10577 | 0.202 |
| 10589 | 1.337 |
| 10590 | 0.900 |
| 10592 | 0.840 |
| 10593 | 2.050 |

**Table C - 1. Road Maintenance Associated with the Beaver Creek Landscape Restoration Project.**

| Road Number | Miles |
|---|---|
| 10735 | 2.650 |
| 10737 | 1.371 |
| 10739 | 0.800 |
| 10742 | 0.587 |
| 11636 | 1.900 |
| 11646 | 0.250 |
| 11647 | 0.740 |
| 90257 | 0.623 |
| 90261 | 0.276 |
| 90262 | 0.321 |
| 90272 | 0.460 |
| 91201 | 0.299 |
| 91202 | 1.030 |
| 91203 | 1.558 |
| 91222 | 0.050 |
| 9557Z | 0.020 |
| 9658B | 0.580 |
| 9658C | 0.270 |
| Total | 49.69 |

# State Requirements for Protection of Water Quality

Montana State Water Quality Standards require the use of reasonable land, soil, and water conservation practices (similar to BMPs) as the controlling mechanism for non-point pollution. The use of BMPs is also required in the MOU between the Forest Service and the State of Montana as part of the agency's responsibility as the designated water quality management agency on NFS lands.

# Best Management Practices Implementation Process

In cooperation with the State, the Forest Service's primary strategy for the control of non-point sources of pollution is based on the implementation of preventive practices (i.e., BMPs). The BMPs have been designed and selected to protect the identified beneficial uses of the watershed.

The Forest Service non-point source management system consists of the following steps:

## Best Management Practice Selection and Design

Water quality goals are identified in the Forest Plan. These goals meet or exceed applicable legal requirements including State water quality regulations, the Clean Water Act, and the NEPA. Environmental assessments for projects are tiered to Forest Plans using the NEPA process. The appropriate BMPs are selected for each project by an ID Team. In each new location, there is flexibility to design different BMPs depending on local conditions and values and downstream beneficial uses of water. The BMP selection and design are dictated by the proposed activity, water quality objectives, soils, topography, geology, vegetation, and climate. Environmental impacts and water quality protection options are evaluated, and alternative mixes of practices are considered. A final collection of practices is selected that not only protect water quality, but also meet other resource needs. These final selected practices constitute the BMPs for the project.

## BMP Application

The BMPs are translated into contract provisions, special use permit requirements, project plan specifications, and so forth. This ensures that the operator or person responsible for applying the BMPs actually is required to do so. Site-specific BMP prescriptions are taken from plan-to-ground by a combination of project layout and Resource Specialists (hydrology, fisheries, soils, etc.). This is when final adjustments to fit BMP prescriptions to the site are made.

## BMP Monitoring

When the resource activity begins (e.g., timber harvest or road building), Timber Sale Administrators, Engineering Representatives, Resource Specialists, and others ensure the BMPs are implemented according to plan. Best Management Practices implementation monitoring is done before, during, and after resource activity implementation. This monitoring answers the question: Did we do what we said we were going to do? Once BMPs have been implemented, further monitoring is done to evaluate if the BMPs are effective in meeting management objectives and protecting beneficial uses. If monitoring indicates that water quality standards are not being met or beneficial uses are not being protected, corrective action will consider the following:

1. Is the BMP technically sound? Is it really best or is there a better practice that is technically sound and feasible to implement?
2. Was the BMP applied entirely as designated? Was it only partially implemented? Were personnel, equipment, funds, or training lacking which resulted in inadequate or incomplete implementation?
3. Do the parameters and criteria that constitute water quality standards adequately reflect human-induced changes to water quality and beneficial uses?

## Feedback

Feedback on the results of BMP evaluation is both short and long term in nature. Where corrective action is needed, immediate response will be undertaken. This action may include modification of the BMP, modification of the activity, ceasing the activity, or possibly modification of the State Water Quality Standard. Cumulative effects over the long term may also lead to the need for possible corrective actions. Effectiveness of BMPs is based on audit results. Audit results specific to the Swan Lake Ranger District of the Flathead National Forest are on file at the District Office.

# Best Management Practices Effectiveness

In looking at the effectiveness of BMPs for the Flathead National Forest, it is reasonable to group BMP audit results for the Kootenai and Flathead National Forests together since they have similar soils. Both Forests are dominated by soils formed in the glacial till formed in material weathered from Belt rocks. This material is topped with windblown volcanic ash from west coast eruptions up to 6,000 years ago.

Best Management Practice audits have occurred on the Flathead and Kootenai National Forests since 1988. Audits are done to determine if BMPs were properly applied and, if so, if they were effective at maintaining soil and water quality. Since 1988, individual BMPs have been audited or monitored 2,232 times on the Flathead and Kootenai National Forests. They were effective 2,211 times.

In order to analyze the results of the BMP audits, they were grouped according to the soil type on which they occurred. The simplest way is to group them by two classes:

1. Residual soils that formed from the underlying bedrock, or
2. Soils formed from glacial till.

Looking at these soil criteria, BMPs were effective when properly applied on glacial soils 1,585 times out of 1,596 applications. Best Management Practices were effective when properly applied on residual soils 154 out of 156 applications. An additional 480 BMPs were monitored without reference to the soil types on which they are applied. Of these, 472 were effective at protecting soil and water quality.

In summary, BMPs were effective 99.3 percent of the time they were properly applied on glacial till soils. Lumping the entire audit results together regardless of their soil types and including the earliest audits that were not specific to soil type, BMPs were effective 99 percent of the time that they were properly applied on the Flathead and Kootenai National Forests.

# ITEMS COMMON TO ALL SOIL AND WATER CONSERVATION PRACTICES

## RESPONSIBILITY FOR IMPLEMENTATION

The Swan Lake District Ranger is responsible for ensuring that all applicable SWCPs are applied and implemented. The Timber Management Assistant is responsible for ensuring that the objectives of the SWCPs identified in this appendix are incorporated into the Timber Sale Contract by use of the appropriate Timber Sale Contract CT provisions. The Timber Sale Administrator and Engineering Representative/Contracting Officer's Representative is responsible for ensuring that contract provisions are properly administered on the ground.

## MONITORING

The Timber Sale Administrator, Engineering Representative/Contracting Officer's Representative, Forest Soil Scientist, and Forest Hydrologist, as needed, will monitor the effectiveness of the applied SWCPs. If the practice is not effective in meeting State or Forest Plan Standards, the practice or project activity will be redesigned, rescheduled, or dropped. Feedback of the results of the site-specific SWCP monitoring to the Forest Soil Scientist will ensure that the best practices are incorporated into all projects impacting water quality. This requirement conforms to the objectives of Practice 11.02 - Soil and Water Resource Monitoring and Evaluation.

# SITE-SPECIFIC BEST MANAGEMENT PRACTICES

Description of the soil and water conservation practices from the Forest Service Soil and Water Conservation Handbook (FSH 2509.22) will be applied in all alternatives. The location where the practices will be applied is specified in the table below. For a more detailed description of a specific BMP refer to the Soil and Water Conservation Handbook.

Abbreviations used in this table:

**ABBREVIATION/COMPLETE PHRASE**

CO – Contracting Officer
COR = Contracting Officer's Representative
EA = Environmental Assessment
ER = Engineering Representative
FMO = Fire Management Officer
FNF = Flathead National Forest
IDT = Interdisciplinary Team
INFISH = Inland Native Fish Strategy

**ABBREVIATION/COMPLETE PHRASE**

PSF = Pre Sale Forester
RHCA = Riparian Habitat Conservation Area
SAM = Sale Area Map
SMZ = Streamside Management Zone
SPS = Special Project Specification
SWCP = Soil and Water Conservation Practice
TSA = Timber Sale Administrator
TSC = Timber Sale Contract

**TABLE C - 2. SITE SPECIFIC BEST MANAGEMENT PRACTICES.**

| SWCP | MT BMP | SWCP OBJECTIVE | APPLICABLE UNITS/ROADS | RECOMMENDED BMPS BY IDT/TSA | CONSIDERATIONS FOR BMPS | PERSON(S) RESPONSIBLE | STANDARD CONTRACT PROVISIONS | STEWARDSHIP CONTRACT PROVISIONS |
|---|---|---|---|---|---|---|---|---|
| 14.01 | IV. A-C | TIMBER SALE PLANNING - To incorporate soil and water resource considerations into Timber Sale Planning | All Activities | 1. Unit design, mitigation, and effects analysis was done by IDT.<br>2. TSC will be prepared by PSF that will include management constraints and Design Criteria from EA.<br>3. Use standard interim RHCA widths unless modified through watershed analysis.<br>4. Use exiting skid trails where feasible. | IDT has evaluated watershed characteristics and estimated response to proposed activities. The EA identifies Design Criteria to protect soil and water resources. Timber sale contracts will include provisions to meet water quality, soils, and other resources as directed by the Decision. | IDT, PSF | N/A | N/A |
| 14.02 | IV. A | TIMBER HARVEST UNIT DESIGN - To insure that timber harvest unit design | All Activities | 1. Cumulative effects analysis and unit design were performed by the | Proposed activities were evaluated to estimate the potential watershed response. Prescriptions will be designed | IDT | N/A | N/A |

**TABLE C - 2. SITE SPECIFIC BEST MANAGEMENT PRACTICES.**

| SWCP | MT BMP | SWCP OBJECTIVE | APPLICABLE UNITS/ROADS | RECOMMENDED BMPS BY IDT/TSA | CONSIDERATIONS FOR BMPS | PERSON(S) RESPONSIBLE | STANDARD CONTRACT PROVISIONS | STEWARDSHIP CONTRACT PROVISIONS |
|---|---|---|---|---|---|---|---|---|
| | | will secure favorable conditions of water flow, maintain water quality and soil productivity, and reduce soil erosion and sedimentation. | | IDT.<br>2. The prescriptions and unit design are consistent with direction outlined in the considerations for BMPs.<br>3. Use standard interim RHCA widths unless modified through watershed analysis.<br>4. Use exiting skid trails where feasible. | to assure an acceptable level of protection for soil and water resources. Management will protect soil/water values by avoiding sensitive areas, adjusting unit boundaries, adding specific BMPs to meet specific SWCPs, applying mitigation, and applying implementation/effectiveness monitoring. | | | |
| 14.03 | N/A | USE OF SALE AREA MAPS (SAMs) FOR DESIGNATING SOIL AND WATER PROTECTION NEEDS - To delineate the location of protected areas and available water sources and insure their recognition, proper consideration, and protection on the ground. | All Activities | 1. Water courses identified and protected using SMZ buffers as a minimum.<br>2. Skidding on soil when moisture is <18%.<br>3. Use designated skid trails agreed to by TSA.<br>4. Use standard interim RHCA widths unless modified through watershed analysis. | The IDT will identify water courses to be protected, unit boundaries, and other features. Ground verification and preparation of SAMs to be included in TSC will be done by PSF. TSA reviews areas of concern with purchaser before operations. | IDT, PSF, TSA | B(T)1.1<br>B(T)6.5<br>C(T)6.50#<br>C(T)6.4# | B.1<br>G.5<br>K-G.5.0#<br>K-G.4# |
| 14.04 | IV. A-2, B-1,2<br>VI. A | LIMITING THE OPERATION PERIOD OF TIMBER SALE ACTIVITIES - To minimize soil erosion, sedimentation, and a loss in soil productivity by insuring that the purchaser conducts his/her operations in a timely manner. | All Activities | 1. Units located on soils sensitive to compaction and/or displacement have been identified.<br>2. Designate units needing harvest on frozen or snow-covered ground.<br>3. All other ground disturbing activities will occur during dry, frozen, or snow-covered conditions.<br>4. Be prepared to suspend operations if | If limited operating periods are identified and recommended during the analysis by the IDT, the PSF will prepare a contract that includes appropriate provisions. | IDT, PSF, TSA | B(T)6.31<br>B(T)6.311<br>B(T)6.6<br>C(T)6.6<br>C(T)6.316#<br>C(T)6.4# | G.3.1<br>G.3.1.1<br>G.6<br>K-G.6<br>K-G.3.1.6#<br>K-G.4# |

**TABLE C - 2. SITE SPECIFIC BEST MANAGEMENT PRACTICES.**

| SWCP | MT BMP | SWCP OBJECTIVE | APPLICABLE UNITS/ROADS | RECOMMENDED BMPS BY IDT/TSA | CONSIDERATIONS FOR BMPS | PERSON(S) RESPONSIBLE | STANDARD CONTRACT PROVISIONS | STEWARDSHIP CONTRACT PROVISIONS |
|---|---|---|---|---|---|---|---|---|
| | | | | conditions change rapidly and when the erosion hazard becomes high.<br>5. Consult with operators experienced with winter logging techniques.<br>6. In wet unfrozen soil areas, use tractors or skidders to compact the snow for skid road locations only when adequate snow depth exists. Avoid steeper areas where frozen skid trails may be subject to erosion next spring. | | | | |
| 14.05 | IV. A-B, III A-2-4 | PROTECTION OF UNSTABLE AREAS - To protect unstable areas and avoid triggering mass movements of the soil mantle and resultant erosion and sedimentation. | All Activities | 1. Unstable landtypes will be identified during the planning process.<br>2. Units found to need further protection will use alternative yarding techniques, seasonal restrictions, and/or unit boundary adjustments. | If the NEPA analysis concluded that soils/geology in the area were unstable, BMPs would be designed to prevent irreversible soil and water effects. | IDT, PSF, TSA | C(T)6.316#<br>C(T)6.4# | K-G.3.1.6#<br>K-G.4# |
| 14.06 | II | RIPARIAN AREA DESIGNATION - To minimize the adverse effects on riparian areas with prescriptions that manage nearby logging and related land disturbance activities. | All Activities | 1. Identify areas with or adjacent to wet areas.<br>2. Default RHCA widths will be adhered to unless modified through watershed analysis. SMZ widths will be used as a minimum if modification is proposed.<br>4. Areas found during sale layout will be reported to the | All streams and wetlands in the project area will comply with the FNF Plan as amended by INFISH. The width of the riparian areas will be decided upon by the IDT. These widths will be included on the SAM, marked on the ground and included in the TSC. | IDT, PSF | B(T)1.1<br>B(T)6.5,<br>C(T)6.4#<br>C(T)6.41#<br>C(T)6.50# | B.1<br>G.5<br>K-G.4#<br>K-G.4.1#<br>K-G.5.0# |

| TABLE C - 2. SITE SPECIFIC BEST MANAGEMENT PRACTICES. | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| SWCP | MT BMP | SWCP OBJECTIVE | APPLICABLE UNITS/ROADS | RECOMMENDED BMPS BY IDT/TSA | CONSIDERATIONS FOR BMPS | PERSON(S) RESPONSIBLE | STANDARD CONTRACT PROVISIONS | STEWARDSHIP CONTRACT PROVISIONS |
| | | | | Hydrologist and afforded the same protections as those identified earlier. | | | | |
| 14.07 | IV. A-2, B-1 | DETERMINING TRACTOR-LOGGABLE GROUND - To protect water quality from degradation caused by tractor logging ground disturbance. | All Activities | 1. Tractor loggable units have been identified during the planning process.<br>2. Those areas found not to be tractor loggable were designated as alternative logging systems or were dropped form the unit. | IDT has identified tractor-loggable ground (in conjunction with personnel from timber operations) during transportation and timber sale planning process. The results have been used to determine intensity of and restrictions for land disturbance activities. TSC and SAM indicate areas and conditions under which tractors can operate. | IDT, PSF | B(T)1.1<br>B(T)6.42<br>C(T)6.4#<br>C(T)6.316# | B.1<br>G.4.2<br>K-G.4#<br>K-G.3.1.6# |
| 14.08 | IV. A-B | TRACTOR SKIDDING DESIGN - To minimize erosion and protect soil productivity by designing skidding patterns to best fit the terrain. | All Activities | 1. Identify units with designated or dispersed skid trails.<br>2. TSA and purchaser agree on proposed locations before operation. | IDT has identified sensitive areas during the planning process. The TSA will execute the plan on the ground by locating the skid trails with the timber purchaser or by agreeing to the purchaser's proposed locations prior to operation. | IDT; TSA | B(T)6.422<br>C(T)6.4# | G.4.2<br>K-G.4# |
| 14.09 | IV. A-2 | SUSPENDED LOG YARDING IN TIMBER HARVESTING - To protect the soil from excessive disturbance and accelerated erosion and maintain the integrity of the riparian areas and other sensitive areas. | Cable Logging Units | 1. Units that have slopes that are unsuitable for or sensitive to ground-base skidding will be identified.<br>2. Units with sustained slopes >35% will be designated cable harvest units. | IDT recognizes the hazards associated with operating on steep and/or rocky slopes. Areas found to be of concern will use appropriate harvest systems that provide for a safe work environment and protect natural resources. | IDT, PSF | B(T)6.42<br>C(T)6.4#<br>C(T)6.50# | G.4.2<br>K-G.4#<br>K-G.5.0# |
| 14.10 | IV. A-5,6 B-4 | LOG LANDING LOCATION AND DESIGN - To locate in such a way as to avoid soil erosion and water quality degradation. | All Activities | 1. TSA and purchaser agree on landing locations before operation.<br>2. Use minimum size and least excavation needed.<br>3. No side-cast material | The TSA must agree to landing locations proposed by the purchaser. Approved landing locations will meet the criteria of minimal size, least excavation needed, minimum skid roads necessary, no side-cast material into sensitive areas, and have proper drainage. | TSA | B(T)6.422<br>C(T)6.422 | G.4.2.2<br>K-G.4.2.2 |

**TABLE C - 2. SITE SPECIFIC BEST MANAGEMENT PRACTICES.**

| SWCP | MT BMP | SWCP OBJECTIVE | APPLICABLE UNITS/ROADS | RECOMMENDED BMPS BY IDT/TSA | CONSIDERATIONS FOR BMPS | PERSON(S) RESPONSIBLE | STANDARD CONTRACT PROVISIONS | STEWARDSHIP CONTRACT PROVISIONS |
|---|---|---|---|---|---|---|---|---|
| | | | | into sensitive areas or waterways.<br>4. Install proper drainage. | | | | |
| 14.11 | IV. A-5,6<br>B-4 | LOG LANDING EROSION PREVENTION AND CONTROL- To reduce erosion and subsequent sedimentation from log landing through the use of mitigating measures. | All Activities | 1. Proper drainage will be installed and maintained during operation.<br>2. Landings will be scarified, seeded, and fertilized upon completion of harvest activities.<br>3. TSA will assess conditions and take necessary steps to ensure soil and water protection. | PSF and TSA assess what is necessary to prevent erosion from landings and to ensure stabilization. It is up to the TSA to request technical assistance as needed. | PSF, TSA | B(T)6.6<br>B(T)6.64<br>C(T)6.6<br>C(T)6.632#<br>C(T)6.633# | G.6<br>G.6.4<br>K-G.6<br>K-G.6.3.2#<br>K-G.6.3.3# |
| 14.12 | IV.<br>A-C | EROSION PREVENTION AND CONTROL MEASURES DURING THE TIMBER SALE OPERATION - To ensure that the purchaser's operations shall be conducted reasonably to minimize soil erosion. | All Activities | 1. Designate units with seasonal restrictions.<br>2. Do not operate during wet periods including spring snowmelt and/or intense or long-duration rain storms.<br>3. TSA ensures that erosion control is kept current and prevents operation when excessive impacts are possible. | PSF and TSA sets purchaser's responsibility to prevent soil/water resource damage in TSC. TSA ensures that erosion control is kept current and prevents operation when excessive impacts are possible. | PSF, TSA | A16<br>B(T)6.6<br>B(T)6.64<br>C(T)6.6<br>C(T)6.601#<br>C(T)6.316# | A.16<br>G.6<br>G.6.4<br>K-G.6<br>K-G.6.6.1<br>K-G.3.1.6# |

**TABLE C - 2. SITE SPECIFIC BEST MANAGEMENT PRACTICES.**

| SWCP | MT BMP | SWCP OBJECTIVE | APPLICABLE UNITS/ROADS | RECOMMENDED BMPS BY IDT/TSA | CONSIDERATIONS FOR BMPS | PERSON(S) RESPONSIBLE | STANDARD CONTRACT PROVISIONS | STEWARDSHIP CONTRACT PROVISIONS |
|---|---|---|---|---|---|---|---|---|
| 14.13 | IV. B-5, 6 | SPECIAL EROSION PREVENTION MEASURES ON AREAS DISTURBED BY HARVEST ACTIVITIES - To prevent erosion and sedimentation on disturbed areas. | All Activities | 1. Waterbar, slash, seed, and/or fertilize skid trails and landings.<br>2. Rehabilitate constructed skid trails and temporary roads.<br>3. BMPs may be adjusted by the TSA to meet operational requirements. | IDT identifies locations needing special stabilization measures. If any such areas are identified, BMPs may be adjusted by the TSA to meet operational requirements. | IDT, TSA | C(T)6.601#<br>C(T)6.32#<br>C(T)6.633# | K-G.6.0.1#<br>K-G.6.3.2#<br>K-G.6.3.3# |
| 14.14 | IV. B-5 | REVEGETATION OF AREAS DISTURBED BY HARVEST ACTIVITIES - To establish a vegetative cover on disturbed areas to prevent erosion and sedimentation. | All Activities | 1. Seed and fertilize areas of exposed soil with FNF approved vegetative and fertilizer mix. | IDT has established vegetation and fertilizer mix to be used in the project area with outlines on the extent to which it should be used. TSA is responsible for seeing that revegetation work required by purchaser is done correctly and in a timely manner. The purchaser will be responsible for revegetation immediately after the completion of harvest. Funds will be collected for the District to do follow-up seeding/fertilizing in years 2 and 3 after harvest. | IDT, TSA | C(T)6.01#<br>C(T)6.633# | K-G.6.0.1#<br>K-G.6.3.3# |
| 14.15 | IV. A-4, 5<br>B- 5, 6 | EROSION CONTROL ON SKID TRAILS - To protect water quality by minimizing erosion and sedimentation derived from skid trails. | All Activities | 1. Ensure proper skid trail location.<br>2. Ensure proper drainage on skid trails.<br>3. Rehabilitate constructed skid trails and temporary roads.<br>4. Ensure maintenance of erosion control structures by purchaser. | Erosion control measures may be recommended by the IDT, but site specifically adjusted by the TSA. TSA will ensure erosion control measures are applied prior to expected hydrologic events (spring runoff, high-intensity storms, etc.). Maintenance of erosion control structures by the purchaser may be necessary and requested by the TSA. | TSA | B(T)6.6<br>B(T)6.65<br>B(T)6.66<br>C(T)6.6<br>C(T)6.633# | G.6<br>G.6.5<br>G.6.6<br>K-G.6<br>K-G.6.3.3# |
| 14.16 | IV. B-2 | WET MEADOW PROTECTION DURING TIMBER HARVESTING - To avoid damage to the ground cover, soil, and water in meadows. | All Activities | 1. Identify units with or adjacent to wet meadows.<br>2. Units with unmapped wet areas will be reported to Hydrologist and afforded the same protection as those | IDT has identified areas needing special protection. PSF will verify the areas needing protection and prepare the contract to prevent damage to meadows. TSA will be responsible for on-the-ground protection of meadows. If meadows are found by the TSA during operations, it is their responsibility to | IDT, PSF, TSA | B(T)1.1<br>B(T)6.422<br>B(T)6.61<br>C(T)6.4#<br>C(T)6.62# | B.1<br>G.4.2.2<br>G.6.1<br>K-G.4#<br>K-G.6.2# |

**TABLE C - 2. SITE SPECIFIC BEST MANAGEMENT PRACTICES.**

| SWCP | MT BMP | SWCP OBJECTIVE | APPLICABLE UNITS/ROADS | RECOMMENDED BMPS BY IDT/TSA | CONSIDERATIONS FOR BMPS | PERSON(S) RESPONSIBLE | STANDARD CONTRACT PROVISIONS | STEWARDSHIP CONTRACT PROVISIONS |
|---|---|---|---|---|---|---|---|---|
| | | | | identified during the planning process. 3. Standard interim RHCA widths will be adhered to unless modification is in place. 2. SMZ law will be met or exceeded. | either afford them the proper protection or pursue a contract modification. | | | |
| 14.17 | V. A-C | STREAM CHANNEL PROTECTION (IMPLEMENTATION AND ENFORCEMENT) - Protect natural stream flows; provide unobstructed passage of flows; reduce sediment input; and restore flow if diverted by timber sale activity. | All Activities | 1. Standard interim RHCA widths will be adhered to unless modification is in place. 2. SMZ widths will be used at a minimum if modification in place. 3. SMZ law will be met or exceeded. | IDT has identified the location of channels in the decision area. PSF will prepare a SAM locating the channels needing protection. Layout crew marks boundaries and trees according to HB-731 and FP guidelines. TSA will see that TSC items are carried out on the ground. Technical assistance will be consulted as needed. | IDT, PSF, TSA | B(T)1.1<br>B(T)6.5<br>B(T)6.6<br>C(T)6.50#<br>C(T)6.6 | B.1<br>G.5<br>G.6<br>K-G.5.0#<br>K-G.6 |
| 14.18 | IV. A-C | EROSION CONTROL STRUCTURE MAINTENANCE - To insure that constructed erosion control structures are stabilized and working effectively. | All Activities | 1. During the period of the TSC, the purchaser is responsible for maintaining their erosion control features. | During the period of the TSC, the purchaser is responsible for maintaining their erosion control features. If work is needed beyond this time, the District will pursue other sources of funding. | TSA | B(T)6.66<br>B(T)6.67 | G.6.6<br>G.6.7 |
| 14.19 | IV. A-C | ACCEPTANCE OF TIMBER SALE EROSION CONTROL MEASURES BEFORE SALE CLOSURE - To assure the adequacy of required erosion control work on timber sales. | All Activities | 1. TSA reviews erosion prevention work before each harvest unit is considered complete. 2. The inspection will determine if the work is acceptable and will meet the objective of the erosion control feature. | A careful review of erosion prevention work will be made by the TSA before each harvest unit is considered complete. The inspection will determine if the work is acceptable and will meet the objective of the erosion control feature. A feature is considered not acceptable if it does not meet standards or is not expected to protect soil/water values. Technical assistance will be used as necessary. | TSA | B(T)6.36 | G.3.6 |
| 14.20 | IV. C | SLASH TREATMENT IN SENSITIVE AREAS - To protect water quality by protecting sensitive | All Activities | 1. Where harvest is proposed within riparian areas, either slash should be removed with | All activities will comply with the FNF Plan as amended by INFISH. Where harvest within riparian areas is proposed, either the slash would be removed with | TSA, FMO | B(T)6.5<br>B(T)6.7<br>C(T)6.50#<br>C(T)6.7 | G.5<br>G.7<br>K-G.5.0#<br>K-G.7# |

**TABLE C - 2. SITE SPECIFIC BEST MANAGEMENT PRACTICES.**

| SWCP | MT BMP | SWCP OBJECTIVE | APPLICABLE UNITS/ROADS | RECOMMENDED BMPS BY IDT/TSA | CONSIDERATIONS FOR BMPS | PERSON(S) RESPONSIBLE | STANDARD CONTRACT PROVISIONS | STEWARDSHIP CONTRACT PROVISIONS |
|---|---|---|---|---|---|---|---|---|
| | | tributary areas from degradation that would result from using mechanized equipment for slash disposal. | | the tree or scattered and not treated.<br>2. Mechanical fuels treatments should not be used on sensitive land types. | the tree or scattered and not treated. | | C(T)6.71<br>C(T)6.753 | K-G.7.1<br>K-G.7.5.3 |
| 14.22 | N/A | MODIFICATION OF THE TSC - To modify the TSC if new circumstances or conditions indicate the timber sale will cause irreversible damage to soil, water, or watershed values. | All Activities | 1. Environmental modification procedure. | If TSC is not adequate to protect soil/water resources, the TSA and Contracting Officer are responsible for recommending modification of the TSC. | TSA | B(T)8.33 | i.3.3 |
| 15.01 | III. A-E | GENERAL GUIDELINES FOR TRANSPORTATION PLANNING - To introduce soil and water resource considerations into transportation planning. | All Roads | 1. Complete a roads analysis.<br>2. Transportation plans include installation and maintaining proper drainage. | The IDT has evaluated watershed characteristics and estimated the response of soil and water resources to proposed transportation alternatives and activities. | IDT, ER | N/A | |
| 15.02 | III. A-B | GENERAL GUIDELINES FOR THE LOCATION AND DESIGN OF ROADS AND TRAILS - To locate and design roads and trails with minimal soil and water impact while considering all Design Criteria. | New Road and Trail Construction | 1. Follow INFISH Standards and Guidelines for road management.<br>2. Identify sensitive land types, riparian areas, and wetlands during planning.<br>3. Use the minimum amount of roads and trails necessary. | The IDT has insured that the location and design of roads and trails are based on multiple resource objectives. Mitigation measures have been designed to protect the soil and water resources identified in the NEPA process. Contract provisions will be prepared by the ER that meets the soil and water resource protection requirements. | IDT, ER | | |
| 15.03 | III. A-E | ROAD AND TRAIL EROSION CONTROL PLAN - To prevent, limit, and mitigate erosion, sedimentation, and resulting water quality degradation prior to the initiation of construction by timely implementation of erosion control practices. | New Road and Trail Construction | 1. Seed and fertilize disturbed areas.<br>2. Install proper ditching and road slope.<br>3. Install proper drainage.<br>4. Incorporate road grade breaks.<br>5. Use minimum road or trail length/width | IDT has established soil/water conservation objectives and mitigation measures. ER will then prepare a contract that reflects the objectives. ER will see that erosion control measures are approved and completed in a timely manner. IDT reviews projects to check effectiveness of erosion control features. | IDT, ER | B(T)6.31<br>B(T)6.312<br>B(T)6.6<br>C(T)6.601# | G.3.1<br>G.3.1.2<br>G.6<br>K-G.6.0.1# |

**TABLE C - 2. SITE SPECIFIC BEST MANAGEMENT PRACTICES.**

| SWCP | MT BMP | SWCP OBJECTIVE | APPLICABLE UNITS/ROADS | RECOMMENDED BMPS BY IDT/TSA | CONSIDERATIONS FOR BMPS | PERSON(S) RESPONSIBLE | STANDARD CONTRACT PROVISIONS | STEWARDSHIP CONTRACT PROVISIONS |
|---|---|---|---|---|---|---|---|---|
| | | | | necessary.<br>6. Avoid wet areas or areas of sensitive soil types. | | | | |
| 15.04 | III. D-1, 4 | TIMING OF CONSTRUCTION ACTIVITIES - To minimize erosion by conducting operations during minimal runoff periods. | New Road and Trail Construction | Avoid construction during wet periods. | IDT has outlined detailed erosion control measures in NEPA process. ER puts these measures into contract provisions. Compliance is assured by Contracting Officer or ER. | IDT, ER | B(T)6.31<br>B(T)6.312<br>B(T)6.6<br>SPS 204 | G.3.1<br>G.3.1.2<br>G.6 |
| 15.05 | III. A-E | SLOPE STABILIZATION AND PREVENTION OF MASS FAILURES - To reduce sedimentation by minimizing the chances for road-related mass failures, including landslides and embankment slumps. | New Road and Trail Construction | 1. Avoid construction across unstable areas.<br>2. Construct embankments following approved engineering practices.<br>3. Use minimum road or trail length/width necessary. | Road and trail construction in mountainous terrain requires cutting and loading natural slopes which may lead to landslides and/or embankment failures. In areas with intrinsic slope stability problems, appropriate technical resource personnel must be involved in an interdisciplinary approach to route location. | IDT, ER | N/A | |
| 15.06 | III. A-E | MITIGATION OF SURFACE EROSION AND STABILIZATION OF SLOPES - To minimize soil erosion from road cut slopes, fill slopes, and travel ways. | All Haul Roads | 1. Seed and fertilize cut and fill slopes.<br>2. Install proper ditching and road slope.<br>3. Install proper drainage.<br>4. Incorporate road grade breaks.<br>5. Install ditch relief culverts before/after stream crossings. | IDT has outlined detailed erosion control measures in the NEPA process. Stabilization techniques are included in contract provisions. Compliance is assured by Contracting Officer or ER. | IDT, ER | SPS 203, 204, 206A 210, 412 619, 625, 626 630<br>B(T)<br>5.3 B(T)6.6<br>B(T)6.63<br>B(T)6.66<br>B(T)6.312<br>C(T)5.314#<br>C(T)6.6<br>C(T)6.601# | F.3<br>G.6<br>G.6.3<br>G.6.6<br>G.3.1.2<br>K-F.3.1.4#<br>K-G.6<br>K-G.6.0.1# |

| TABLE C - 2. SITE SPECIFIC BEST MANAGEMENT PRACTICES. | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| SWCP | MT BMP | SWCP OBJECTIVE | APPLICABLE UNITS/ROADS | RECOMMENDED BMPS BY IDT/TSA | CONSIDERATIONS FOR BMPS | PERSON(S) RESPONSIBLE | STANDARD CONTRACT PROVISIONS | STEWARDSHIP CONTRACT PROVISIONS |
| 15.07 | III. E-2 | CONTROL OF PERMANENT ROAD DRAINAGE - To minimize the erosive effects of concentrated water and degradation of water quality by proper design and construction of road drainage systems and drainage control structures. | All Haul Roads | 1. Avoid long, steep grades.<br>2. Maintain adequate surface drainage.<br>3. Prevent erosion of culvert fills.<br>4. Maintain ditches.<br>5. Ditch relief culverts before/after stream crossings. | IDT has identified locations, Design Criteria, drainage control features, and mitigation. Compliance will be assured by the ER/Contracting Officer. | ER | B(T)5.3<br>B(T)6.6<br>C(T)5.31#<br>C(T)6.6 | F.3<br>G.6<br>K-F.3.1#<br>K-G.6 |
| 15.08 | III. D | PIONEER ROAD CONSTRUCTION - To minimize sediment production and mass wasting associated with pioneer road construction. | New Road and Trail Construction | 1. Ensure stable slopes during construction.<br>2. Seed and fertilize exposed soil.<br>3. Avoid construction during wet periods.<br>4. Use slash filter windrows. | ER/Contracting Officer will be responsible for enforcing contract specifications. The purchaser is responsible for submitting an operating plan that includes erosion control measures. | ER | B(T)5.23<br>B(T)6.31<br>B(T)6.311<br>B(T)6.312<br>B(T)6.6<br>C(T)6.601#<br>SPS 204 | F.2.3<br>G.3.1<br>G.3.1.1<br>G.3.1.2<br>G.6<br>K-G.6.0.1# |
| 15.09 | III. E-7,8 | TIMELY EROSION CONTROL MEASURES ON INCOMPLETE ROADS AND STREAM CROSSING PROJECTS - To minimize erosion of and sedimentation from disturbed ground on incomplete projects. | All Road Construction, Reconstruction, and Maintenance | 1. Avoid construction during wet periods.<br>2. Use slash filter windrows or silt fence.<br>3. Seed and fertilize disturbed areas. | IDT has identified project location and mitigation measures in NEPA process. Protective measures will be kept current on all areas of disturbed, erosion-prone areas. TSA ensures contract compliance. | IDT, TSA | B(T)5.23<br>B(T)6.31<br>B(T)6.6<br>B(T)6.66<br>C(T)6.6<br>C(T)6.601# | F.2.3<br>G.3.1<br>G.6<br>G.6.6<br>K-G.6<br>K-G.6.0.1# |
| 15.10 | III. D-8 | CONTROL OF ROAD CONSTRUCTION, EXCAVATION, AND SIDE-CAST MATERIAL - To reduce sedimentation from unconsolidated excavated and side-cast material caused by road construction, reconstruction, or maintenance. | All Road Construction, Reconstruction, and Maintenance | 1. Do not side-cast into waterways or sensitive areas.<br>2. Use slash filter windrows or silt fence. | IDT has identified project location and mitigation measures in NEPA process. Protective measures will be kept current on all areas of disturbed, erosion-prone areas. TSA ensures contract compliance. | IDT, TSA | B(T)5.3<br>C(T)5.31#<br>SPS 203<br>SPS 204 | F.3<br>K-F.3.1# |

| Table C - 2. Site Specific Best Management Practices. | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| SWCP | MT BMP | SWCP Objective | Applicable Units/Roads | Recommended BMPs by IDT/TSA | Considerations for BMPs | Person(s) Responsible | Standard Contract Provisions | Stewardship Contract Provisions |
| 15.11 | VII. A-1,2 | SERVICING AND REFUELING EQUIPMENT - To prevent contamination of waters from accidental spills of fuels, lubricants, bitumens, and other harmful materials. | All Activities | 1. Ensure proper fuel storage and transportation.<br>2. Keep fuel from streams, wetlands, ponds, and lakes. | ER/TSA/Contracting Officer will designate the location, size, and uses of service refueling areas. All projects will adhere to the FNF Hazardous Substance Spill Plan in case of accidents. | ER, TSA | B(T)6.222<br>B(T)6.34<br>B(T)6.341 | G.2.2.2<br>G.3.4<br>G.3.4.1 |
| 15.12 | III A. 4 | CONTROL OF CONSTRUCTION IN RIPARIAN AREAS - To minimize the adverse effects on riparian areas from roads. | New Road and Temporary Road Construction | 1. Follow INFISH Standards and Guidelines for construction within riparian areas.<br>2. Use slash filter windrows or silt fence.<br>3. Install ditch relief culverts and surface water deflectors before/after stream crossings. | Proposed new and temporary roads will adhere to guidelines in the Montana Streamside Management Zone Law (HB-731). All road activities will follow INFISH Standards and Guidelines for road management. | ER, TSA | B(T)6.5<br>B(T)6.62<br>C(T)6.50#<br>SPS 206<br>SPS 206A | G.5<br>G.6.2<br>K-G.5.0# |
| 15.13 | V. C-1 | CONTROLLING IN-CHANNEL EXCAVATION - To minimize stream channel disturbances and related sediment production. | All Road Construction, Reconstruction, and Maintenance | 1. Use silt fence to minimize introduced sediment.<br>2. Use minimum amount of road.<br>3. Construct minimum number of crossings. | BMP improvements at crossings would adhere to the guidelines in Montana Streamside Management Zone Law (HB-731) and the INFISH Standards and Guidelines for road management. | ER, TSA | B(T)6.5<br>SPS 204<br>SPS 206<br>206A | G.5 |
| 15.14 | V. A, C | DIVERSION OF FLOWS AROUND CONSTRUCTION SITES - To minimize downstream sedimentation by insuring all stream diversions are carefully planned. | All Work at Stream Crossings | 1. Divert stream flow around construction.<br>2. Use silt fence to minimize introduced sediment.<br>3. Construction during low-flow. | The IDT has determined, where stream crossings meet multiple resource objectives, the crossings would require a State 124 permit. This would require the State Fish, Wildlife, and Parks to review the adequacy of the proposed mitigation. Compliance with contract provisions would be done by the ER. | IDT, ER | B(T)6.5<br>B(T)6.31<br>C(T)6.50#<br>C(T)6.6 | G.5<br>G.3.1<br>K-G.5.0#<br>K-G.6 |

**TABLE C - 2. SITE SPECIFIC BEST MANAGEMENT PRACTICES.**

| SWCP | MT BMP | SWCP OBJECTIVE | APPLICABLE UNITS/ROADS | RECOMMENDED BMPS BY IDT/TSA | CONSIDERATIONS FOR BMPS | PERSON(S) RESPONSIBLE | STANDARD CONTRACT PROVISIONS | STEWARDSHIP CONTRACT PROVISIONS |
|---|---|---|---|---|---|---|---|---|
| 15.15 | V. A-C | STREAM CROSSINGS ON TEMPORARY ROADS - To keep temporary roads from unduly damaging streams, disturbing channels, or obstructing fish passage. | All Roads | 1. Consult Hydrologist on placement of crossing.<br>2. Use minimum number of stream crossings.<br>3. Construction during low-flow.<br>4. Follow INFISH Standards and Guidelines for construction within riparian areas. | The IDT identifies areas in need of a temporary road during the NEPA process. Proposed stream crossings would adhere to the guidelines in Montana Streamside Management Zone Law (HB-731). | PSF, ER, TSA | N/A | |
| 15.16 | V. C-1-7 | BRIDGE AND CULVERT INSTALLATION - To minimize sedimentation and turbidity resulting from excavation for in-channel structures. | All Road Construction, Reconstruction, and Maintenance | 1. Installation should be done during periods of low flow.<br>2. In-stream sediment retention devices should be used throughout implementation. | IDT has identified project location and mitigation measures in NEPA process. Protective measures will be kept current on all areas of disturbed, erosion-prone areas. TSA ensures contract compliance. | IDT, TSA | C(T)5.31# (T-310)<br>B(T)6.312 | K-F.3.1# (T-618)<br>G.3.1.2 |
| 15.17 | III. D-9 | REGULATION OF BORROW PITS, GRAVEL SOURCES, AND QUARRIES - To minimize sediment production from borrow pits, gravel sources, and quarries and limit channel disturbance in those gravel sources suitable for development in floodplains. | N/A | | | ER | B(T)6.5<br>C(T)6.50# | G.5<br>K-G.5.0# |
| 15.18 | III. D-8 | DISPOSAL OF RIGHT-OF-WAY AND ROADSIDE DEBRIS - To insure that debris generated during road construction is kept out of streams and prevent slash and debris from subsequently obstructing channels. | All Road Construction, Reconstruction, and Maintenance | Debris and slash generated during road construction should not be side-cast into streams. | Proposed road construction will adhere to the guidelines in the Montana Streamside Management Zone Law (HB-731). | ER | Std Spec 201<br>SPS 201 | |

**TABLE C - 2. SITE SPECIFIC BEST MANAGEMENT PRACTICES.**

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|---|---|---|---|---|---|---|---|---|
| 15.19 | III. A | STREAM BANK PROTECTION – To minimize sediment production from stream banks and structural abutments in natural waterways. | All Road Construction, Reconstruction, and Maintenance | 1. Take precautions to minimize or eliminate disturbance to stream banks.<br>2. Maintain in-stream structures. | IDT has identified project location and mitigation measures during NEPA process. Protective measures will be kept current on all areas of disturbed soils. TSA and ER ensure contract compliance. | IDT, ER, TSA | Std Spec 619 | |
| 15.20 | N/A | WATER SOURCE DEVELOPMENT CONSISTENT WITH WATER QUALITY PROTECTION - To supply water for road construction and maintenance and fire protection while maintaining water quality. | N/A | | | ER, FMO | Std Spec 207 | |
| 15.21 | III. E | MAINTENANCE OF ROADS - To maintain all roads in a manner that provides for soil and water protection by minimizing rutting, failures, side-cast, and blockage of drainage facilities. | All Road Reconstruction and Maintenance | 1. Maintain all roads in a manner that provides for soil and water protection. | Road maintenance associated with a timber sale is the responsibility of purchaser. The ER/TSA will ensure that the purchaser maintains roads according to the appropriate maintenance level. | ER, TSA | B(T)5.12<br>B(T)5.3<br>B(T)6.6<br>C(T)6.6<br>C(T)5.31# | F.1.2<br>F.3<br>G.6<br>K-G.6<br>K-F.3.1# |
| 15.22 | III. E-1 | ROAD SURFACE TREATMENT TO PREVENT LOSS OF MATERIALS - To minimize the erosion of road surface materials and, consequently, reduce the likelihood of sediment production. | All Haul Roads | 1. Maintenance of road surface should include proper blading and/or dust abatement.<br>2. Use crush-gravel where necessary. | Protective measures will be kept current on all areas of disturbed, erosion-prone areas. ER ensures contract compliance. | IDT, ER | B(T)5.3<br>C(T)5.31#<br>C(T)5.314# | F.3<br>K-F.3.1#<br>K-F.3.1.4# |
| 15.23 | III. E-6 | TRAFFIC CONTROL DURING WET PERIODS - To reduce the potential for road surface disturbance during wet weather and reduce sedimentation. | All Haul Roads | 1. Avoid hauling during wet periods. | Road restrictions and traffic control measures will be implemented on all haul roads when damage would occur during spring breakup. The decision to restrict a road is made by the ER. Hauling restrictions would be controlled by the TSA. | ER, TSA | B(T)6.6<br>C(T)6.6<br>C(T)5.316#<br>C(T)5.41# | G.6<br>K-G.6<br>K-F.3.1.6#<br>K-F.4.1# |

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|---|---|---|---|---|---|---|---|---|
| 15.24 | III.E-4 VI. A-B | SNOW REMOVAL CONTROLS - To minimize the impact of snow melt on road surfaces and embankments and reduce the probability of sediment production resulting from snow removal operations. | All Winter Haul Roads | 1. Be careful not to leave snow berm at edge of road. 2. Ensure proper drainage by opening sections of berm to allow water to leave road surface. 3. Ensure no side cast material enters waterways. 4. Consider hauling only during frozen periods. During cold weather, plow any snow cover off the roadway to facilitate deep freezing of the road prior to hauling. 5. Before logging, mark existing culvert locations. During and after logging, make sure that all culverts and ditches are open and functional. 6. Use compacted snow for roadbeds in unroaded, wet or sensitive areas. Construct snow roads for single-entry harvests or for temporary roads. 7. Return the following summer and build erosion barriers on any trails that are steep enough to erode. | Snow removal will be kept current on all roads associated with winter logging operations. TSA ensures compliance with contract provisions. | IDT, TSA | C(T)5.316# Std Spec 203.09 | K-F.3.1.6# |

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|---|---|---|---|---|---|---|---|---|
| 15.25 | III. E 7, 8 | OBLITERATION OF TEMPORARY ROADS - To reduce sediment generated from temporary roads by obliterating them at the completion of their intended use. | All Temporary Roads | 1. Re-contour road fully where feasible.<br>2. Seed and fertilize exposed soil.<br>3. Pull slash and woody debris back onto rehabilitated road. | This work will be done on all new temporary roads in the decision area. The work will be done by the purchaser with compliance by the TSA. | TSA | B(T)6.63<br>C(T)6.6<br>C(T)6.632#<br>C(T)6.633#<br>C(T)6.601# | G.6.3<br>K-G.6<br>K-G.6.3.2#<br>K-G.6.3.3#<br>K-G.6.0.1# |
| 18.03 | IV. C-8 | PROTECTION OF SOIL AND WATER FROM PRESCRIBED BURNING EFFECTS - To maintain soil productivity, minimize erosion, and prevent ash, sediment, nutrients, and debris from entering surface water. | All Prescribed Burning | 1. Follow INFISH Standards and Guidelines for burning in RHCAs.<br>2. Adhere to SMZ Law.<br>3. Where harvest within riparian areas is proposed, either the slash should be removed with the tree or scattered and not treated. | Prescribed burning adjacent to riparian areas will adhere to guidelines in the Montana SMZ Law (HB-731). Prescribed burn plans identify the conditions necessary to prevent soil damage and meet site preparation objectives. | FMO | N/A | |

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# APPENDIX D
# BIBLIOGRAPHY AND GLOSSARY

## BIBLIOGRAPHY

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# GLOSSARY

**Action Alternative** - An alternative that proposes some management action, as contrasted to the No Action Alternative.

**Affected Environment** - The biological and physical environment that will or may be changed by actions proposed and the relationship of people to that environment.

**Age or Size Class** - A distinct group of trees, or portion of growing stock recognized on the basis of age (or size).

**Airshed** - Basic geographic units in which air quality is managed.

**Allelles –** An alternative form of a gene (one member of a pair) that is located at a specific position on a specific chromosome.

**Alternativ**e - A combination of management prescriptions applied in specific amounts and locations to achieve a desired management emphasis. One of the several policies, plans or projects, proposed for decision-making.

**Analysis Area –** One or more capability areas combined for the purpose of analysis in formulating alternatives and estimating various impacts and effects

**Bear Management Area (BMA)** – Areas delineated to include important habitat components and to implement standards and guidelines pertaining to grizzly bears. These areas have also been used for evaluating habitat for other wildlife species including big game and old growth indicator species.

**Bear Management Subunit** – An area approximately the size of an average female home range (about 50 mi2), generally from ridge top to valley bottom, and including all seasonal habitats.

**Best Management Practices (BMPs**) - Methods, measures or practices to prevent or reduce water pollution, including but not limited to, structural and non-structural controls, operation and maintenance procedures, other requirements, and scheduling and distribution of activities. Usually BMPs are applied as a system of practices rather than a single practice. BMPs are selected on the basis of site-specific conditions that reflect natural background conditions and political, social, economic, and technical feasibility.

**Biological Assessment (BA)** - A document prepared by a federal agency for the purpose of identifying any endangered species or threatened species, which is likely to be affected by an agency action. This document facilitates compliance with the Endangered Species Act. The federal agency, in consultation with the Secretary of Interior, must insure that any action authorized, funded, or carried out by a federal agency is not likely to jeopardize the continued existence of any endangered or threatened species, or result in the destruction or adverse modification of its habitat.

**Biological Evaluation (BE)** - A document prepared by the Forest Service to review programs or activities to determine how an action might affect any threatened, endangered, proposed, or sensitive species. This document often focuses only on sensitive species if the Threatened, Endangered, and Proposed Species will be covered in a Biological Assessment.

**Biomass (Fuels)** - Live and dead accumulations of organic material.

**Blowdown (Windthrow)** - Uprooting by the wind. Also refers to a tree or trees so uprooted.

**Board Foot** - A unit of measurement represented by a board one foot square and one inch thick.

**Broadcast Burn –** A prescribed fire allowed to burn over a designated area within a well-defined boundary to achieve some land management objective.

**Browse** - Twigs, leaves, and young shoots of trees and shrubs on which animals feed; in particular, those shrubs which are used by big game animals for food.

**Buffer** – A land area designated to block or absorb unwanted effects to the area beyond the buffer and to preserve other qualities along or adjacent to roads, trails, watercourses, and recreation sites.

**Burn Severity**– A relative measure of the degree of change in a watershed that related to the intensity of the fire on soil hydrological function. Burn severity is delineated on topographic maps of polygons. Classes of burn severity are high, moderate, low, and unburned.

**Canopy** - The forest cover of branches and foliage formed by tree crowns.

**Canopy Cover or Crown Closure** - The percentage of ground surface that is shaded by the live foliage of plants as seen from above. Used to describe how open or dense a stand of trees is.

**Capability** - The potential of an area of land and/or water to produce resources, supply goods and services, and allow resource uses under a specified set of management practices and at a given level of management intensity. Capability depends upon current conditions and site conditions such as climate, slope, landform, soils, and geology; as well as the application of management practices, such as silviculture or protection from fires, insects, and disease.

**Cavity** - A hollow in a tree that is used by birds or mammals for nesting, denning, roosting, etc.

**Closed Canopy** - The description given to a stand when the crowns of the main level of trees forming the canopy are touching and intermingled so that light cannot reach the forest floor directly.

**Coarse Woody Debris (CWD)** - Any piece(s) of dead woody material, e.g., dead boles, limbs, and large root masses on the ground or in streams.

**Cohort** – An age class of trees that is distinctively different from other age classes in a particular forest stand.

**Commercial Thinning** - A silviculture treatment that “thins” out an overstocked stand by removing trees, which are large enough to be sold as products such as poles or fence posts. It is carried out to improve the health and growth rate of the remaining crop trees.

**Composition (Species)** - The mix of different species that make up a plant or animal community, and their relative abundance.

**Condition Class** – A function of the degree of departure from historical fire regimes resulting in alterations of key ecosystem components, such as species composition, structural stage, stand age, and canopy closure. Categorized by three classes as follows: Condition Class 1 – Fire regimes are within or near an historical range; Condition Class 2 – Fire regimes have been moderately altered from their historical range; Condition Class 3 – Fire regimes have been significantly altered from their historical range.

**Confidence Interval –** A confidence interval is used to express the degree of uncertainty associated with a sample statistic. A confidence interval is an interval estimate combined with a probability statement.

**Consultation** - A process required by Section 7 of the ESA whereby Federal agencies proposing activities in a listed species habitat confer with the U.S. Fish and Wildlife Service about the impacts of the activity on the species. Consultation may be informal, and thus advisory, or formal, and thus binding.

**Corridor** - A band of vegetation, usually older forest, which serves to connect distinct patches on the landscape. By providing connectivity, corridors permit the movement of plant and animal species between what would otherwise be isolated patches.

**Council on Environmental Quality (CEQ)** - An advisory council to the President established by the National Environmental Policy Act of 1969. It reviews Federal programs for their effect on the environment, conducts environmental studies, and advises the President on environmental matters.

**Cover/Forage Ratio** - The ratio of tree cover (usually conifer types) to foraging areas (natural openings, clearcuts, etc.).

**Cover Type** - The present vegetation composition of an area, described by the dominant plant species.

**Crown** - The part of a tree or other woody plant bearing live branches and foliage.

**Crown Fire** - A fire that advances from top-to-top of trees or shrubs more or less independently of the surface fire. Sometimes, crown fires are classed as either running or dependent, to distinguish the degree of independence from the surface fire.

**Cultural Resources** - The physical remains of human activity (artifacts, ruins, burial mounds, petroglyphs, etc.) and conceptual content or context (as a setting for legendary, historic, or prehistoric events; as a sacred area of native peoples, etc.) of an area of prehistoric or historic occupation.

**Cumulative Effect** - The impact on the environment, which results from the incremental impact of the action when added to other actions. Cumulative impacts can also result from individually minor but collectively significant actions taking place over a period of time.

**Density (Stand)** - The number of trees growing in a given area, usually expressed in terms of trees per acre.

**Diameter at Breast Height (DBH)** - The diameter of a tree measured four and one-half feet above the ground.

**Direct Effect** - Effects on the environment that occur at the same time and place as the initial cause or action.

**Dispersal** - The movement of organisms away from the place of birth or from centers of population density.

**Disturbance (Ecosystem)** - Refers to events that alter the structure, composition, or function of terrestrial or aquatic habitats. Natural disturbances include, among others, drought, floods, wind, fires, wildlife grazing, and insects and pathogens. Human-caused disturbances include actions such as timber harvest, livestock grazing, roads, and the introduction of exotic species.

**Diversity** - The distribution and abundance of different plant and animal communities and species.

**Duff** - The partially decayed organic matter on the forest floor.

**Early Seral/Structural Stage** - A stage of development of an ecosystem from a disturbed, relatively unvegetated state to a plant community that is up to 30 years old. Stand structure is seedling and sapling sized.

**Ecosystem** - A complete, interacting system of organisms considered together with their environment; i.e., a marsh, watershed, or lake.

**Ecosystem Services –** the benefit(s) people obtain from an ecosystem, including: a) Provisioning Services –food, fresh water, fuel, and timber; b) Regulating Services –climate, water, pollination, and disease regulation; c) Supporting Services –soil formation and nutrient cycling; and d) Cultural Services – educational, aesthetic, cultural heritage values, recreation, and tourism. Stress generally reduces both the quality and quantity of these services.

**Endangered Species** - Any species, plant, or animal that is in danger of extinction throughout all or a significant portion of its range. In accordance with the 1973 ESA, the Secretary of the Interior identifies endangered species.

**Endemic** - A species whose natural occurrence is confined to a certain region and whose distribution is relatively limited (vertebrate biology). A population that is at equilibrium or low density (invertebrate biology or pathology).

**Escape Route** – A means to access a safety zone.

**Fire Exclusion -** The disruption of a characteristic pattern of fire intensity and occurrence (primarily through fire suppression).

**Fire Event (Fire Occurrence, Fire Incidence)** - A single fire or series of fires within an area at a particular time.

**Fire Frequency** – A general term referring to the recurrence of fire in a given area over time.

**Fire Hazard** - The potential fire behavior for a fuel type, regardless of the fuel type's weather-influenced fuel moisture content or its resistance to fire line construction. Assessment is based on physical fuel characteristics, such as fuel arrangement, fuel load, condition of herbaceous vegetation, and presence of elevated fuels.

**Fire Intensity** – Based on temperature, flame length, rate of spread, heat of combustion, and total amount and size of fuel consumed. Accounts for convective heat rising into the atmosphere and fire effects to the overstory.

**Fire Intolerant (or "intolerant")** - Species of plants that do not grow well or die from the effects of fire. Generally these species are shade-tolerant as well.

**Fire Regimes** – the role of fire in ecosystems and its interactions with dominant vegetation.

**Fire Return Interval (Fire Interval)** - The number of years between successive fire events in a given area.

**Fire Risk** - The probability or chance of fire starting determined by the presence and activities of causative agents.

**Fire Rotation** – The length of time necessary for an area equal in size to the study area to burn.

**Fire Severity** – A relative measure of the post-fire appearance of vegetation (residual fuels/mortality) as it related to the intensity of the fire and its consumptive effects on vegetation.

**Fire Suppression (Fire Control)** - All of the work and activities connected with fire extinguishing operations, beginning with discovery and continuing until the fire is completely extinguished.

**Fire Tolerant (or "tolerant")** - Species of plants that can withstand certain frequency and intensity of fire. Generally these species are shade-intolerant as well.

**Firefighter Safety** - A work environment where foreseeable risks have been minimized through the mitigation of known hazards associated with wildlife suppression.

**Fish Habitat** - The place where a population of fish species lives and its surroundings; includes the provision of life requirements such food and cover.

**Fish Passage** - Clear access for migrating fish through a potential barrier.

**Fishery** - The total population of fish in a stream or body of water and the physical, chemical, and biological factors affecting that population.

**Forage** - All browse and non-woody plants available to livestock or wildlife for feed.

**Forb** – Any herbaceous (herb-like) plant other than grass or grass-like plants that has little or no wood on it. For example, wildflowers are forbs.

**Forest Development Road (FDR)** - A road wholly or partly within or adjacent to and serving the National Forest System and which is necessary for the protection, administration, and use of the National Forest System and the use and development of its resources.

**Forest Health** - (also called forested landscape or forestland) is defined as: the conditions under which the integrity of the soil and ecological processes are sustained resulting in systems that maintain their diversity, resiliency, and productivity with associated sustainable human resource issues.

**Forest Plan** - The Flathead National Forest Land and Resource Management Plan.. A Forest Plan is a document prepared under the National Forest Management Act by each national forest that generally describes how the resources in the forest will be managed for a 10 to 15 year period.

**Forest Structure** - The mix and distribution of tree sizes, layers, and ages in a forest. Some stands are mostly one size (single-story), some are two-story, and some are a mix of trees of different ages and sizes (multi-story).

**Forest Type** - Relates to the tree species (and to generalized understory plant) composition.

**Fuels** - Includes living plants, dead, woody vegetative materials; and other vegetative materials capable of burning.

**Fuel Loading** - The oven dry weight of fuels in a given area, usually expressed in tons per acre. Fuel loadings may be referenced to fuel size or time-lag categories; and may include surface fuels or total fuels.

**Fuel Management** - Manipulation or reduction of flammable matter for the purpose of reducing the intensity or rate of spread of a fire, while preserving and enhancing environmental quality.

**Fuel Treatment** - The rearrangement or disposal of natural or activity fuels.

**Geographic Information System (GIS)** - Computer software that provides database and spatial analytic capabilities.

**Goal** – A concise statement that describes a desired condition to be achieved. It is normally expressed in broad, general terms and is timeless in that it has no specific date that it is to be completed. Goal statements form the principal basis upon which objectives are developed.

**Guideline** - An indication or outline of policy or conduct dealing with the basic management of the Forest. Forest-wide management standards and guidelines apply to all areas of the Forest regardless of the other management prescriptions applied.

**Habitat Type** - An aggregation of all land areas potentially capable of producing similar plant communities at climax.

**Haul Roads -** Roads that are proposed to haul forest products from the area.

**Hazard** - A real or potential condition that may result in an undesired event, the cause of risk. Hazard can apply to the probability of tree mortality or damage by an insect or disease and also represents material or fuel that will ignite and burn.

**Hiding Cover** – Trees of sufficient size and density to conceal animals from view at 200 feet.

**Historic Range of Variability (HRV)** - Conditions which be expected to occur under natural disturbance and succession regimes.

**Home Range** - An area, from which intruders may or may not be excluded, to which an individual restricts most of its usual activities.

**Indirect Effects** - Secondary effects which occur in locations other than the initial action or significantly later in time.

**Initial Attack** - An aggressive suppression action consistent with firefighter and public safety and values to be protected.

**Instream Cover** - Anything in the water that provides protection to fish from predators (including turbulence, debris, logs, and rocks).

**Intensity** - Energy release rates; these are physical descriptors of the fire, not its ecological effects. Generally referred to as High, Moderate, or Low intensity.

**Interdisciplinary Team (ID Team)** - A group of individuals with different training assembled to solve a problem or perform a task. The team is assembled out of recognition that no one scientific discipline is sufficiently broad to adequately solve the problem. Through interaction, participants bring different points of view to bear on the problem.

**Intermittent Stream** - A stream which flows only at certain times of the year when it receives water from springs or from some surface source such as melting snow.

**Invasive Plant** – All State and county listed “noxious weeds” are considered invasive plants. Also, other exotic species (not listed by State or counties as noxious weeds) that can successfully out compete and displace native plant communities.

**Inventoried Roadless Area** - An area identified and classified as roadless. These areas were identified during the second Roadless Area Review and Evaluation (RARE II).

**Issue** - See Public Issue.

**Ladder Fuels** - Fuels which provide vertical continuity between the surface fuels and crown fuels in a forest stand, thus contributing to the ease of torching and crowning.

**Landscape** - The landforms of a region in the aggregate; the land surface and its associated habitats at scales of many acres to many square miles; a spatially heterogeneous area.

**Landtype** - An inventory map unit with relatively uniform potential for a defined set of land uses. Properties of soils landform, natural vegetation, and bedrock are commonly components of landtype delineation used to evaluate potentials and limitations for land use.

**Large Woody Debris** – Large logs and stumps in streams and on land that provide habitat for aquatic and terrestrial organisms and affects stream function.

**Late Seral/Structural Stage** - A stage of development of an ecosystem from approximately 80 to 120 years old. Forested stands are generally 12 to 16 inches average dbh.

**Lethal Fire/Lethal Fire Regime** - Fire that consumes the entire vegetative community (grasses, shrubs, trees. Also see Stand Replacement Fire.

**Linkage (Habitat)** - Linkage zones are combinations of landscape structural factors that allow wildlife to move through, and live within, areas influenced by human actions. A linear habitat patch through which a species must travel to reach habitat more suitable for reproduction and other life-sustaining needs.

**Lop and Scatter –** A hand method of removing the upward-extended branches from tops of felled trees to keep slash low to the ground, to increase the rate of decomposition, lower fire hazard, or as a pretreatment prior to burning.

**Low Severity Ground Fire** - A fire with low intensity that primarily scorches tree boles, allowing fire tolerant species to survive.

**Maintenance Level (ML)** – The Maintenance Level of a road indicates the type of traffic it can accommodate.

**Management Area (MA)** - An aggregation of capability areas that have common management direction and may be dispersed over the Forest. Consists of a grouping of capability areas selected through evaluation procedures and used to locate decisions and resolve issues and concerns.

**Management Indicator Species (MIS)** - Species identified in a planning process that are used to monitor the effects of planned management activities on populations of wildlife and fish including those that are socially or economically important.

**Mature Timber** - Individual trees or stands of trees that in general are at their maximum rate in terms of the physiological processes expressed as height, diameter, and volume growth.

**MBF and MMBF** - Thousand board feet and million board feet, respectively.

**Mean Fire Return Interval (Mean Fire Interval)** – The average of all fire intervals in a given area over a given time period.

**Mesic** - Moderately moist.

**Mid-Seral/Structural Stage -** A stage of development of an ecosystem from approximately 30 to 80 years old. Forested stands are generally 5 to 12 inches average dbh. Stand structure is pole- and small sawlog-sized trees.

**Mixed-Severity Fire/Mixed Severity Fire Regime** - Mixed-severity fire regime areas can experience the full range of fire severities during either a single event or consecutive events. In other words, in a single fire event both low severity (killing few trees) and high severity (killing all trees) in patches of variable sizes. This tends to create complex fine-grained spatial patterns of vegetation conditions across a landscape.

**Monitoring and Evaluation** - The periodic evaluation on a sample basis of Forest Plan management practices to determine how well objectives have been met and how closely management standards have been applied.

**Montane** - Of, growing in, or inhabiting mountain areas.

**National Environmental Policy Act (NEPA)** - An act which encourages productive and enjoyable harmony between man and his environment; promotes efforts to prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; enriches the understanding of the ecological systems and natural resources important to the Nation; and establishes a Council on Environmental Quality.

**National Forest Management Act (NFMA)** - A law passed in 1976 as amendments to the Forest and Rangeland Renewable Resources Planning Act that requires the preparation of Regional and Forest Plans and the preparation of regulations to guide that development.

**National Forest System (NFS)** - All national forest lands reserved or withdrawn from the public domain of the United States, all national forests lands acquired through purchase, exchange, donation, or other means, the national grasslands and land utilization projects administered under Title III.

**National Forest System Road (NFS Road)** - A road wholly or partly within or adjacent to and serving the National Forest System and which is necessary for the protection, administration, and use of the National Forest System and the use and development of its resources.

**National Wilderness Preservation System** - All lands covered by the Wilderness Act and subsequent wilderness designations, irrespective of the department or agency having jurisdiction.

**Native Species** - Species that are indigenous to a region, as opposed to introduced or exotic species.

**Native (Natural) Succession and Disturbance Regimes** - The historic patterns (frequency and extent) of fire, insects, wind, landslides, and other natural processes in an area.

**Natural Regeneration** - Renewal of a tree crop by natural seeding, sprouting, suckering, or layering.

**No Action Alternative** - The management direction, activities, outputs, and effects most likely to exist in the future if the current plan would continue unchanged.

**Non-Lethal Fire/Non-Lethal Fire Regime** – Fire that primarily consumes surface fuels causing little mortality to overstory trees. See also Low Severity Fire.

**Noxious and Invasive Weed EA** (NIWC EA)

**Noxious Weed** - Any exotic plant species established or that may be introduced in the area which may render land unfit for agriculture, forestry, livestock, wildlife, or other beneficial uses.

**Oligotrophic -** Especially of a lake that is relatively low in plant nutrients and containing abundant oxygen in the deeper parts.

**Old Growth Habitat** - A community of forest vegetation that has reached a late stage of plant succession characterized by a diverse stand structure and composition along with a significant showing of decadence. The stand structure will typically have multi-storied crown heights and variable crown densities. There is a variety of tree sizes and ages ranging from small groups of seedlings and saplings to trees of large diameters exhibiting a wide range of defect and breakage both live and dead, standing and down. The time it takes for a forest stand to develop into old growth condition depends on many local variables such as forest type, habitat type, and climate. Natural chance events involving forces of nature such as weather, insect, disease, fire, and the actions of man also affects the rate of development of old-growth stand conditions.

**Open Road** – A road with no restrictions on motorized vehicle use.

**Overmature Timber** - Individual trees or stands of trees that in general are past their maximum rate in terms of the physiological processes expressed as height, diameter, and volume growth.

**Overstory** - The portion of the trees that form the uppermost canopy layer in a forest of more than one story.

**Perennial Streams** - Streams that flow continuously throughout most years and whose upper surface generally stands lower than the water table in the region adjoining the stream.

**Phloem** – The layer of cells under the bark and outside of the cambium layer responsibility for transporting food created by the leaves.

**Piscicide –** A chemical substance that is poisonous to fish.

**Pole** - A tree between a sapling and small timber size at least 5 inches DBG but smaller than 8 inches DBH.

**Pool** - A portion of the stream with reduced current velocity, often with water deeper than the surrounding areas, and which is usable by fish for resting and cover.

**Population** - A group of coexisting (conspecific) individuals that interbreed if they are sexually reproductive.

**Potential Habitat (Wildlife)** - Habitat that is likely to be occupied by a wildlife species or group of species, currently or in the near future.

**Potential Vegetation Group (PVG)** - Groupings of habitat groups on the basis of similarity of general moisture or temperature environment.

**Pre-Commercial Thinning** - The selective felling, deadening, or removal of trees in a young stand primarily to accelerate diameter increment on the remaining stems, maintain a specific stocking or stand density range, and improve the vigor and quality of the trees that remain.

**Preferred Alternative** - The Agency's preferred alternative is the alternative that the agency believes would best fulfill its statutory mission and responsibilities, giving consideration to economic, environmental, technical and other factors, and which meets the purpose and need of the NEPA document.

**Prescribed Burning** - The controlled use of fire to reduce or eliminate the unincorporated organic matter of the forest floor, or low, undesirable vegetation. A written, approved prescribed fire plan must exist, and NEPA requirements must be met, prior to ignition.

**Proposed Action** - The proposed action or proposal exists at that stage in the development of an action when an agency subject to the Act (NEPA) has a goal and is actively preparing to make a decision on one or more alternative means of accomplishing that goal and the effects can be meaningfully evaluated.

**Public Involvement** - A process designed to broaden the information base upon which agency decisions are made by informing the public about Forest Service activities, plans, and decisions, and participation in the planning processes which lead to final decision making.

**Public Issue** - A subject or question of widespread public interest identified through public participation relating to management of NFS lands.

**Ranger District** – Administrative subdivision of the Forest supervised by a District Ranger.

**Reach** - A length of stream channel, lake, or inlet exhibiting, on average, uniform hydraulic properties and morphology.

**Rearing Habitat** - In the case of juvenile westslope cutthroat trout, this is primarily the pool environment in streams.

**Recovery Plan** - A plan that details actions or conditions necessary to promote species recovery, that is, improvement in the status of species listed under the ESA to the point at which listing is no longer appropriate. Plans are required for virtually all listed species.

**Reforestation** - The renewal of forest cover by seeding, planting, and natural means.

**Regeneration** - The renewal of a forest, whether by natural or artificial means. This term may also refer to a tree crop itself.

**Release** - Freeing a tree or group of trees from more immediate competition by cutting or otherwise eliminating growth that is overtopping or closely surrounding them.

**Resident Fish** - Non-migratory fish species.

**Resilient, Resiliency** - The ability of a system to respond to disturbances. Resiliency is one of the properties that enable the system to persist in many different states or successional stages.

**Responsible Official** - The Forest Service employee who has the authority to select and/or carry out a specific planning action.

**Restore, Restoration** - The re-creation of a natural or self-sustaining, resilient community or ecosystem, or a movement in that direction.

**Riparian Areas** - Areas with distinctive resource values and characteristics that are comprised of an aquatic ecosystem and adjacent upland areas that have direct relationships with the aquatic system. This includes flood plains, wetlands, and all areas within a horizontal distance of approximately 100 feet from the normal high waterline of a stream channel, or from the shoreline of a standing body of water.

**Riparian Ecosystem** - A transition between the aquatic ecosystem and the adjacent upland terrestrial ecosystem. It is identified by soil characteristics and by distinctive vegetative communities that require free or unbounded water.

**Riparian Habitat Conservation Area (RHCA)** - Portions of watersheds where riparian-dependent resources receive primary emphasis and management activities are subject to specific standards and guidelines. Riparian Habitat Conservation Areas were established as INFISH guidelines.

**Risk** - The probability of a hazard and/or the consequences of that hazard (hazards are undesirable events).

**Road Management** - The combination of both traffic management and maintenance management operations. Traffic management is the continuous process of analyzing, controlling, and regulating uses to accomplish National Forest objectives. Maintenance management is the perpetuation of the transportation facility to serve intended management objectives.

**Salvage** – Harvest of trees that are dead, dying, or deteriorating due to fire, wind, insect or other damage, or disease.

**Sapling** - A young tree that is larger than a seedling but smaller than a pole, typically 5 to 25 feet tall.

**Scoping Process** - An early and open process for determining the scope of issues to be addressed and for identifying the issues related to the proposed action.

**Security** - The protection inherent in any situation that allows a wildlife species to remain in a defined area despite an increase in stress or disturbance, such as that associated with hunting season. The components of security include vegetation, topography, the size of the blocks of vegetation, road density, distance from roads, intensity of the disturbance, and seasonal timing.

**Sediment** - Solid material, both mineral and organic, that is in suspension, being transported, or has been moved from its site of origin by air, water, gravity, or ice.

**Seedling** - A young tree that has just germinated but has not yet reached sapling size, typically 1 to 5 feet tall.

**Seedling/Sapling** - A size category for forest stands in which trees less 5 inches in diameter are the predominant vegetation.

**Sensitive Species -** Those wildlife and plant species identified by the Regional Forester for which population viability is a concern because of significant current or predicted downward trends in (a) population numbers or density, or (b) habitat capability that would reduce a species' existing distribution.

**Seral** - A biotic community that is developmental; a transitory stage in an ecologic succession.

**Seral Stage** (also called successional or structural stage) refers to vegetation structural development; and describes the mix and distribution of tree species, sizes, canopy layers, ages, and general conditions in a forest.

**Seral/Structural Stage** - A stage of development of an ecosystem from a disturbed, relatively unvegetated state to a complex, mature plant community.

**Severity** - Refers to the ecological effects of fires, usually on the dominant organisms of the ecosystem, for example a stand dominated by lodgepole pine.

**Shade Intolerant** - Species of plants that do not grow well or die from the effects of too much shade. Generally, these are fire-tolerant species.

**Shade Tolerant** - Species of plants that can develop and grow in the shade of other plants. Generally, these are fire-intolerant species.

**Silviculture** - The theory and practice of controlling the establishment, composition, growth, and quality of forest stands in order to achieve the objectives of management.

**Silvicultural Prescription** - A written document that describes management activities needed to implement silvicultural treatment or treatment sequence. The prescription documents the results of the analysis during the diagnosis phase.

**Silvicultural Systems** - A management process whereby forests are tended, harvested, and replaced, resulting in a forest of distinctive form. It includes all cultural management practices performed during the life of the stand, such as regeneration cutting, thinning, and use of genetically improved tree seeds and seedlings to achieve multiple resource benefits.

**Site Preparation** - A general term for a variety of activities that remove competing vegetation, slash, and other debris that may inhibit the reforestation effort.

**Site Productivity** - Production capability of a specific area of land.

**Slash** - The residue left on the ground after felling and other silvicultural operations and/or accumulating there as a result of storms, fire, or poisoning trees.

**Snag** - A standing dead tree usually greater than 5 feet in height and 6 inches DBH.

**Soil Productivity** - The capacity of a soil to produce a specific crop such as fiber and forage, under defined levels of management. It is generally dependent on available soil moisture and nutrients and length of growing season.

**Spawning Habitat** - Areas of substrate that provide well-oxygenated and suitable sized gravels for fish spawning.

**Species** - A group of actually or potentially interbreeding populations that are reproductively isolated from all other kinds of organisms.

**Stagnation** - A condition where plant growth is markedly reduced or even arrested through, e.g., competition, state of the soil, or disease.

**Stand** - A community of trees or other vegetative growth occupying a specific area and sufficiently uniform in composition (species), age, spatial arrangement, and conditions as to be distinguishable from the other growth on adjoined lands, so forming a silvicultural or management entity.

**Stand Replacement Fire** - Fire that emphasizes the destruction of the living overstory vegetation. See also Lethal fire.

**Stand Replacement Fire Regime** - Stand-replacement fire regimes typically occur on lands that experience predominantly lethal fires, with less than 10 percent of the forested canopy cover remaining after the fire.

**Stand-Replacing Disturbance** - An agent such as fire, blowdown, insect or disease epidemic, or timber harvest that kills or removes enough trees to result in an early-seral/structural stage condition.

**Standards and Guidelines** - An indication or outline of policy or conduct dealing with the basic management of the Forest. Forest-wide management standards and guidelines apply to all areas of the Forest regardless of the other management prescriptions applied.

**Stocking** - A measure of timber stand density as it relates to the optimum or desired density to achieve a given management objective.

**Structure** - The various horizontal and vertical physical elements of the forest, including tree size, canopy composition, quantity and quality of deadwood, ephemeral herbaceous species, density of wildlife trees, fungi, age structure, forest height, etc.

**Subspecies** - Subpopulations or races within a species that are distinguishable by morphological characteristics and, sometimes, by physiological or behavioral characteristics.

**Substrate** - Mineral and/or organic material that forms the stream bed (stream bottom).

**Summer Range** - Land used by wildlife species (specifically big game and/or grizzly bear) during the summer months.

**Succession** - A predictable process of changes in structure and composition of plant and animal communities over time. Conditions of the prior plant community or successional stage create conditions that are favorable for the establishment of the next stage. The different stages in succession are often referred to as "seral stages."

**Temporary Road** - A road constructed to facilitate forest management activities but is rehabilitated soon after the activity is completed.

**Territory** - Any area defended by one or more individuals against intrusion by others of the same or different species.

**Thermal Cover** - Cover used by animals to ameliorate the chilling effects of winter weather or the heating effects of summer weather. For elk, a stand of coniferous trees 40 feet or taller with an average crown closure of 70 percent or more.

**Threatened Species** - Any species, plant or animal, which is likely to become an endangered species within the near future throughout all, or a significant portion, of its range. In accordance with the 1973 ESA, the Secretary of the Interior identifies endangered species.

**Tiering** - Refers to the elimination of repetitive discussions of the same issue by incorporating by reference the general discussion in an environmental impact statement of broader scope. For example, a project EA could be tiered to the Forest Plan EIS.

**Travel Habitat** - Habitat used by a wildlife species for daily or periodic movements between areas of higher-quality habitat. For example, for a lynx this would be the forested cover used while traveling between areas used for denning and that used for hunting.

**Underburning** - A fire that consumes surface fuels but not trees and large shrubs. See also Low Severity Fire and Stand Maintenance Fire.

**Understory** - The trees and other woody species which grow under a more or less continuous cover of branches and foliage formed collectively by the upper portion of adjacent trees and other woody growth.

**Ungulate** - A mammal with hooves.

**Vegetative Succession** - A phase in the gradual supplanting of one community of plants by another.

**Viable Population -** A population which has adequate numbers and dispersion of reproductive individuals to ensure the continued existence of the species population in the planning area.

**Visual Resource** - The composite of basic terrain, geologic features, water features, vegetative patterns, and land use effects that typify a land unit and influence the visual appeal the unit may have for visitors.

**Water Quality** - The physical, chemical, and biological properties of water.

**Water Yield** - The runoff from a watershed, including groundwater outflow.

**Watershed** - The land area drained by a river system.

**Wetland** - Areas that under normal circumstances have hydrophytic vegetation, hydric soils, and wetland hydrology.

**Wilderness** - Federal land retaining its primeval character and influence without permanent improvements or human habitation as defined under the 1964 Wilderness Act. It is protected and managed so as to preserve its natural conditions, which (1) generally appear to have been affected primarily by forces of nature with the imprint of man's activity substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and confined type of recreation; (3) has at least 5000 acres or is of sufficient size to make practical its preservation, enjoyment, and use in an unimpaired condition, and (4) may contain features of scientific, educational, scenic, or historical value as well as ecologic and geologic interest.

**Wildland Fire** - A non-structure fire, other than prescribed fire, that occurs in the wildland. Any fire originating from an unplanned ignition.

**Wildland Urban Interface (WUI)** - That line, area, or zone where structures and other human development meet or intermingles with undeveloped wildland or vegetative fuels.

**Wind Dominated Fire** - The power of the wind is greater than the power of the fire in influencing its behavior.

**Windfirm** - A tree (live or dead) or species of tree that is relatively resistant to being blown over by the wind.

**Windthrow** - A tree or stand of trees that have been blown over by the wind.

**Winter Range** - The areas available to and used by big game during the winter season. Must contain forage or browse to feed big game. Winter range areas tend to have a relatively low amount of snow cover which enables the animals to reach the forage.

**Yarding/whole tree yarding –** The entire tree will be cut, branches and top will be left attached, while trees are delivered to a central landing.

# ACRONYMS

| | |
|---|---|
| **A19** | Amendment 19 |
| **AIFRA** | American Indian Freedom of Religion Act |
| **AOP** | Aquatic Organism Passage |
| **APHIS** | Animal and Plant Health Inspection Service |
| **ARM** | Administrative Rules of Montana |
| **ATV** | All-Terrain Vehicle |
| **BA** | Biological Assessment |
| **BBER** | Bureau of Business and Economic Research |
| **BCR** | Bird Conservation Regions |
| **BE** | Biological Evaluation |
| **BIA** | Bureau of Indian Affairs |
| **BLM** | Bureau of Land Management |
| **BMA** | Bear Management Analysis Area |
| **BMP** | Best Management Practice |
| **BMU** | Bear Management Unit |
| **BO** | Biological Opinion |
| **CAA** | Clean Air Act |
| **CCF** | 100 cubic feet |
| **CEQ** | Council of Environmental Quality |
| **CFLRP** | Collaborative Forest Landscape Restoration Program |
| **CFR** | Code of Federal Regulations |
| **CFS** | Cubic Feet per Second |
| **CSKT** | Confederated Salish and Kootenai Tribes |
| **CWPP** | Community Wildfire Protection Plan |
| **DBH** | Diameter at Breast Height |
| **DEQ** | MT Department of Environmental Quality |
| **DMR** | Designated Monitoring Reach |
| **DN** | Decision Notice |
| **DNRC** | MT Department of Natural Resources and Conservation |
| **DSD** | Detrimental Soil Disturbance |
| **EA** | Environmental Assessment |
| **ECA** | Equivalent Clearcut Acre |
| **EIS** | Environmental Impact Statement |
| **EO** | Executive Order |
| **EPA** | Environmental Protection Agency |
| **ERC** | Energy Release Component |
| **ESA** | Endangered Species Act |
| **FACTS** | Forest Service Activity Tracking System |
| **FAMWEB** | Fire and Aviation Management Web Application |
| **FDR** | Forest Development Road |
| **FEIS** | Final Environmental Impact Statement |
| **FHP** | Forest Health and Protection |
| **FIA** | Forest Inventory and Analysis |
| **FLAMMAP** | Fire Behavior Mapping and Analysis Program |
| **FMU** | Fire Management Unit |
| **FOFEM** | First Order Fire Effect Model |
| **FONSI** | Finding of No Significant Impact |
| **Forest Plan** | Land and Resource Management Plan |
| **FR** | Federal Register |
| **FRCC** | Fire Regime Condition Classes |
| **FS** | Forest Service |
| **FSH** | Forest Service Handbook |
| **FSM** | Forest Service Manual |
| **FSVeg** | Field Sampled Vegetation |
| **FVS** | Forest Vegetation Simulator |
| **GIS** | Geographic Information System |
| **GNP** | Glacier National Park |
| **GTR** | General Technical Report |
| **HFRA** | Healthy Forests Restoration Act |
| **HRV** | Historic Range of Variability |
| **ID Team** | Interdisciplinary Team |
| **IMBCR** | Integrated Monitoring in Bird Conservation Regions |
| **IMPLAN –** | IMpact analysis for PLANning |
| **INFISH** | Inland Native Fish Strategy |
| **ISS** | Intermittent Stored Service |
| **LANDFIRE** | Landscape Fire and Resource Management Planning Tools Project |
| **LAU** | Lynx Analysis Unit |
| **LCAS** | Lynx Conservation Agreement Strategy |
| **LDM** | Larch Dwarf Mistletoe |
| **LWCF** | Land and Water Conservation Fund |
| **MA** | Management Area |
| **MAFI** | Mean Annual Fire Intervals |
| **MAPS** | Monitoring Avian Productivity and Survivorship |
| **MBF** | Thousand Board Feet |
| **MFWP** | Montana Department of Fish, Wildlife & Parks |
| **MFI** | Mean Fire Interval |
| **MIS** | Management Indicator Species |
| **ML** | Maintenance Level |
| **MMA** | Maximum Management Area |
| **MMBF** | Million Board Feet |
| **MNHP** | Montana Natural Heritage Program |
| **MOU** | Memorandum of Understanding |
| **MPB** | Mountain Pine Beetle |
| **MPDES** | Montana Pollutant Discharge Elimination System |
| **MS** | Management Situation |
| **MS** | Mixed Severity |
| **MTSHPO** | Montana State Historic Protection Office |
| **NAAQS** | National Ambient Air Quality Standards |
| **NAGPRA** | Native American Graves Protection and Repatriation Act |
| **NAIP** | National Agriculture Imagery Program |
| **NCDE** | Northern Continental Divide Ecosystem |
| **NEPA** | National Environmental Policy Act |
| **NFDRS** | National Fire Danger Rating System |
| **NFMA** | National Forest Management Act |
| **NFS** | National Forest System |
| **NHPA** | National Historic Preservation Act |
| **NIFMID** | National Interagency Fire Management Integrated Database |
| **NIWC** | Noxious and Invasive Weed Control |
| **NPS** | National Park Service |
| **NR** | Not Recorded |
| **NRCS** | Natural Resources Conservation Service |
| **NRIS** | Natural Resource Information System |
| **NRLMD** | Northern Region Lynx Management Direction |
| **NTMB** | Neotropical Migratory Bird |
| **NWCG** | National Wildland Fire Coordinating Group |
| **OHV** | Off-Highway Vehicle |
| **OMB** | Office of Management and Budget |
| **ORD** | Open Road Density |
| **PCE** | Primary Constituent Elements |
| **PCTC** | Plum Creek Timber Company, LLP |
| **PL** | Public Law |
| **PM** | Particulate Matter |
| **PNV** | Present Net Value |
| **PSD** | Prevention of Significant Deterioration |
| **PVG** | Potential Vegetation Groups |
| **R1PA** | Region One Programmatic Agreement |
| **RAWS** | Remote Access Weather Station |
| **RFSS** | Regional Forester's Sensitive Species |
| **RHCA** | Riparian Habitat Conservation Area |
| **RMO** | Road Management Objectives |

| | | | |
|---|---|---|---|
| **RMRS** | Rocky Mountain Research Station | **TPL** | Trust for Public Land |
| **ROD** | Record of Decision | **TRD** | Total Road Density |
| **SDMP** | Soil Disturbance Monitoring Protocol | **TSMRS** | Timber Stand Management Record System |
| **SEC** | Swan Ecosystem Center | **USC** | United States Code |
| **SIAM** | Structure Ignition Assessment Model | **USDA** | United States Department of Agriculture |
| **SIS** | Site Identification Strategy | **USDI** | United States Department of the Interior |
| **SMZ** | Stream Management Zone | **USFWS** | United States Fish and Wildlife Service |
| **SOPA** | Schedule of Proposed Activities | **USGS** | United States Geological Survey |
| **SPA** | Streamside Protection Act | **UV** | Ultra Violet |
| **SVGBCA** | Swan Valley Grizzly Bear Conservation Agreement | **VMAP** | Vector Map |
| | | **VQO** | Visual Quality Objectives |
| **SWCP** | Soil and Water Conservation Practices | **WATSED** | Water Yield and Sediment Model |
| **TAP** | Travel Analysis Process | **WEPP** | Water Erosion Prediction Project |
| **TES** | Threatened and Endangered Species | **WFDSS** | Wildland Fire Decision Support System |
| **TMDL** | Total Maximum Daily Load | **WRA** | Weed Risk Assessment |
| **TNC** | The Nature Conservancy | **WUI** | Wildland Urban Interface |
| **TPA** | Tons Per Acre | **WWPA** | Western Woods Products Association |

# APPENDIX E
# LIST OF PREPARERS

The following individuals assisted with the development of the Beaver Creek Landscape Restoration Project Environmental Assessment.

**TABLE E-1. LIST OF PREPARERS.**

| ID TEAM MEMBER | TITLE | AREA OF CONTRIBUTION |
|---|---|---|
| Rich Kehr | District Ranger | Project Oversight and Guidance |
| Sarah Canepa | Planning Team Leader | Project Oversight |
| Chantelle DeLay | Botanist | Plants and Invasive Species |
| Mark Ruby | Wildlife Biologist | Wildlife |
| Beth Gardner | Fisheries Biologist | Aquatics |
| Joleen Dunham | Recreation Specialist/ Planning Team Leader | Recreation, Wilderness, Land, Range and Project Oversight |
| Tim Light | Archeologist | Heritage Resources |
| Derek Milner | Soil Scientist | Soils |
| Greg Karow, John Bassman, Carol Young, Elisa Stamm, Melisa Jenkins | Silviculturist | Forest Vegetation and Project Oversight |
| Andy Reed | Forester/Planning Team Leader | Economics |
| Justin Kaber/Brent Olson | Fire/Fuels Specialist | Fire and Air |
| Mitch Guenthner | Engineering Coordinator | Transportation System |
| Sue Tebay | Writer/Editor/ Planning Team Leader | Writing, Editing and Project Oversight |
| Byron Stringham | Landscape Architect | Visuals |
| Michele Draggoo | Forest NEPA Program Leader | NEPA Guidance |

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