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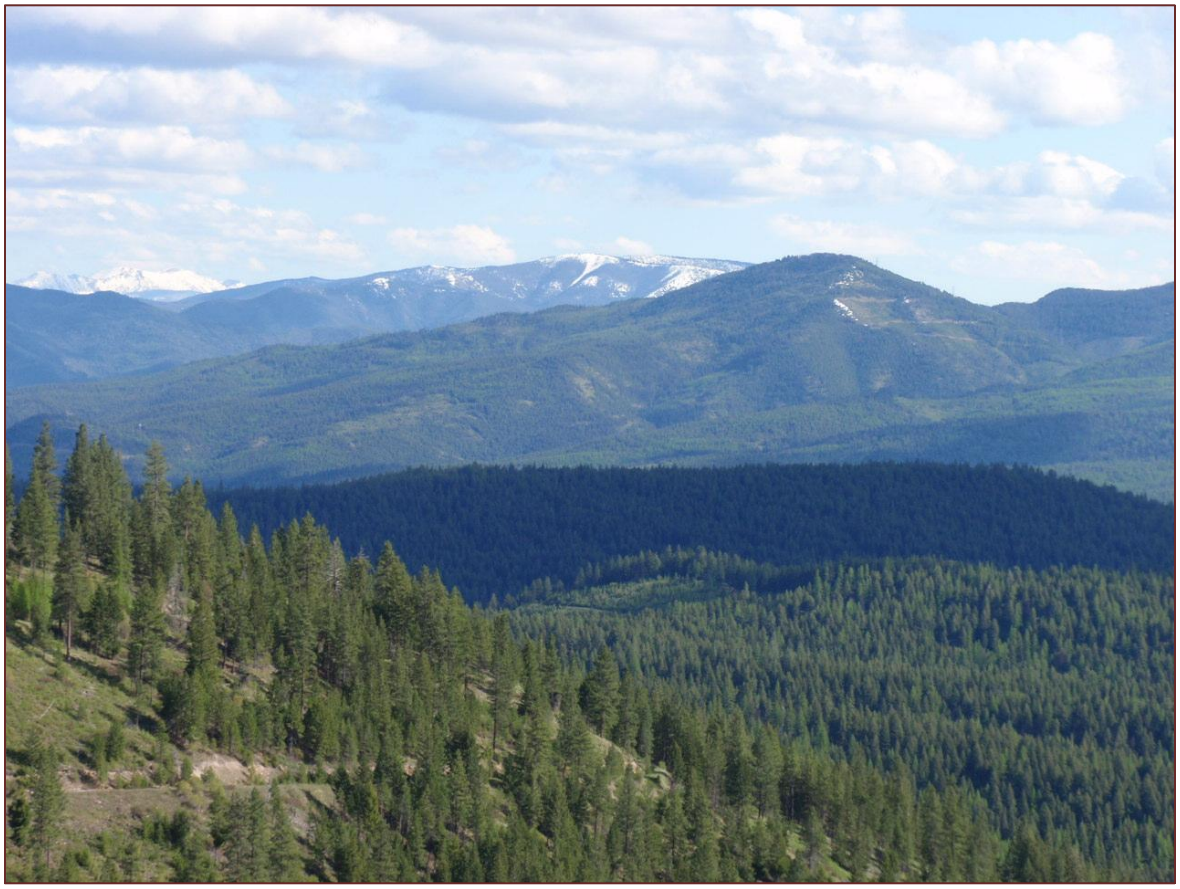
Rennic Stark Project

Ninemile Ranger District, Lolo National Forest
Missoula County, Montana



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CHAPTER 1 PURPOSE AND NEED FOR ACTION

INTRODUCTION

The Lolo National Forest is proposing land management activities within the 35,500-acre Rennic Stark project area on the Ninemile Ranger District. Proposed activities include: vegetation management, (e.g., commercial harvest, non-commercial tree cutting, prescribed burning, weed treatment, and tree planting); road treatments (e.g., decommissioning, storage, and maintenance); watershed improvements (e.g., culvert replacements and removals and stream channel reclamation); and the reconstruction/re-graveling of the Cedar Creek Trailhead. This work would likely be implemented in phases over a 5-to 10-year period which is anticipated to begin in fall 2013.

The purpose of this Environmental Assessment (EA) is to comply with the National Environmental Policy Act (NEPA) and to provide sufficient evidence, analysis and basic conclusions for the deciding officer to determine whether to prepare an environmental impact statement (EIS) or a finding of no significant impact (FONSI) [1]. The Ninemile District Ranger is the responsible official for this project's decision. The decision to be made by the Ranger is whether to implement the proposed action, modify the proposed action, or take no action at this time. This EA provides a "hard look" at the question of whether the consequences of the proposed action, given the intensity and the context of the impacts, are "significant." **All numbers throughout this EA are approximations as are mapped proposed treatments**.

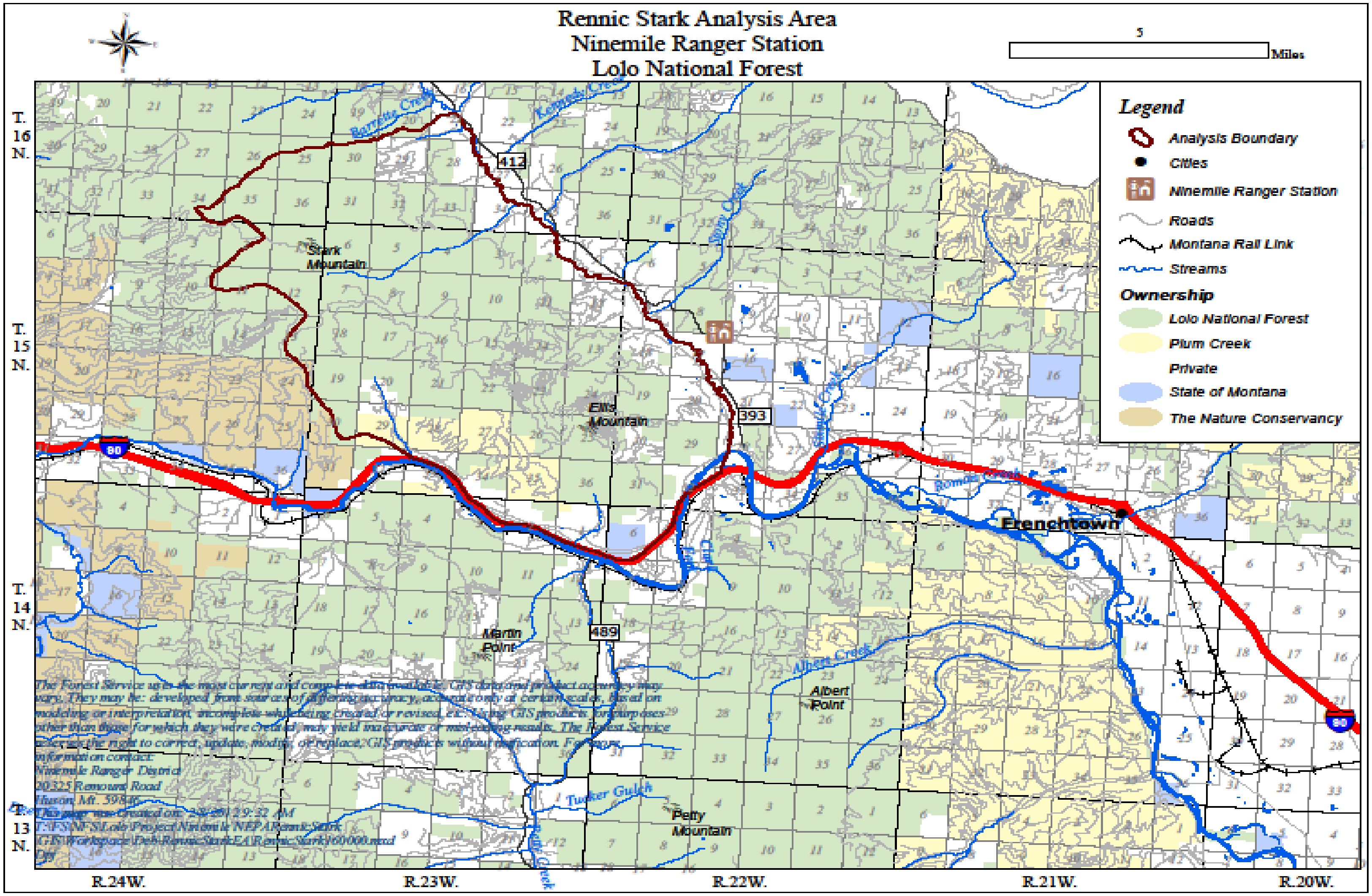
This document is intended to be a concise summary. More detailed information by resource, including discussions about analysis area boundaries, effects analysis indicators and methodology, and the affected environment can be found in the individual resource reports. These reports are posted the Lolo National Forest's website at fs.usda.gov/goto/lolo/projects. The abbreviation "PF" is used in this document to cite information located in the project file, which is located at the Missoula Ranger District, Fort Missoula, Building 24, Missoula, MT.

PROJECT LOCATION AND SETTING

The Rennic Stark analysis area is located just west of the Ninemile Ranger Station in Mineral and Missoula Counties. It straddles the Ninemile Divide from the Clark Fork River at the analysis area's southern boundary to Fire Creek at the north end of the area (see Map 1). Activities are proposed on National Forest System (NFS) lands which consist of about 70% of the analysis area.

[1] 40 CFR 1508.9

Map 1 - Rennic Stark Analysis Area



Forest Service system roads and trails provide access to the area for dispersed recreation activities which primarily include hiking, hunting, horseback riding, driving for pleasure, and viewing natural features. The analysis area has about 192.9 total miles of road; about107.7 of those are located on NFS lands, and the rest are on other state and private lands, 14.9 miles of which are under county jurisdiction. About 24.3 miles of NFS roads (35%) are drivable and open to public motorized travel year-round. The main roads used for recreation include Rennic Road (#5511), Cedar Rennic Road (#5515), and Ellis Road (#380). The area is also used extensively by the public for firewood cutting and during the hunting seasons. The Stark Mountain Lookout is staffed during the summer months and is a popular destination for Forest visitors driving up from the east side of the Ninemile Divide. Other infrastructure includes the Bonneville Power Administration (BPA) Garrison-Taft 500-KV transmission line, which cuts across the southern portion of the analysis area, the Missoula County communication site ("Alberton Beacon") on the ridge 1 mile to the southwest of Ellis Mountain, the Forest Service communication site 1.5 miles to the northwest of Ellis Mountain, and power and telecommunication lines serving residences. There is little snowmobile use in the analysis area. Several of the main use gated roads are commonly used for hunting, firewood gathering, berry picking, and horseback riding. Many of the roads adjacent to private land receive frequent use by residents.

The forested vegetation within the Rennic Stark area was primarily shaped by large-scale fire events in the early 1900s, although about 9% of National Forest System lands within the analysis area have had some type of recorded harvest activity. The majority of the recorded harvest (about 43%) occurred in the 1990s and involved thinning along the boundary with private land to reduce stand density and fire hazard. Approximately 1,756 acres were harvested from the 1960s through 1980s, and many of these treatments were regeneration harvests that reestablished young forests.

About 25% (6,180 acres) of the NFS land in the analysis area is in the Stark Mountain Inventoried Roadless Area (IRA) #01800. Management activities have occurred on approximately 225 acres within the IRA inside the analysis area boundary. They include: low intensity underburning (2004), insect control (2008-2010), commercial harvest (1954 – 1993), and tree planting (2008). Management activities that have occurred within the analysis area outside of the IRA include wildfire suppression, timber harvest, road and trail construction and maintenance, road decommissioning, noxious weed control, tree planting, and livestock grazing (See Appendix D).

PURPOSE AND NEED FOR ACTION

The purpose and need for the Rennic Stark project was derived from the differences between the desired landscape conditions and current conditions related to forest vegetation and fuels, and wildlife and aquatic habitat. This project is proposed to address the following:

Restore functioning ecosystems by enhancing natural ecological processes

- Maintain and enhance resilience and resistance of vegetative communities while maintaining naturally appearing scenery.
- Maintain or increase shade-intolerant fire-resistant species.

The large-scale fire events in the early 1900s largely shaped the forested vegetation patterns within the Rennic Stark area. These wildfires resulted in conditions consistent with the stand initiation phase of stand development over the majority of the analysis area (Oliver and Larsen, 1996). While some residual overstory survived these fires, the forests that currently occupy the area, by in large, regenerated in response to these disturbance events. Aspect, elevation, temperature, moisture regimes and seed availability and dispersal approximately 90 years ago led to the establishment of the forests we see today in the Rennic Stark area. The type, size, scale, arrangement, duration, intensity and species affected in subsequent disturbance events will dictate how forest development patterns emerge after their occurrence.

Following nearly 100 years since the first of these disturbances, much of the forested area has moved into the stem exclusion phase of stand development. During stem exclusion, intense inter-tree competition precludes the establishment of most new individuals (Oliver and Larsen, 1996). Most of the forested area within the Rennic Stark area is presently experiencing extreme physiological competition, consistent with stem exclusion, and corresponding losses to insects and disease due to poor vigor and resilience to insect attack. Shade-intolerant pines are losing live crown ratio, thinning from the center, and experiencing increasing losses. As ponderosa pine and lodgepole pine crowns thin, more diffuse light reaches Douglas-fir or other shade-tolerant species in the understory allowing their survival. Over time, the competitive advantage may shift to Douglas-fir and grand fir as the pines struggle with the demands placed on their limited photosynthae and succumb to insects, disease, and competition (Oliver and Larsen, 1996).

Without fire as a disturbance agent, the forested lands are shifting towards uniform, overstocked stands dominated by shade-tolerant species. These conditions predispose stands to stand-replacing fire events and insect and disease epidemics (Graham et al., 2004).

Noxious weed infestations also affect the natural function of ecosystems in the analysis area. Spotted Knapweed is the most widespread weed within the analysis area, particularly in open south-facing slopes and along road right-of-ways. St. Johnswort infestations occur on several road right-of-ways including Ellis Road (#380), Road 5510 and several BPA roads. St. Johnswort also occurs on the south-facing slopes above the Stark Mountain Lookout Trail and has likely spread to other open areas. Infestations of Houndstongue, Canada Thistle, Cheatgrass and Bull Thistle have been documented along roads within the analysis area. Infestations of leafy spurge occur within the Eddy Creek Winter Range area. The BPA powerline right-of-way and access roads are infested with Spotted Knapweed and St. Johnswort and act as vectors for weed spread. In addition, there are permitted special-use sites such as electronic sites within the analysis area and roads that access those sites. Spotted Knapweed is prevalent at those sites and along the access roads. An isolated infestation of Diffuse Knapweed has been treated at one site.

Re-establish fire as a natural process on the landscape

- Reduce potential for crown fire initiation and fireline intensity in stands that are within 1.5 miles of private property and infrastructure (e.g., power line corridor and communication sites).
- Enhance firefighter efficiency and public safety.
- Rearrange and reduce continuity of fuels and provide for age class diversity within the Stark Mountain IRA along the Ninemile Divide.

The Rennic Stark Project area is located in the "Intermix Interface", which as defined by the Community Wildfire Protection Plans for both Missoula and Mineral Counties, is "locations where structures are scattered throughout lands with wildland fuels continuous outside and within the developed area". Within the project area there are approximately 19,540 acres that are deemed wildland-urban interface. These acres are located along the Ninemile Valley, town of Alberton, and the West Mountain Creek Drainage. Both the Missoula and Mineral County Community Wildland Fire Protection Plans identify the Rennic Stark Project area as an area at risk and in need of hazardous fuels reduction activities. The power line corridor and communication sites within the project area are of high value and in need of protection from any wildfire events. Fuels treatments within 1.5 miles of private ownership, the power line corridor, and communication sites are needed to reduce the potential for crown fire initiation and fireline intensities.

Studies indicate the most appropriate fuel treatment strategy for reducing hazardous fuels includes forest thinning (removing ladder fuels and decreasing tree crown density) followed by prescribed burning, piling and burning of fuels, or other mechanical treatments (Peterson, 2005). Other research shows that treating areas before fire begins can decrease the severity of fire (Strom and Fule, 2007; Peterson, et. al, 2005; Omi and Martinson, 2004; Agee and Skinner, 2005; Graham, 2004; Pollet and Omit, 202; Fuel, et. a.l

2001). However, in extreme weather conditions, such as drought or very high winds, fuel treatments may do little to mitigate fire spread or severity (Pollet and Omni, 2002).

Treatments on NFS lands in the project area would reduce fire intensity and crown fire potential, but may not directly protect all homes. Wildfire mitigation focused on structures and their immediate surrounding may be the most effective at reducing structure ignitions (Cohan, 1999, 2000, and 2002; Scott, 2003).

While individual home-by-home treatments can help reduce the risk of structure loss, relying solely on such treatments could forego strategic opportunities for suppressing wildfires within the wildland-urban interface. Although homes in the path of wildfire are often the most recognized value-at-risk, treatments need to go beyond the home ignition zone to protect other resource values that make up the forested setting including soil stability, wildlife habitat, water quality, timber value, and landscape aesthetics (Graham, 2004).

Studies have found that the loss of structures and other resource damage from wildfires can be limited by fuel treatments conducted prior to fires (Graham, 2009). In addition to modifying wildfire intensity, the severity of effects to vegetation and soils in previously treated areas can be lower than in areas not treated prior to wildfire. Studies have also found that by modifying fire behavior, lower impact suppression methods can be used. Because of the lower burn intensity in treated areas, firefighters are able to remain within the area to suppress spot fires ignited ahead of the wildfire. Therefore, fuel treatments, like those proposed in this project, can be used to create irregular forest structures and compositions that produce forests that are more resilient to wildfire.

Improve terrestrial habitat and connectivity

- Maintain or improve terrestrial and aquatic habitat and landscape connectivity for wide ranging wildlife and fish species including big game and carnivore species.
- Increase the diversity of the understory to improve cover/forage conditions for snowshoe hare in potential lynx habitat.
- Improve forage quality and plant species diversity on big game winter range.
- Promote development of large trees (as well as snags and down wood) for flammulated owls, northern goshawks and pileated woodpeckers.
- Create stand conditions that would retain and enhance resilience of large diameter (>=21 dbh) ponderosa pine and western larch.

The Ninemile/Reservation Divide and Ninemile Valley is considered part of a broad-scale linkage zone that provides connectivity for forest carnivores (grizzly bear, Canada lynx, wolverine, and others) from the Mission and Rattlesnake Wilderness areas to the Selway-Bitterroot Wilderness and beyond (IGBC 2004, MFWP 2010). The Rennic Stark project area encompasses a portion of the Ninemile Divide. For forest carnivores, providing connectivity between populations that may be subdivided geographically or to suitable areas that are currently unoccupied is crucial to recovering and maintaining species viability. Reducing road density by decommissioning roads or placing them in long-term storage, as is proposed in this project, would increase habitat security and landscape connectivity.

While official records of lynx occurrences haven't been reported in the analysis area in over 10 years, the area is managed as occupied lynx habitat. Suitable lynx habitat occurs in small scattered patches at higher elevations near the Ninemile Divide and then extends north and west out of the analysis area to the boundary between the Ninemile Ranger District and Bureau of Indian Affairs land. Applying prescribed fire in the inventoried roadless area is needed to increase structural diversity which could increase foraging potential for lynx.

FWP identified a decline in forage plants for elk on NFS lands in the analysis area (MTFWP 2005). The decline has been attributed to a lack of disturbance in areas where shrub fields, created by past fires and timber harvest, have grown in with conifers. Winter range on the periphery of the analysis area has been actively managed with prescribed fire and noxious weed treatments. No large wildfires have occurred since the early 1900s (see Fire and Fuels Specialist's Report); however one small fire (689 acres) occurred in 2000. Aggressive fire suppression would continue that, and if effective, could contribute to the downward trend in elk forage in some areas. Applying prescribed fire would stimulate grass and shrub growth increasing forage for big game. Prescribed burning on the Lolo NF in particular has been shown to increase forage production on elk winter range (Hillis and Applegate 1998).

Invasive plants, particularly knapweed, have become an issue along roads and trails that bisect elk winter range. This has the potential to reduce forage for elk and other species. Past commercial timber harvest and development and use of the road system within the area has also introduced noxious weeds that compete with native vegetation and reduce forage value. Effects associated with weed population enlargement may include declines in the palatability or abundance of wildlife and forage (Rice et al., 1997), declines in native plant diversity (Forcella and Harvey, 1983; Tyser and Key, 1988), and an overall decline of ecosystem health. Vegetation management, prescribed fire, noxious weed treatments, and road management could improve foraging opportunities for elk and other wildlife.

Large trees, both live and dead (snags), are important to a variety of species including flammulated owls, northern goshawks and pileated woodpeckers. For instance, pileated woodpeckers require large trees for nesting, excavating a new nest cavity each year (Bull and Jackson, 1995). Flammulated owls then use cavities excavated in previous years by primary cavity nesters (such as the pileated woodpecker) and require a supply of suitable cavities (McCallum, 1994). Because of the large fires of the early 1900s, the analysis area is overrepresented by trees in the 5 to 9.9" DBH size class and underrepresented by larger sized trees. Young Douglas-fir trees are suppressing the recruitment of shade-intolerant species and large trees and reducing the amount of open understory needed as foraging areas. Restoring the open character of ponderosa pine and dry Douglas-fir stands through thinning and applying prescribed fire would create conditions that would promote the development and enhance the resilience of large diameter trees (as well as snags and down wood). In addition vegetation treatments that reduce the potential for severe fire effects would aid in maintaining nesting and foraging habitat and create areas with more vigorous, healthy, heterogeneous vegetative components adding biodiversity to the analysis area.

Improve aquatic habitat and connectivity.

- Protect and improve overall watershed health, including stream health, soil quality and function, and riparian function.
- Improve and maintain watershed and aquatic conditions by improving hydrologic function, water quality, aquatic species passage, and habitat.
- Improve aquatic habitat connectivity, reduce sediment production and delivery, and reduce road density while providing the most efficient system for long-term management goals.

Much work has been done in the Ninemile Drainage to improve watershed health and aquatic habitat. Ninemile Creek itself drains about 120,000 acres; the Rennic Stark analysis area encompasses the lower half of the watershed on the west side between Fire Creek and the Clark Fork River (about 36,000 acres). While there are no documented past or current mining related undertakings within the Rennic Stark analysis area boundary, Ninemile Creek and many of its tributaries have a long history of surface mining. In many areas, disturbance from large-scale placer mining has altered streams and impacted riparian habitat. Since 2000, when several large fires burned across the Ninemile drainage, the Forest Service has worked alongside other agencies and organizations to improve water quality and fish habitat in Ninemile Creek and its tributaries.

Immediately after the fires, the Lolo National Forest and Missoula County completed a variety of projects to improve fish passage, stream flows, and water quality. These projects included: maintaining, relocating, and closing NFS roads to reduce sediment delivery to nearby streams, and replacing undersized culverts and bridges on Forest and county roads.

Starting in 2003, the Lolo National Forest, the Ninemile Watershed Group, Trout Unlimited, and Missoula County began cleanup of mine-related disturbances in the Ninemile Drainage. Numerous reclamation projects have been completed. These and other projects to replace/resize culverts and bridges, upgrade roads, relocate roads, and conduct in-stream channel restoration work have improved riparian function and aquatic habitat within the bigger landscape of the Ninemile Drainage. Activities proposed in the Rennic Stark project would complement these activities, further improving the trends and conditions of the watersheds in this area.

Watershed conditions vary across the Rennic Stark analysis area. Some streams are in a relatively unaltered condition and are functioning at or near desired conditions. Others have dewatered sections, fragmented habitats, lack of large wood, roads encroaching on streams, and high road densities leading to frequent and often undersized drainage crossings and high sediment deliveries. Ninemile, Nemote, and Cedar Creeks are listed as impaired water bodies on the State's 303(d) list. The State's Total Maximum Daily Load (TMDL) plan for Ninemile Creek was completed in 2005. Restoration work is needed and would help meet the TMDL plan. Road upgrades, maintenance, storage, decommissioning, and culvert removals and/or replacements would help to reduce road surface sediment inputs into streams in the long term. Resizing of culverts, culvert removals, and road decommissioning would minimize the long-term risk of mass failure and major sediment delivery. Reducing road densities also contributes favorably towards improvement in shading, large woody debris input, and floodplain and stream structure and function. Silvicultural and fuel treatments would reduce potential wildfire intensities and contribute to managing for more natural water yields.

Integrate restoration with socio-economic well-being.

- Provide opportunities to maintain the forest industry infrastructure (forest products, watershed improvement workforce, and fuels reduction workforce) for future management needs, while benefiting local communities.
- Provide recreation opportunities.

The combination of small towns and rural settings, along with people from a wide variety of backgrounds, provides a diverse social environment for the geographical region around the Lolo National Forest, including the Ninemile Ranger District. Local residents pursue a wide variety of lifestyles but many share a common theme—an orientation to the outdoors and natural resources. This is reflected in both vocational and recreational pursuits including employment in logging and milling operations, outfitter and guide businesses, hiking, hunting, fishing, camping, and many other recreational activities. Timber, tourism, and agricultural industries are important to the economy of local areas. Visitor information collected on the Lolo NF during 2006 indicates that over 1.4 million visits occurred Forest-wide. Main activities were primarily focused on dispersed recreation including hiking/walking, relaxing, hunting, snowmobiling, and viewing natural features.

The management of the natural resources on the Lolo National Forest has the potential to affect local economies. People and economies are an important part of the ecosystem. Use of resources and recreational visitation to the national forests generate employment and income in the surrounding communities and counties, and generate revenues returned to the Federal treasury or used to fund additional on-the-ground activities to accomplish resource management objectives.

REGULATORY DIRECTION

Forest Service Manual (FSM) 2020 provides foundational policy for using ecological *restoration*[2] to manage National Forest System lands in a *sustainable*[3] manner. The aim is to reestablish and retain ecological *resilience*[4] of National Forest System lands and associated resources to achieve sustainable management and provide a broad range of *ecosystem services*[5]. 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 2020.20).

Activities proposed in the Rennic Stark Project tier to the 1986 Lolo Forest Plan, which provides guidance for managing the Forest. Treatments are primarily proposed within MAs 1, 10, 14, 16, 17, 18, 21, 23, and 25. Project activities are not proposed in riparian areas (MA 13). Table 1 summarizes the Forest Plan Management Area direction for the project.

Table 1 Management Areas in the Rennic Stark Analysis Area

Reference	Goal
MA 1 – Non-forest (Forest Plan, page III-2)	Maintain near-natural conditions.
MA 10 – Small, unroaded (Forest Plan, page III-30)	Maintain in natural condition to protect basic soil and water resources and provide for activities that meet other resource objectives if they are appropriate without developing the area.
MA 13 - Riparian (Forest Plan, page III-56)	1. Manage riparian areas to maintain and enhance their value for wildlife, recreation, fishery and aquatic habitat, and water quality. 2. Provide opportunities to improve water quality, minimize erosion, and strengthen or protect streambanks through specifically prescribed vegetation manipulation and/or structural means. 3. Provide opportunities to improve fisheries and wildlife habitat through specifically prescribed vegetation manipulation and/or structural means. 4. Provide for healthy stands of timber and manage timber to give preferential consideration to riparian-dependent species on that portion of the management area classified as suitable for timber production.
MA 14 – Riparian but with Grazing (Forest Plan, page III-64)	1. Same as MA13, but while maintaining livestock grazing compatible with the above resources. 2. Same as MA13. 3. Same as MA13. 4. Same as MA13.
MA 16 - Timber Management (Forest Plan, page III-70)	1. Provide for healthy stands of timber and optimize timber growing potential. 2. Develop equal distribution of age classes to optimize sustained timber production. 3. Provide for dispersed recreation opportunities, wildlife habitat, and livestock

[2] The process of assisting the recovery of resilience and adaptive capacity of ecosystems that have been degraded, damaged, or destroyed. Restoration focuses on establishing the composition, structure, pattern, and ecological processes necessary to make terrestrial and aquatic ecosystems sustainable, resilient, and healthy under current and future conditions (FSM 2020.5).

[3] Meeting needs of the present generation without compromising the ability of future generations to meet their needs (FSM 2020.5). Sustainability is composed of desirable social, economic, and ecological conditions or trends interacting at varying spatial and temporal scales, embodying the principles of multiple-use and sustained-yield (FSM 1905).

[4] The capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks (FSM 2020.5).

[5] **B**enefits people obtain from ecosystems (FSM 2020.5).

Reference	Goal
	use. 4. Maintain water quality and stream stability.
MA 17 – Timber Management but with Slopes >60% (Forest Plan, page III-78)	1. Same as MA16. 2. Same as MA16. 3. Provide for maintenance of soil productivity and other resource values.
MA 18 - Winter Range (Forest Plan, page III-83)	1. Optimize forage production and cover for deer, elk, and bighorn sheep on winter range. 2. Considering the needs of big game, maintain healthy stands of timber and optimize timber growing potential.
MA 21 – Old-growth (Forest Plan, page III-104)	1. Provide for old-growth succession in timber stands with an optimum arrangement of habitat components to maintain viable populations of old-growth dependent wildlife species. 2. Provide opportunities for nonmotorized dispersed recreation.
MA 23 - Partial Retention (Forest Plan, page III-112)	1. Achieve the visual quality objective of partial retention. 2. Provide optimal cover:forage ratios for deer, elk, and bighorn sheep winter range within the constraints of Goal 1. 3. Maintain healthy stands of timber within the constraints imposed by Goals 1 and 2.
MA 25 - Partial Retention (Forest Plan, page III-127)	1. Achieve the visual quality objective of partial retention. 2. Provide for healthy stands of timber and optimize timber growing potential within the constraints imposed by Goal 1, while providing for dispersed recreation opportunities, wildlife habitat, and livestock use.

In addition to following the guidance discussed above the Rennic Stark project aligns with several of the 13 Restoration Principles developed by the Lolo Restoration Committee (LRC). The LRC is a diverse group of local volunteers including representatives of environmental organizations, motorized users, outfitters, timber industry, state government, and the Forest Service, which was formed in 2007. It is a private initiative not convened or managed by the Forest Service. The LRC has collaborated with the Lolo National Forest (LNF) on restoration projects on several ranger districts. To learn more about the LRC and its parent organization, the Montana Forest Restoration Committee (MFRC) visit http://www.montanarestoration.org/home .

PROPOSED ACTION – ALTERNATIVE 2

Map 2 – Rennic Stark Alternative 2

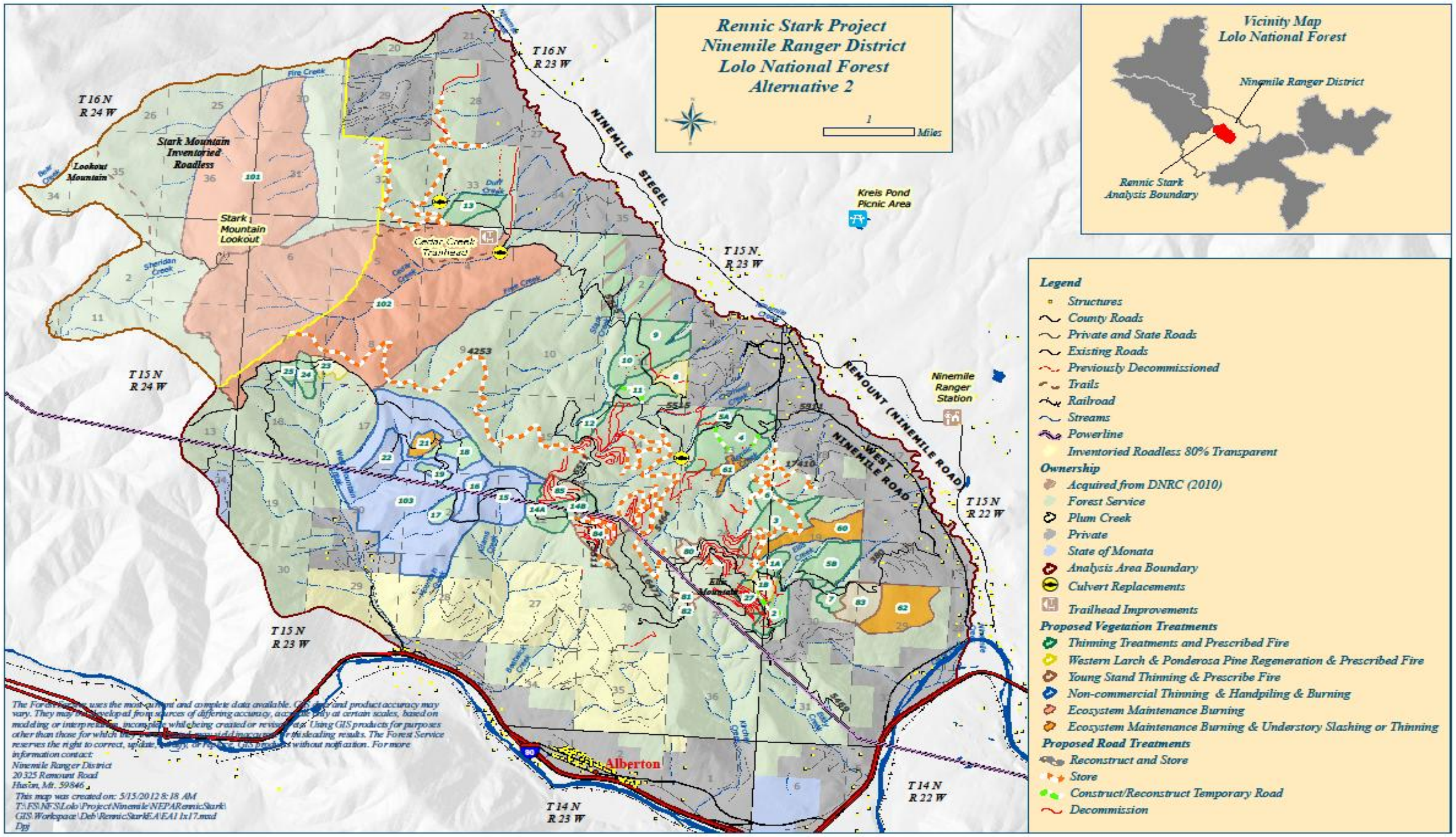


Table 2 Rennic Stark Proposed Action Treatment Summary

Activity	Amount
Proposed Vegetation Treatments (acres)	
Thinning Treatments and Prescribed Fire	1,823
Western Larch and Ponderosa Pine Regeneration and Prescribed Fire	153
Young Stand Thinning and Prescribed Fire	404
Non-commercial Thinning and Handpiling and Burning	1571
Ecosystem Maintenance Burning	4787
Ecosystem Maintenance Burning and Understory Slashing or Thinning	463
Total proposed treatments (acres)	9,201
Other Proposed Vegetation Treatments (acres)	
Plant blister-rust resistant whitebark pine	≤100
Plant ponderosa pine and western larch	≤153
Ground-based Noxious Weed Treatments	>2000
Yarding Systems (acres)	
Winter ground-based yarding	548
Summer ground-based yarding	796
Skyline yarding	631
Estimated timber harvest volume (ccf)	10,704
Proposed Road Treatments (miles)	
Add to System and Store	4.4
Store System Road	17.9
Reconstruct System Road and Store	0.1
Retain System Road	51.2
Reconstruct Previously Decommissioned Road as Temporary Road	0.2
Previously Decommissioned Nonsystem Road but Needs Further Mitigation	0.8
Decommission Nonsystem Road	27.0
Decommission System Road	1.6
Construct Temporary Road	1.0
Reconstruct Nonsystem Road as Temporary Road	0.3
BMP/maintenance	34.3
Other Road/Stream Channel Treatments (each)	
Fish barrier culverts removed/replaced	3
Rehabilitate road/skidding operation in Cromwell Creek	1
Proposed Recreation Improvement (acres)	
Re-construct/re-gravel Cedar Creek Trailhead	1/10

PUBLIC INVOLVEMENT

In May, 2009 an ID Team was assembled to evaluate resource opportunities in the project area. Prior to public scoping in March 2010, the project was presented to the Lolo Forest Restoration Committee (LRC). The presentation to the LRC demonstrated how the project proposals tie directly to several of the 13 Restoration Principles (see PF, I-2).

RENNIC STARK PROJECT PUBLIC INVOLVEMENT SUMMARY

- February 9, 2010 - Ninemile District Ranger Chad Benson presented the Rennic Stark project to the LRC.
- March 8, 2010 - Scoping letter sent to 383 individuals, organizations, agencies, and Confederated Salish and Kootenai Indian Tribe. The legal notice, published in the *Missoulian*, ran concurrently with the scoping letter. Thirteen comments were received.

In addition, as part of the public involvement process:

- The Rennic Stark project has been listed in the Lolo NF Schedule of Proposed Actions website and publicly distributed in the quarterly reports since April 2010.
- Information about the project (e.g., scoping letter, maps) is posted on the Lolo NF Plans and Projects webpage fs.usda.gov/goto/lolo/projects.

ISSUE RESOLUTION

In response to scoping, the Forest received 13 comments from the public. Some of those who commented support the project, although several expressed specific concerns and desires about the project including: creating sustainable resilient forest conditions; minimizing impacts from road treatments to resources and recreational use; minimizing adverse impacts to fish, wildlife, and old-growth; and reducing weed establishment.

No unresolved issues (cause-effect relationship) were identified that required the development of alternatives to the proposed action. Rather, public comments and resource issues were addressed by: 1) modifying the proposed action and developing project design criteria and resource protection measures to avoid, offset, or reduce any potential effects of the project; or by, 2) incorporating the comment into the analysis process to check and confirm that no significant effects would be caused by the treatments.

Below is a list of several of the public concerns. Other concerns are addressed in the effects analyses under the environmental consequences sections of the Specialists' Reports and the EA. A content analysis of the comments and the disposition or summary of the analysis of those comments is located in Appendix C.

PUBLIC CONCERNS

Concern: Vegetation treatments may affect habitat needs for flammulated owls and pileated woodpeckers.

Response: The effects of the proposed vegetation treatments on these two species is analyzed and disclosed in Chapter 3 Affected Environment and Environmental Consequences - Wildlife section as well as in depth in the Wildlife Specialist's Report located at fs.usda.gov/goto/lolo/projects. In addition, Resource Protection Measures 7-9 listed in Chapter 2 are included to minimize disturbance and impacts to mating, nesting, fledging, foraging and roosting habitat.

Concern: The project may affect the viability of old growth stands defined by Green and others (1992, errata 2008) and old-growth associated species. We request that the Lolo National Forest incorporate additional project design criteria when proposing treatments in old growth stands, "in order to maximize the chances for public support of the project."

Response: In response to this public input, the following design criteria were incorporated into Alternative 2: (1) no commercial harvest in old growth stands; (2) no permanent or temporary road construction within or immediately adjacent to old growth stands, and; (3) maintenance of existing year-round road closures within or immediately adjacent to old growth stands to prevent loss of snags to firewood cutting. The effects of the proposed vegetation treatments on old growth and large tree retention is analyzed and disclosed in Chapter 3 Affected Environment and Environmental Consequences – Forested Vegetation section as well as in depth in the Forested Vegetation Specialist's Report located at fs.usda.gov/goto/lolo/projects. In addition Resource Protection Measures 22, 56, and 60 listed in Chapter 2 are included to protect large diameter trees in the project area.

Concern: Road treatments may cause more damage than leaving them to decommission naturally, and may not be appropriate since they may be needed for future management and for equestrian and pedestrian use.

Response: A "Travel Analysis" Process was completed for the Rennic Stark Project (PF, K10-2 and K10-3). The purpose of Travel Analysis is to provide Line Officers with information for: (a) identifying the minimum road system needed for long-term National Forest use and management; and, (b) for designation of routes (roads and trails) and areas for motorized travel. Travel analysis is an interdisciplinary, science-based process that identifies opportunities, risks, needs, and priorities relating to the transportation systems for the project area for the Line Officer to consider for further study during the environmental analysis process.

Specifically for Travel Analysis, information is provided to inform decisions for managing road systems that are safe and responsive to public needs and desires, are affordable and efficiently managed, have minimal negative ecological effects on the land, and are in balance with available funding for needed management actions.

Recommendations, and ultimately decisions, include consideration of the Lolo National Forest Plan and interim direction and guidance, mitigation needs and expenses, long-term maintenance needs and expenses (and likelihood of maintenance occurring), travel management enforcement needs, near-term access needs (for example, for recreation, vegetation treatments, or fuel treatments), as well as reasonably foreseeable future access needs (such as wildfire suppression access and salvage and fuel treatments for future tree mortality from insect and disease epidemics).

To provide guidance for road management during the Rennic Stark environmental analysis process, a numerical rating matrix was developed for individual road segments to disclose issues related to economic values, human uses, and aquatic and wildlife criteria. All of this detail is captured, by individual road segment, in the Travel Analysis documents in the PF (PF, K10-2 and K10-3).

The effects of the proposed road treatments on various resources (e.g., watersheds, wildlife, fisheries, recreation, noxious weeds, etc.) are analyzed and disclosed in Chapter 3 Affected Environment and Environmental Consequences section as well as in depth in the individual Specialist's Report located at fs.usda.gov/goto/lolo/projects. In addition Resource Protection Measure 27 listed in Chapter 2 is included to ensure that road decommissioning would be implemented such that it would not preclude foot and stock travel on several roads known to be used by hikers and horseback riders in the project area.

Chapter 2 Alternatives

Introduction

The focus of this chapter is to describe and compare the alternatives considered for the Rennic Stark Project under the National Environmental Policy Act (NEPA, 40 CFR 1502.14). Section 1500.2(e) of the NEPA requires the Forest Service to develop, describe, and study reasonable alternatives to the proposed action and help minimize or avoid adverse impacts on the quality of the human environment in the NEPA process.

As discussed in Chapter 1, no unresolved issues (cause-effect relationship) were identified that required the development of alternatives to the proposed action, rather the Deciding Official chose to modify the original proposed action and develop project design criteria and resource protection measures to address public concerns. Comments were also incorporated into the analysis process to confirm that no significant effects would be caused by the proposed treatments.

This chapter includes Resource Protection Measures and monitoring activities which would occur with implementation of a decision.

Alternatives Considered in Detail

Alternative 1 – No Action

The Council on Environmental Quality (CEQ) regulations (40 CFR 1502.14(d)) requires that a "no action" alternative be analyzed in every environmental assessment or environmental impact statement. This alternative represents the existing condition against which the other alternatives are compared.

Under the No Action alternative, no restoration, fuels reduction, or recreation enhancement activities would be implemented to accomplish project goals. However, ongoing Forest management activities would continue. Previously authorized projects, basic roads and facility maintenance, and other "normal" Forest management activities, such as fire suppression, would continue under current management direction. The No Action Alternative addresses public comments regarding a preference for limiting active management of the Forest.

Alternative 2 – Modified Proposed Action

As mentioned above, the original Proposed Action, which was scoped in March 2010, was modified to address issues related to wildlife and old growth. In general, the changes to the original Proposed Action include a change in vegetative restoration treatments (from commercial harvest to non-commercial treatments) on about 415 acres, and 1,205 acres proposed for ecosystem maintenance burning preceded by understory slashing or thinning was changed to non-commercial thinning followed by handpiling and burning. The original Proposed Action also included an administrative management area correction, which will no longer be pursued. About 1,215 acres allocated to MA 21 (old growth) is along the BPA powerline that provides power to three western states. A Forest Plan amendment was proposed to change this MA designation. The original Proposed Action proposed commercial treatment on approximately 360 acres of this area within ½ mile of the powerline. The proposed treatment areas were bisected by or immediately adjacent to the powerline. In response to public comment and additional ground reconnaissance it was determined that while the majority of this area does not meet the Forest Plan definition of old growth, an administrative management area change will not be pursued. It was also determined that resource objectives could be met, although not to the same extent, by implementing non-commercial treatments rather than commercial treatments in these areas (see treatment description of "non-commercial thinning followed by handpiling and burning").

Alternative 2, the Modified Proposed Action, includes various vegetation treatment activities designed to improve stand structure and resilience to disturbances; reduce fuels to lower the risk of crown fire and improve firefighter safety, and; introduce fire in areas where it has been excluded.

This alternative also includes activities to improve the Rennic Stark road system to optimize future infrastructure needs while balancing the need to reduce roads and their effects on wildlife, aquatic, and watershed resources. Other management activities include road decommissioning and storage for aquatic and wildlife benefits, and stream crossing replacement or removal for fish population connectivity. Alternative 2 also includes improvements to the Cedar Creek trailhead to meet user needs in this area.

Lastly, it includes integrated weed treatments (e.g., educational practices, biocontrol agents, mechanical control and ground-applied herbicides) to reduce the risk of noxious weed spread. The transportation system used to access and manage commercial vegetation treatments and roads that would be mechanically stored or decommissioned would be treated.

Vegetation Treatments

In Alternative 2, vegetation treatments would occur on approximately 9,201 acres as follows (see Map 2):

- Commercially harvest ponderosa pine/Douglas-fir stands and mixed conifer (western larch, Douglas-fir, ponderosa pine and lodgepole pine) stands on approximately 1,976 acres primarily using ground-based (tractor) harvest with lesser amounts of skyline yarding. This may be followed by thinning or slashing non-commercial understory trees, chipping, handpiling slash, and/or prescribed burning. Harvest methods may include thinning from below, single tree selection, creating openings, and removing individual dead, dying, or diseased trees.
- Non-commercially thin young stands and then handpile and burn or underburn approximately 1,975 acres.
- Ecosystem maintenance burn approximately 5,250 acres. Of the 5,250 acres, approximately 2,813 acres (54%) is located within the Stark Mountain IRA.

Table 3 Summary of Proposed Vegetative Treatments – Alternative 2

Unit	Silvicultural Prescription	Fuels Prescribed Fire Treatment	Acres	Logging System
Thinning Treatments & Prescribed Fire				
1a	IC	JPB/UB	39	T
2	IC	JPB/UB	83	T/SL
3	CT	UB	185	T
4	STS	UB	281	T
5A	IC	UB	38	SL
5B	IC	UB	149	T
6	IC	UB	50	SL
7	IC	JPB/UB	41	T
9	STS	JPB	143	T
10	STS	JPB	124	T
11	STS/GS	UB	101	T
12	IC	UB	47	SL
13	IC	UB	97	T/SL

Unit	Silvicultural Prescription	Fuels Prescribed Fire Treatment	Acres	Logging System
14a	IC	WTYUB	104	T/SL
14b	Liberation/STSC	JPB	58	T
17	IC	UB	44	SL
18	IC	UB	83	SL
19	IC	UB	31	SL
24	IC	UB	58	SL/T
25	IC	UB	25	SL
27	CT	UB	42	SL
Subtotal			1823	
Western Larch & Ponderosa Pine Regeneration & Prescribed Fire				
1b	STSC 2 age	JPB/UB	48	T
8	STSC 2 age	JPB/UB	60	SL
23	STSC	MP/PB/UB	45	SL/T
Subtotal			153	
Young Stand Thinning & Prescribed Fire				
80	PCT	N/AJPB/UB/HPB	48	N/A
81	PCT	JPB/UB/HPB	15	N/A
82	PCT	JPB/UB/HPB	11	N/A
83	PCT	JPB/UB/HPB	121	N/A
84	PCT	JPB/UB/HPB	131	N/A
85	PCT	JPB/UB/HPB	78	N/A
Subtotal			404	
Non-commercial Thinning & Handpiling & Burning				
15	PCT	HPB	197	N/A
16	PCT	HPB/JPB	72	N/A
22	PCT	HPB	97	N/A
103	PCT	HPB	1205	N/A
Subtotal			1571	
Ecosystem Maintenance Burning				
101	EMB	UB	1497	N/A
102	EMB	UB	3290	N/A
Subtotal			4787	
Ecosystem Maintenance Burning & Understory Slashing or Thinning				
21	PCT/EMB	UB	49	N/A
60	PCT/EMB	UB	152	N/A
61	PCT/EMB	UB	44	N/A
62	PCT/EMB	UB	218	N/A
Subtotal			463	
Grand Total			9201	

IC = Improvement Cut; CT = Commercial Thin; STS = Single Tree Selection; GS = Group Selection; STSC = Seed Tree Seed Cut; PCT = Precommercial Thin: EMB = Ecosystem Maintenance Burn; JPB = Jackpot Burn; UB = Underburn; MP = Machine Pile; PB = Pile Burn; HPB = Hand Pile and Burn; T = Tractor; SL = Skyline

Thinning Treatments and Prescribed Fire – 1,823 acres

Figure 1 - Picture of Unit 25

These sites are predominantly dense, mid-aged ponderosa pine/Douglas-fir and mixed conifer (western larch, Douglas-fir, ponderosa pine, lodgepole pine) forests. Overstory trees would be thinned to reduce stand density, create structural diversity, favor ponderosa pine and western larch, and increase vigor and resilience to insects and fire. Some trees would be removed from site as biomass or other wood products. The proposed treatments include: thinning from below; single tree selection, creating small openings (group selection), improvement cutting, and removal of individual dead, dying and diseased trees. The residual overstory would be irregularly spaced and may have some small openings. Understory density and ladder fuels would be reduced through thinning or slashing where necessary to facilitate prescribed burning and protect the overstory from crowning. Biomass and slash disposal may include a variety of methods such as mechanical removal, mastication, hauling as sawlogs, biomass utilization, disposal on site, excavator or hand piling and burning, burning, or chipping. Individual treatments or a combination of treatments may occur.

Figure 2 - Picture of Unit 9

The thinning treatments would *thin stands from below* favoring ponderosa pine and western larch. Thinning from below (low thinning) involves removing trees from the lower part of the forest canopy, leaving the largest, healthiest trees to occupy the site. The treatment mimics the mortality caused by surface fire or inter-tree competition and concentrates the site resources to the largest, dominant trees. Thinning from below primarily removes overtopped and intermediate trees, or trees that are shorter and receive a limited amount of light. In some cases larger Douglas-fir trees may be removed to favor ponderosa pine and western larch. In a heavy low thinning, the main canopy may also be thinned to reduce competition, density, and crown fire potential (Graham et al. 1999). This type of treatment has been shown to accelerate diameter growth resulting in large diameter trees sooner than if no treatments were applied (Sala et al. 2005; Sala and Calaway, 2004). These treatments would reduce wildfire hazard over the long term by rendering stands more resilient to natural fire occurrence and disturbances.

The thinnings would be applied using an average residual target basal area in order to accomplish resource objectives. The target average residual basal area ranges from 50 to 80 square feet per acre. This equates to removing approximately 30 to 60% of the existing crown cover. Integrated weed treatments would occur within the units, at landing sites, along roads and trails, and in adjacent forest openings in units/areas where rare plant surveys have been completed (this includes units 1a, 2, 3, 4, 5a, 6, 7, 9, 10, 11, 12, 13, and 14a/b).

Western Larch and Ponderosa Pine Regeneration and Prescribed Fire – 153 acres

Figure 3 - Pictures of Unit 8

Units 1B, 8 (shown here), and 23 are proposed for larch and ponderosa pine regeneration. The stands have moderate to high levels of tree mortality from insects and disease. Mountain pine beetle has attacked and killed the majority of the lodgepole pine in units 1B and 23. Root disease is prevalent in Units 8 and 23 resulting in mortality and a state of decline in the Douglas-fir. Within Unit 8, most larch trees have poor vigor and moderate to high dwarf mistletoe infection. The proposal is to retain the healthiest and most disease resistant overstory trees and create conditions to regenerate ponderosa pine or western larch. The stands would be managed as two-aged forests under a seedtree system. The healthiest larch and ponderosa pine would be retained and the majority of the Douglas-fir and diseased and dying trees would be removed. Approximately 60 – 70% of the canopy would be removed to create an environment suitable for western larch and ponderosa pine regeneration. The stand would be underburned to reduce fuel loading and to prepare sites for planting. Some small diameter trees (< 7" dbh) would be slashed to create a fuel bed to carry the fire. The site would be planted with locally adapted stock. Western larch and ponderosa pine would be the primary species planted. Animal damage netting may also occur. Integrated weed treatments would occur within the units, at landing sites, along roads and trails, and in adjacent forest openings where rare plant surveys have been completed (this includes units 1b and 8).

Northern Region Forest Service policy is normally to limit the size of harvest openings created by even-aged silvicultural systems to 40 acres or less. However, where natural catastrophic events such as fire, windstorms, or insect and disease attacks have occurred, 40 acres may be exceeded (FSM 2471.1). Treatments in Units 1b, 8, and 23 each exceed 40 acres in size; the respective unit acreages are 48, 60, and 45. Regeneration harvest activities would occur to address insect and disease attacks that have occurred in these units.

Young Stand Thinning and Prescribed Fire – 404 acres

Figure 4 - Picture of Unit 83

Thinning is proposed in young predominately ponderosa pine, Douglas-fir, and western larch stands. The sites were previously managed and the treatment is designed to reduce stand density; enhance growth and vigor; reduce competition for sunlight, water, and nutrients; and modify stand conditions to lessen the risk of potential mountain pine beetle-caused mortality and stand-replacing fire in the future. The treatment is also designed to promote irregular spacing, favor shade-intolerant species, and restore fire as a process on these previously managed areas. The treatment would thin small diameter trees that would be felled to a stocking of approximately 150 - 200 trees per acre favoring the most vigorous, dominant and best-formed trees. Only small diameter (less than 8" diameter at breast height) trees would be cut. In addition, fuels would be treated by lopping and scattering tops and limbs to speed decomposition. Hand piling and burning piles or underburning would be completed in areas where the fuel loading is determined to be an unacceptable risk. Invasive weeds would be treated along roadsides, trails, within the unit perimeter and in adjacent forest openings in areas/units where rare plant surveys have been completed. Individual treatments or a combination of treatments would occur.

Non-commercial Thinning followed by Hand Piling and Burning – 1,571 acres

Figure 5 - Picture of Unit 103

This treatment is designed to reduce hazardous fuels in multistoried old growth mixed conifer stands (Units 15, 16, 22, and 103, which include stands classified as old growth as defined by the Lolo Forest Plan and Green and others (1992)). The treatment would reduce ladder fuels and competition around large diameter ponderosa pine, western larch and Douglas-fir trees. The treatment would only thin small diameter trees underneath the main canopy (trees less than 10” dbh). All thinning work would be accomplished by hand, using chainsaws. No heavy equipment or product removal is proposed. The treatment is designed to reduce ladder fuels and surface fuel loading through thinning or slashing and hand piling and burning. Soil mixing at the base of large diameter trees may also occur to reduce duff accumulations. Underburning or jackpot burning may also occur after initial treatments are complete. The overstory canopy cover would only be reduced by about 5 to 25% so the treatment would not markedly reduce overstory crown continuity. Invasive weeds would be treated along roadsides, trails, within the unit perimeter and in adjacent forest openings in areas/units where rare plant surveys have been completed (this includes units 15, 16, and 22). Individual treatments or a combination of treatments would occur.

Ecosystem Maintenance Burning - 4,787 acres

This treatment is proposed in mixed severity to high severity fire regimes along Ninemile Divide and within the Stark Mountain Inventoried Roadless Area to reduce fuel continuity and provide for age class diversity. Slashing, thinning, or other tree cutting in these areas is not proposed. Prescribed fire treatment would involve broadcast or underburning. Aerial ignition devices may be used to ignite fire in a strip or spotty pattern to achieve the desired fire intensity. Prescribed fire treatment would involve a backing or flanking fire that is generally of lower intensity than a head fire. Rolling material on steep slopes may cause uphill runs that create pockets of higher intensity fire behavior. Prescribed fire application would include a combination of low to moderate intensity surface fire with areas of passive to active crown fire ranging in size from 1 to 100 acres in mixed severity regimes. Within high severity regimes, areas of low to high intensity surface fire and areas of passive to active crown fire ranging from 1 to 250 acres would be expected. Within the burn perimeter there may be openings in the crowns greater than 250 acres due to natural downfall prior to prescribed fire application.

This treatment is designed to reduce ladder fuels, raise crown base heights, reduce surface fuel loading and create a mosaic of size and age classes. The perimeters, as displayed on the map, represent the outer boundaries (maximum allowable area) where ignition would occur. The entire area would not be burned, it is anticipated that approximately one half of the area would be ignited over multiple days over a several year period due to the size of the landscape. The areas within the unit boundaries that would be targeted for treatment are south aspects, areas of heavy down fuel loading, and sites where mountain pine beetle mortality is prevalent.

On southern aspects, where shrubs and grass dominate the forest floor, the treatment is designed to increase forage for big game. Typically, these sites would be burned in the spring when fuel moistures are higher and control conditions most manageable. On northern aspects, dead and downed fuel concentrations and pockets of mountain pine beetle mortality would be targeted to create a mosaic pattern on the landscape. This would result in discontinuous fuels and reduce the probability of a large crown fire becoming established. Due to elevation, aspect, and fuel moisture conditions these areas would likely be burned in the fall. Ignition would occur in front of a forecasted weather system that would provide moisture to aid in fire control and prevent long-term smoke impacts. Invasive weeds would be treated along roadsides and trails, within the unit perimeter and in adjacent forest openings in units/areas where rare plant surveys have been completed. The treatment includes planting blister rust-resistant whitebark pine (up to 100 acres) on suitable sites along Ninemile Divide in the vicinity of Stark Mountain. Areas in the vicinity of Stark Lookout where whitebark pine is currently established and a sapling component is present would be omitted from stand replacing fire. Individual treatments or a combination of treatments would occur.

Ecosystem Maintenance Burning preceded by Understory Slashing or Thinning – 463 acres

This treatment is proposed on sites that were historically occupied by very open to moderately open ponderosa pine or ponderosa pine and Douglas-fir communities with an average fire frequency of 5 to 50 years (Fischer and Bradley, 1987). Presently, these sites support moderate to heavy understory vegetation with thickets of conifer encroachment below the main canopy. Douglas-fir is the primary understory conifer species. Some very dry inclusions historically occupied by grassland communities, currently support moderate noxious weed populations including spotted knapweed, sulphur cinquefoil and cheatgrass. Some sites are classified as non-forested. The proposal includes prescribed burning, that may include slashing or understory thinning prior to fire application. Understory density and ladder fuels would be reduced through slashing/thinning to protect the overstory from scorch or crowning where deemed necessary. Only small diameter (less than 8" diameter at breast height) trees would be cut. All thinning work would be accomplished by hand, using chainsaws. Slash would be treated by lopping and scattering tops and limbs **and underburning. Invasive weeds would be treated along roadsides and trails, within the unit perimeter, and** in adjacent forest openings in units/areas where rare plant surveys have been completed (this includes unit 21). Individual treatments or a combination of treatments would occur.

Prescribed Fire: As discussed above, prescribed fire is proposed in all treatment units (approximately 9,201 acres). Nonfire fuel treatments, described in the next section, may be implemented in conjunction with prescribed fire (although not in units 101 and 102 which are within the Inventoried Roadless Area). Ecosystem Maintenance Burning can be accomplished by a variety to means including jackpot burning, broadcast burning, and underburning, as described below. Prescribed fire could mean any of the following:

- **Jackpot burning** is a fuel reduction/site preparation treatment in which a continuous fuel bed is not present. Jackpot burning is conducted when fuels tend to be scattered with isolated accumulations distributed across the treatment unit. It is proposed for use in areas where stand conditions necessitate its use to reduce the risk of scorching or stressing residual trees.
- **Broadcast burning** is a prescribed fire burning through a continuous fuel cover. It would be used minimally, in areas with larger fuels where there is less concern for killing or damaging residual trees.
- **Underburning** would be used in areas where the fuel bed is fairly continuous and generally small (0-3" diameter) and conditions are such that fire would spread in a predictable and consistent manner. Underburning implies that there is a live overstory present and often a live understory as well. Underburning would also be used to raise the base height of live crowns, which is desirable to reduce crown fire initiation. Prescriptions for underburning usually include an acceptable mortality level in the live component.
- **Hand piling and burning** provides even greater protection to residual trees, but is more labor intensive and costly. Material is piled by hand and piles are burned under conditions when the risk of fire spread is minimal.
- **Machine (e.g., excavator) piling and burning** provides the same benefits of hand piling and burning, but is utilized to treat larger diameter fuels that cannot be effectively manipulated by hand. Material is piled by machine and piles are burned under conditions when the risk of fire **Nonfire fuel treatments** could be used in combination with prescribed burning or where it is unfeasible to treat the fuels with prescribed fire.

Nonfire fuel treatments include:

- **Whole tree** yarding means entire trees are yarded to the landing. Tops, limbs, and other unmerchantable large materials that do not have commercial value are piled for later treatment or utilization at the landing site.
- **Lop and scatter** is a fuel reduction treatment prescribed when rearranging the fuels or reducing their depth is desired. Lopping facilitates decomposition and nutrient cycling by placing the fuels closer to the forest floor.
- **Chipping or mastication** rearranges fuel complexes and also facilitates decomposition and nutrient cycling.

ROAD TREATMENTS

"Travel Analysis" Process was completed for the Rennic Stark Project. The Transportation Analysis Specialist's Report documents, which are located in the Project File, include details by individual road segment (PF, K10-1 through K10-3). Following is a brief summary of the road decommissioning and storage treatments proposed for the Rennic Stark project (other treatments include retain, reconstruct, construct temporary roads, etc.). Approximately 28.6 miles of road (both system and non-system) throughout the project area would be decommissioned and about 22.4 miles of roads would be stored under Alternative 2 (Table 4, and Appendix H, Map 2).

Decommissioned roads are removed from the transportation system and physically treated depending on condition and location. Some roads would be allowed to "naturally" decommission while others, generally those associated with streams and riparian areas or located on steep slopes and erosive soils, would be recountoured using heavy equipment. Both decommission levels 3 and 5 include weed spraying and the application of large woody debris and native seeding.

- **Decommission level 3**: The entrance is obliterated and the entire road surface is decompacted and stabilized with all drainage-ways restored and culverts removed.
- **Decommission level 5**: The entire road prism is recontoured and drainage ways are restored.
- **Decommission level 3-natural:** Roads are deemed stabilized with little to no watershed or aquatic risk and are left "as is" and removed from the Forest road system inventory.

Stored roads remain on the Forest's transportation system because future use is anticipated. These roads would not be open to public access and usually drainage structures are removed or protected. Storing mitigates watershed, aquatic, and wildlife concerns while maintaining flexibility for future use.

- **Storage level 3**: The surface is decompacted and stabilized and culverts removed and drainage ways recontoured.
- **Storage level 3–natural:** Recontouring is not warranted, roads are deemed stabilized with low risk to environmental disturbance.

It is anticipated that about three segments of temporary road totaling about 1 mile would need to be built to access commercial vegetation treatment areas. These roads would be used for a period of one year or less and then obliterated. All temporary roads would be constructed over 300 feet from any live stream with road grades less than 10 percent and on sideslopes less than 60 percent.

Approximately 0.5 miles of road would be reconstructed for vegetation treatments. These reconstructed roads would be stored or decommissioned after use (Table 4).

Haul-related maintenance/reconstruction and BMP work (e.g., brushing, grubbing, blading and shaping, spot widening, and surface drainage improvements) would be applied to 34.3 miles of road to be used for haul (see Transportation Specialist's Report). These applications would provide longer-term benefits to the transportation system after the project, as most would be on roads that would remain in an open state (Table 4).

Appendix H summarizes the existing condition and recommended improvements for individual roads in the analysis area. See the Transportation Specialist's Report for more detailed information.

In conjunction with/in addition to the road treatments described above, three high-priority culverts on FS Road 5515 would be replaced to allow for fish passage: one undersized culvert in Cromwell Creek (Figure 6); the culvert associated with the Cedar Creek Trailhead improvements; and an undersized culvert in Duff Creek. One stream channel reclamation project, an old road/skidding operation in Cromwell Creek, is also proposed (Figure 6). Stream function is altered by sawn logs placed in "corduroy orientation" and surrounding the channel for some distance upstream of the crossing. These logs were placed most likely for skidding timber down the valley and would be removed where they alter active channel dimensions and function.

Figure 6 - FS Road 5515 crossing of Cromwell Creek.

The 36 inch corrugated metal pipe (CMP) is partially blocked by a large rock at the inlet and requires maintenance. The culvert is undersized (i.e., the culvert is about (half as wide as the active channel) and does not meet Regional standards for capacity or stream simulation standards.

Figure 7. - Looking down on channel bed of Cromwell Creek and remnants of "corduroy road".

Table 4 Summary Miles of Road Treatments – Alternative 2

Proposed Treatment		Current Condition		Proposed Closure Level					
TREATMENT	**Total**	**Drivable Other than Closure Device**	**Not Drivable**	**3-S**	**3-SN**	**3-D**	**3-DN**	**4**	**5**
Add to System & Store	4.4	2.8	1.6	3.5	0.9				
Store System Road	17.9	14.2	3.7	17.1	0.8				
Reconstruct System Road and Store	0.1		0.1	0.1					

Proposed Treatment		Current Condition		Proposed Closure Level					
Retain System Road	51.2								
Previously Decommissioned System Road -- Reconstruct as Temporary Road	0.2								0.2
Previously Decommissioned Nonsystem Road -- But Needs Further Mitigation	0.8					0.8			
Decommission Nonsystem Road	27.0	0.6	26.4			3.4	19.9	1.9	1.8
Decommission System Road	1.6	1.1	0.5			1.2			0.4
Construct Temporary Road	1.0								1.0
Reconstruct Non-System Road as a Temporary Road	0.3								0.3
Total Miles	104.5			20.7	1.7	5.4	19.9	1.9	3.7

Non-System Roads = Roads on NFS lands that are not managed as part of the Forest transportation system (e.g., jammer roads). All non-system roads are "restricted yearlong" by definition.
System Roads = Roads on NFS lands that are managed as part of the Forest transportation system. Examples include:
Arterial roads that provide primary access for resource management, timber haul and recreational activities.
Collector roads like Rd. 5471 which provide primary access for resource management and timber haul.
Local roads like Rd. 18057 that are primarily used for intermittent timber harvest and management activities.

Recreation Improvements

Reconstruct and re-gravel the Cedar Creek Trailhead in order to provide parking and space to park vehicles and trailers as well as turn trailers around. The area would involve some work with heavy equipment to prepare and gravel the existing trailhead and would include replacing the existing undersized culvert. The work would be done on approximately 1/10 of an acre.

Noxious Weed Treatments

Ground-based weed treatments would occur on haul routes, decommissioned roads, landings and other areas where ground-disturbance would occur as a result of this project. In addition, the following units, as discussed above in the description of forested vegetation treatments, have either been surveyed for rare plants and none were found or do not include potential habitat for rare plants and noxious weeds in these units may be treated with herbicides: 1a/b, 2, 3, 4, 5a, 6, 7, 8, 9, 10, 11, 13, 14, 15, 16, 18, 19, 21, 22 and 60. In addition all of the BPA roads and the following NFS roads would be treated with herbicides: Rd. 380, 5510, 5511, 5515, 5471, 16472, 17415, 18055, 18056, and 18057.

Resource Protection Measures

As mentioned in the Public Involvement section the ID Team carefully considered all of the comments that were received on the proposed action. One way concerns were resolved was by modifying existing design criteria or adding additional site-specific protection measures to reduce to negligible or eliminate the unintended effect. These measures are called Resource Protection Measures (RPM) in this document.

Appendix C shows how RPM were used and developed in Alternative 2 to address comments made during scoping. In addition to the RPM listed below the Forest Service would obtain all necessary permits required prior to implementation.

These RPM are objective based. Ways that these objectives can be met are described; however, another method, determined to be equally or more effective in meeting the mitigation objective by a resource specialist and approved by a line officer, could also be used.

Visual Quality

(1) General Mitigation

- Created openings and treatment units would not be symmetrical in shape.
- Straight lines and right angles would be avoided
- Treatments would follow natural topographic breaks and changes in vegetation. Utilize natural breaks in topography and vegetation type to delineate treatment edges.
- Leave trees in all timber harvest units would be left in an irregular pattern to mimic natural vegetation patterns.
- Where new access roads and skid trails meet a primary travel route, they would curve after the junction to minimize the length of route seen from the primary travel route.
- Where feasible, retain screening trees one tree-height below roads and landings (including cable landings) when viewed from below.
- Where feasible, leave a diversity of species and age classes.
- Ensure the slash is abated near landings by scattering, chipping, or other techniques.

(2) All Skyline Units

- Minimize the straight line effect of skyline corridors by felling trees first and establishing corridors in openings.
- Establish corridors to minimize residual damage and allow for narrower (less visible corridors).

(3) Cedar Creek Culvert Replacement - Due to the location of the creek crossing at the end of the open segment of Road 5515 and adjacent to a trailhead, the travel speeds are very low to stationary. This makes every detail visible and the addition of a large new structure would be noticeable. In addition the trailhead is proposed for expansion/improvement.

- Any structures constructed at this location would incorporate features to minimize exposed metal and concrete areas such as mitered ends for a culvert.
- Culvert would be designed in consultation with the Forest Landscape Architect
- Establish riparian vegetation above and below culvert.

(4) Cedar Creek Trailhead - Any trailhead planning/design/construction activities would be coordinated in advance with an East Zone Engineer and the Forest Landscape Architect.

WILDLIFE

(5) Canada Lynx - To preserve existing forage values, in Unit 84 portions of the unit that provide suitable lynx foraging habitat would be completely removed from treatment by the Forest Biologist and Silviculturist during unit layout.

(**6) Bald Eagle -** To reduce disturbance during the nesting period, Units 9, 10, and 13 would be treated in winter or during the dry season (roughly July 1 to March1) unless otherwise agreed to by the Wildlife Biologist.

(7) Flammulated Owl (1) - To reduce disturbance to mating, nesting, or fledging flammulated owls and preserve nesting/foraging habitat, in Units 14, 17-19 treatments would not occur from May 1 – July 15. Current patches with greater than or equal to 35% canopy cover would be retained throughout the above units post-treatment.

(8) Flammulated Owl (2) – To reduce potential removal or damage of potential nest trees and promote conditions favorable for flammulated owls, in Units 14 and 17 - 19 focus on retaining the largest, healthiest trees as leave trees. Any live trees >21” dbh would be retained to extent practical given project objectives and implementation logistics. Due to the importance of large diameter snags for flammulated owls, with the exception of snags near roads, skylines, trails, or high use recreation sites, and where public and operational safety and facility protection is necessary, all dead trees greater than or equal to 21” dbh would be retained within treatment units.

(9) Flammulated Owl (3) – To maintain roosting habitat for flammulated owls, in Units 103 and 14 – 22 efforts would be made to retain 3-4 thickets of young dense trees.

(10) Goshawk - To protect important habitat features and minimize disturbance to nesting goshawks, if an occupied nest area is located in a proposed treatment unit the Wildlife Biologist would be notified and a minimum 40-acre no treatment buffer would be centered on the nest to completely conserve the nest area. No ground disturbing activities would occur in a 420-acre post-fledgling area (PFA) centered on the occupied nest from April 15 (courtship and egg laying) through August 15 (30 days post-fledging when juvenile feathers become hardened and are capable of sustained flight as discussed in Brewer et al. 2007). After August 15, treatments may commence inside the PFA, but not inside the nest area. Treatments would not occur in the active nest area at any time.

(11) Elk – To ensure treatments maintain a balance of elk cover and forage on winter range consistent with Forest Plan Standards, canopy cover post-treatment would not fall below 50% in MAs 18 and 23 in the project area which includes Units 4, 5A, 9-11, 13, 18, 23, and 24. Vegetation monitoring of canopy cover changes post-treatment would be implemented to assess effectiveness.

(12) Elk – To maintain snow-intercept cover in elk winter range habitat, in Units 4, 5A, 8-11, 13, 18, 23, and 24 favor large, healthy mature trees with full crowns as leave trees.

(13) Elk – To protect important habitat features for elk, in all treatment units no harvest would occur within 150’ of any elk wallow identified during layout.

(14) Elk – To provide hiding cover for elk and refugia for other wildlife, along FS Roads 5511 and 5515 and in Units 4, 5A, 8-12, 84, and 85 visual screening would be left in the form of irregular clumps of leave trees adjacent to the road or cable corridors or thinned areas that can be seen from the road. As a general rule to the extent practical and where it naturally occurs, visual screening on the upslope side of the road should occur in a 50-foot wide area adjacent to the road; and downslope, should occur in a 100-foot wide area. The design, amount, and composition of visual screening may vary depending on availability and topography. A Wildlife Biologist, Silviculturist, Fire Management Officer, and a representative from the Ninemile Working Group would be actively involved in identifying these areas.

(15) Elk – To provide elk with displacement areas from hunter disturbance, in all treatment units ground-disturbing activities would not occur during the first week of and on the weekends during the big game rifle season when public use in the area is highest to provide elk with displacement areas from hunter disturbance.

(16) Wildlife – To protect TES species, in all treatment units if any threatened, endangered, or sensitive species are located during project layout or implementation, a Wildlife Biologist would be notified. Management activities would be altered, if necessary, so that proper protection measures can be taken. Timber sale contract provisions that require the protection of threatened, endangered, and sensitive species would be included in the timber sale contract.

(17) Wildlife – To reduce the potential for animal/human conflicts, particularly with bears, in the project area food and other animal attractant storage would be required for all contract and Forest Service personnel working in the area as well as all public Forest users from April 1 thru December 1.

(18) Wildlife – To retain sufficient habitat for snag- and large tree-dependent species, in the project area the location of proposed roads, skid trails, and skyline corridors would ensure, whenever practical, that veteran and relic survivor trees and snags would not be removed during construction.

(19) Wildlife – Where available, to ensure sufficient large woody debris for structural habitat diversity, in all treatment units adhere to snag retention standard 25 from the Lolo Forest Plan (1986, at p. II-14). Specifically, for units in moderately warm and dry sites (habitat group 2) retain 4 hard snags/acre (min 10” dbh, 15’ tall) with a minimum of 1 big snag/acre (20” dbh, 40’ tall). For moderately cool and dry sites (habitat group 3), retain 3 hard snags/acre and 1 big snag/acre. Select ponderosa pine, western larch, and Douglas-fir when available.

(20) Wildlife – To ensure sufficient large woody debris for structural habitat diversity, in all treatment units follow Forest Plan standards for downed woody debris retention.

(21) Wildlife – To ensure sufficient protection for riparian associated species and to preserve important habitat features, in all treatment units ephemeral draws, streamside riparian corridors, and isolated upland seeps, springs, and wallows shall be protected from treatment related activities using appropriately sized buffers (determined by a Fisheries Biologist, Hydrologist, Botanist and/or Soil Scientist).

(22) Wildlife – To provide for old growth associates, no commercial treatments would occur in old growth (defined by Green et al. 1992). Commercial and non-commercial treatments in mature and older (> 9” dbh) stands would not preclude the stands from developing into old growth (with the exception of Units 1b, 8, 14b, and 23).

NOXIOUS WEEDS

(23) USDA Forest Service 2001 (FSM 2081.2 Weed Prevention and Control Measures), commonly referred to as R1 Weed BMPs; USDA Forest Service 2007b Integrated Weed Management on the Lolo National Forest, Record of Decision; and USDA Forest Service, Lolo National Forest Plan Amendment 11 would be followed.

(24) At a minimum, signs would be placed along the following roads, prior to and immediately following weed treatment: West Rennic Creek #5511, Rennic-Cedar Creek Road #5515, West Mountain #5471, and Ellis Mountain #380.

5) Noxious weeds in units 60, 61, 102 and 103 would be evaluated before conducting any prescribed burning. If burning would increase infestations to an unacceptable degree, weeds would be treated prior to burning or prescribed burns would not be conducted in these units.

(26) During implementation, consider using boulders to block roads with 3-SN, 3-S, 3-DN, 3-D and 4 closures rather than recontouring in order to allow easier access for future weed treatments.

RECREATION

(27) Road decommissioning would be implemented such that it would not preclude foot and stock travel on Road #s 17409, 34036, 5155, 16463, 4253, 5464, and 34304.

28) To minimize impacts to hunting use in the area, hauling would not occur during the first week of and on the weekends during the big game rifle season (also see (15) Elk), and the Cedar Creek Trailhead would not be blocked during these times.

HERITAGE

(29) The culturally modified tree in Unit 102 would be protected during burning in a manner approved by an Archeologist.

SOILS

(30) Non-Commercial and Precommercial Thinning Units (Units 80 – 85): Due to low levels of organic matter in these units, all material cut would be left on site to slowly release nutrients to the soil, improve water retention, and provide future soil organic matter. Prescribed fire or slash piling would not be applied to these units unless the unit is reviewed by the Forest Soil Scientist or fire is prescribed greater than 5 years after the thinning treatment.

(31) Temporary Roads – Units 1B/2, 4, and 11: By agreement with the Purchaser, in addition to timber sale contract provisions; construction and rehabilitation of temporary roads would include: 1) When the temporary road is constructed, stockpile, windrow, or berm the forest floor and topsoil as feasible; and 2) Rehabilitation would occur with weed treatments as needed and the road re-contoured, scarified, seeded, any berms pulled back over the road prism, and large woody material scattered. Slash would be placed over 65-70% of the temporary road to a depth of 2-3 inches in contact with the soil surface.

(32) Landing and Old Road Treatment – Units 4, 9, and 10. If existing landings or old road prisms are used during this entry, the timber sale contract would be used for the rehabilitation. Treatments would include landing and existing road prism rehabilitation accomplished through: 1) noxious weed treatments; 2) breaking up the surface sealing; 3) seeding; 4) pulling any berms back over the landing or road prism; and 5) applying slash to a depth of 2-3 inches and in direct contact with the soil surface over 70% of the disturbed area OR to a depth and cover available. Measure depth and coverage of the slash at the time of placement.

(33) Dispersed Campsite Delineation – Optional Treatment to Improve Soil Productivity – Units 9 and 10: Dispersed campsite delineation would be implemented as funding allows to improve soil productivity. Treatments would include defining and limiting the dispersed campsite footprint at an existing landing off Road 5515 to protect the camas swale and prevent OHV use within the unit.

(34) Winter Ground-based Harvest Units – Units 4, 9, 10:

- Restrict winter season ground-based operations to slopes less than 35% and frozen or snow covered soil conditions (Soils Specialist’s Report Appendix B), unless reviewed by the Forest Soil Scientist.
- Designated ***primary ground-based machine skid trails*** would be spaced an average of 75 feet apart. Dispersed skidding across lightly-used areas is permitted.

- Use standard timber sale or integrated contract language; ensure adequate snow cover and frozen ground to prevent rutting, displacement, or compacted soil over at least 85% of the harvest unit, including the landing.

(35) In-woods Processing – Units 9 and 10: In-woods processing is required.

(36) Summer Harvest – Units 1, 2, 3, 5b, 7, 11, 13, 14, 23, and 24:

- Restrict summer or dry season ground-based operations to slopes less than 35% and dry soil conditions (Soils Specialist's Report Appendix B), unless reviewed by the Forest Soil Scientist.
- Designated ground-based machine skid trail spacing would average 75 feet.
- Use standard timber sale or integrated contract language.

(37) Slash Placement on Skid Trails **-** Units 3, 5b, and 7: By agreement with the Purchaser, to reduce the potential for soil erosion, leave slash on skid trails with exposed bare mineral soil. Slash would not be left on winter harvest trails unless they are bared to mineral soil. This mitigation is needed because of the fine-grained, silt loam textured soils and thin root-tight layers. These soils have a high likelihood to powder when ground-based equipment is used on dry soils and the thin root tight layer will not support multiple machine passes. Slash would be placed over 65-70% of the skid trail to a depth of 2-3 inches in contact with the soil surface.

(38) Within-Unit Pile and Burning **-** Machine Unit Pile Activities – Units 23 and 24: Operate the excavator where fuel concentrations exist and on existing skid trails to the extent possible. Work on dry soil (Soils Specialist's Report Appendix B). Excavators would work along designated trails and generally confine movement to up and down slopes. Excavator piling would occur on slopes less than 35%, except for short pitches (40-45% for less than 100 feet), unless reviewed by the Forest Soil Scientist.

(39) Within-Unit Pile and Burning – Burn Piles (Units 15, 16, 22, and 23): Where feasible: 1) Pile and burn slash where detrimental soil disturbance already exists, such as on old log landings, skid trails, and roads associated with past activity; 2) Handpiles would be no more than about 6 feet in diameter and 4 feet high; and 3) Slash would be left through one winter after cutting to allow for initial decomposition and nutrient leaching. Units adjacent to private land may be piled and burned as soon as possible to reduce fire hazard.

(40) Maintenance Burning and Prescribed Fire (Units 21, 60, 61, 62, 101 102, and 103): To reduce the potential for soil erosion, upon completion of maintenance burning or other prescribed fire activities, bare mineral soil would not be exposed on more than 15% of the burned area. Slash would be left on the ground at least one winter.

(41) Skyline Harvest Units – Locate skyline corridors to fit the landscape and provide suspension of the logs. Use standard timber sale or integrated contract language. Avoid designating a corridor within ephemeral draws (Unit 17).

(42) Coarse Woody Material Guidelines (Units 4, 5a, 5b, 9, 10, 15, 16) **-** Leave down and live and dead standing (for future recruitment) coarse woody debris, scattered through the unit, trending towards the maximum levels (8-13 tons/acre) as identified in the LNF Forest Plan Coarse Woody Material Guide (this would be included in the Silviculture and Fire Prescriptions).

HYDROLOGY

(43) Best Management Practices (BMPs) for Forestry: BMPs for forestry would be met as a minimum. All activities would comply with Forest Service Handbook 2509.22, Soil and Water Conservation Practices, Montana Water Quality Best Management Practices.

44) BMP Timing and Effectiveness: Prior to summer timber haul, implement and maintain all BMP and associated Soil and Water Conservation Practices designed to control surface drainage on project roads. If winter haul occurs before road BMPs are installed, the Timber Sale Administrator would contact the appropriate engineer or hydrologist to assure that typical winter operation requirements are sufficient to mitigate sediment effects, or if specific BMPs would be necessary prior to winter operations.

(45) Erosion Control Measures: Where applied, erosion control measures (i.e. slash filter windrow, straw bales, etc.) would remain in place during and after ground disturbing activities. To ensure effectiveness, erosion control measures would remain functional until disturbed sites (roads, culverts, landings, etc.) are stabilized; typically for a minimum period of one growing season after ground disturbing activity occurs.

(46) Temporary Roads: Sediment buffering devices such as slash filter windrows would be installed below all fill slopes within 300 feet of streams or drainage crossings.

(47) Winter Haul: If winter haul occurs, frequent drainage outlets would be created through snow berms. Installation would occur with initial snow plowing and would be maintained throughout spring run-off conditions.

HYDROLOGY AND FISHERIES

(48) Culvert Replacements or Installations: Work would be conducted to minimize sediment delivery and site disturbance to the extent possible. Water would be diverted around construction activities unless other methods result in less sediment delivery. Clearing limits would be minimized. A Fish Biologist or Hydrologist would be available upon request to assist with appropriate alignment and reshaping of the stream channel, bankfull width, floodplain, step-pools and grade control structures, transplants, etc.

(49) Slash Filter Windrows (low-profile – 1-2 foot height maximum, mostly fine material): Apply 100-200 feet of windrow to intermittent and perennial stream crossings according to the following:

- Where slash is available on site or with minimal haul.
- Located at the toe of the road fill slope on both sides of the stream and road and extending over the crossing structure.
- On road segments that would receive road blading, reconstruction, or other activities that disturb the road surface.
- On major timber haul routes where roads may be susceptible to large traffic volumes and consequent road surface erosion and rutting.
- Between disturbed slopes and the stream at decommissioned road-stream crossings if mulch is not applied.
- Installed below ditch relief culvert outlets that are within 300 feet of a waterway on all haul routes and other roads as needed.

HYDROLOGY, FISHERIES, AND SOILS

(50) INFISH Riparian Habitat Conservation Areas (RHCAs) and Unit Specific Water Resources Buffers – The boundaries of all RHCAs and unit specific water resources would be flagged PRIOR TO on-the-ground activities. Ground-based equipment is excluded from all RHCAs and within buffers for springs, seeps, and ephemeral draws. All non-mechanical vegetation treatment would occur no closer than 50 feet of perennial streams or scoured channels, except for incidental prescribed fire which is allowed to creep into these areas. The construction of hand fireline, as necessary, is allowed within these buffer areas as long as bank stabilizing or inner-gorge vegetation is not removed.

Any variations from these buffers would need to be approved by a Fisheries Biologist, Hydrologist, or Soil Scientist PRIOR TO implementation (Tables 3 and 4).

Table 5 INFISH RHCA Buffer Distances

Channel Type	Buffer (feet)
Perennial fish bearing streams	300
Perennial non fish bearing streams	150
Ponds, lakes, reservoirs, and wetlands greater than 1 acre	150
Seasonally flowing or intermittent streams, wetlands less than 1 acre, landslides, and landslide prone areas	100

Table 6 Unit Specific Water Resource Buffer Distances

Drainage Feature	Buffer	Project Harvest Unit Observations*
Seeps and springs within units	100 feet – perennial 50 100 feet - intermittent	Units 5b, 9, 10, 15, 23 (Shown on sale area map)
Intermittent channel	50 100 feet	Units 5b, 8, 9, 10, 11, 12, 13, 15 (Shown on sale area map)
Ephemeral draws	50 feet equipment exclusion. (Measured from centerline of the draw)	Units 4, 15, 18, 19, 21, 22 (Shown on sale area map)
Glacial Lake Missoula Swales	Do not run equipment up the bottom of the draws or along the swale sides	Units 2, 3, 4, 7, 8, 9, 10, 13

*This list is not all inclusive and only includes units where direct field observations have been made. If field personnel discover additional wet areas and/or stream channels during project layout or implementation, an appropriate no-activity buffer around the wet areas and streams should be discussed with a Fisheries Biologist, Hydrologist, or Soil Scientist, or implemented as previously addressed by documentation for other similar situations. Additional BMPs for operating around wet areas may also be necessary and would be identified by the appropriate specialist.

(51) Wet Areas/Streams Encountered During Project Layout**:** As field personnel identify wet areas and/or stream channels during project layout or implementation an appropriate no-activity buffer around the wet areas and streams should be discussed with an appropriate water and/or fisheries specialist, or as previously addressed by documentation or other similar situations. Other BMPs for operating around wet areas would also be necessary. A map of known areas is included in the Project File (PF, K8-39).

SENSITIVE PLANTS

(52) If sensitive plants are detected within the project area, the Forest Botanist would be contacted so that protective measures may be revised or newly prescribed. This could include addition of buffers or the imposition of activity timing restrictions.

(53) The *Heterocodon rariflorum* population in Cedar Creek on Road 5515 would be buffered from herbicide spraying and trail maintenance activities. Other traffic would still be able to drive through the population.

(54) If camas areas are treated with herbicide, broadcast treatments should focus on treatments for spotted knapweed. Retreatments should be spaced far enough apart to maintain forb diversity in the area.

(55) Noxious weeds that require more concentrated chemicals, such as *Hypericum perforatum* (St. John's wort), should be spot sprayed. Treatment of weeds in this way, can control noxious weeds and help maintain the biological diversity of the plants.

VEGETATION

(56) Where deemed necessary by a Silviculturist, measures would be taken during prescribed burning to protect at risk and/or large diameter (21"+) trees from excessive crown and bole scorch to the extent feasible to avoid unintentional mortality.

(57) Areas of acceptable natural regeneration that meet stand stocking and species preference objectives would be protected from prescribed burning fire effects to the extent practical.

(58) Treat any susceptible ponderosa pine stumps, greater than 12" dbh with Sporax to reduce the potential risk of annosus root disease spread. Annosus root disease has not been confirmed within the analysis area but its presence is suspected.

(59) In regeneration units where planting is planned, seed sources locally adapted to the site would be planted in protected areas with appropriate shade.

(60) Avoid removal of large diameter ponderosa pine (>24 inch dbh) to the extent possible when locating landings, skid trails and skyline corridors. Within MA21, retain all trees >20" dbh.

(61) Where deemed necessary by a Silviculturist, slash piles that contain ponderosa or lodgepole pine slash would be burned in a timely fashion or baited to reduce the likelihood of *Ips* population buildup.

(62) Where prescribed by a Silviculturist, ponderosa or lodgepole pine slash creating operations may be restricted to July through November to reduce the potential for *Ips* population buildup.

(63) Verbenone or MCH capsules may be applied within the analysis area to repel mountain pine or Douglas-fir bark beetles from individual trees or small areas.

AIR QUALITY

(64) Best Available Control Technology: As per the Forest Service open burning permit with the State of Montana, Best Available Control Technology would be used to limit impacts from burning operations. This includes submitting and obtaining burn approval from the MT/ID Airshed Group prior to ignition, and burning only during times of at least good ventilation.

(65) Public Notification: Residents within immediate proximity to the burn area would be notified by mail, message or phone prior to implementation. Signs may be posted as needed along roads warning of potential visibility impairment from smoke.

(66) Splitting Burn Blocks: Larger burn blocks may be burned over multiple days in order to reduce the short-term smoke impacts. For pile burning, short-term impacts may be lessened by reducing the number of piles burned.

(67) Monitoring: All prescribed burns would be monitored visually. If any prescribed burn appears to be generating an unacceptable level of smoke, measures may be taken to cease further ignition as is reasonably implementable.

(68) Mop Up: If a prescribed burn appears to be generating nuisance smoke for days after ignition is complete, those areas may be extinguished.

MONITORING

Recent monitoring establishing area baselines, and leading to this analysis has been completed by Rennic Stark IDT and the Lolo NF resource specialists. This information can be found in specific specialist reports and portions of Chapter 3.

FOREST PLAN MONITORING AND BMP AUDITS

The Forest conducts post-project implementation monitoring per guidance in the Forest Plan. Typically, a project with the scope and breadth of Rennic Stark would have several elements and treatments evaluated per Forest Plan Monitoring guidance.

Another form of monitoring that could occur on portions of the Rennic Stark project is the State BMP audit. This audit is conducted by an interagency team of personnel well-versed in BMP implementation and effectiveness. It would typically focus on timber harvest and associated transportation system elements and implementation. Typically about 10 larger projects on the NFS lands in Montana are evaluated each year.

RENNIC STARK PROJECT-SPECIFIC MONITORING

This section provides a summary of project monitoring. Additional information and more specific monitoring details are contained in individual specialist reports which are available in the Project File and at fs.usda.gov/goto/lolo/projects.

1. Monitor to determine if road maintenance and road BMP measures were implemented and to determine their effectiveness (this includes culvert replacements).
2. Monitor to determine if timber BMP and INFISH buffers were implemented and to determine effectiveness.
3. Monitor to determine if unauthorized OHV use is occurring in areas where treatments have been performed. If monitoring reveals this is occurring, steps would be taken to prohibit use (e.g., signing, barrier installations, increased law enforcement).
4. Monitor residual stand conditions and reforestation. Monitoring the effects on vegetation would take place throughout the implementation and execution of this action, and for a number of years following implementation. Initially, the monitoring begins with the intensive investigation of the landscape vegetation mosaic based on series, habitat type, and management area land and resource objectives which are defined and refined as silvicultural management practices (see Vegetation Specialist’s Report for more detail).
5. A post-treatment stand exam according to the R1 CSE (common stand exam) old growth protocol (PF, K7-02) would be planned in stands proposed for non-commercial treatments which are classified as old growth as defined by Green et al. (1993, errata 2008). A post-treatment exam would be planned to determine if the stand meets old growth after treatment.
6. The Forest Landscape Architect would monitor the project area during timber harvesting. This monitoring would determine whether the proposed activities meet the Forest Plan goals and VQOs and the length of time required for the visual effects of these activities to begin to blend into the natural forested landscape. The Forest Landscape Architect would be involved in design review the Cedar Creek culvert and the Cedar Creek trailhead.
7. Follow the LNF integrated Weed Management project (USDA FS 2007b, pages 32-34), and FSM BMPs regarding monitoring noxious weeds (FSM2081.2) (USDA FS 2001).

8. Goshawk: Survey and monitoring of the area associated with 22 proposed treatment units (Table 22, Wildlife Specialist's Report) would continue in an effort to locate occupied nest sites to ensure adequate protection during project implementation. Monitoring pre- and post-harvest would follow Woodbridge and Hargis (2007).
9. Flammulated owl: Survey and monitoring for flammulated owl would continue post-treatment as described in the Wildlife Specialist's Report.
10. (10) Elk and Flammulated owl: Vegetation monitoring of canopy cover changes post-treatment would be implemented to assess effectiveness; including Units 103, and 14 through 22 for flammulated owl; and Units 4, 5A, 8-11, 13, 18, 23, and 24 for elk.

Chapter 3 Affected Environment and Environmental Consequences

Introduction

This section summarizes the direct, indirect, and cumulative effects of Alternative 1 (No Action) and Alternative 2 (Modified Proposed Action as explained in Chapters 1 and 2), providing the information and analysis necessary for the Deciding Officer to determine whether to prepare a finding of no significant impact or an EIS (40 CFR 1508.9). Additional information, including existing conditions, methodology for analysis, the determination of the effects analysis boundaries, and more details of the effects analysis, are contained in the individual resource Specialist's Reports which are available online at www.fs.usda.gov/goto/lolo/projects or in the Project File located at the Missoula Ranger District. Information from the Transportation Planner Specialist's Report is used throughout the reports for the other resources and is not summarized in this chapter. Specific road treatments are summarized in EA Appendix H.

Past, present, and reasonably foreseeable actions were considered for analysis of cumulative effects where appropriate for each resource (resource reports). Table D-1 in Appendix D provides a summary of activities that were considered in the cumulative effects analyses and includes those that occurred in the past, are still occurring, may occur, or may continue for an undetermined amount of time into the future. These actions are displayed in Map D-2 (see Appendix D).

Forested Vegetation

The forested vegetation patterns within the Rennic Stark area were shaped in large part by large-scale fire events in the early 1900s (see Fire and Fuels Specialist's Report). These wildfires resulted in conditions consistent with the stand initiation phase of stand development over the majority of the analysis area (Oliver and Larsen, 1996). While some residual overstory trees survived these fires, the forests that currently occupy the area, by in large, regenerated in response to these disturbance events. Aspect, elevation, temperature, moisture regimes and seed availability and dispersal approximately 90 years ago led to the establishment of the forests we see today in the Rennic Stark area. The type, size, scale, arrangement, duration, intensity, and species affected in subsequent disturbance events will dictate how forest development patterns emerge after their occurrence. Following nearly 100 years since the first of these disturbances, much of the forested area has moved into the stem exclusion phase of stand development. During stem exclusion, intense inter-tree competition precludes the establishment of most new individuals (Oliver and Larsen, 1996). Most of the forested area within the Rennic Stark area is presently experiencing extreme physiological competition, consistent with stem exclusion, and corresponding losses to insects and disease due to poor vigor and resilience to insect attack. Shade-intolerant pines are losing live crown ratio, thinning from the center, and experiencing increasing losses. As ponderosa pine and lodgepole pine crowns thin, more diffuse light reaches Douglas-fir or other shade-tolerant species in the understory allowing their survival. Over time, the competitive advantage may shift to Douglas-fir and grand fir as the pines struggle with the demands placed on their limited photosynthae and succumb to insects, disease, and competition (Oliver and Larsen, 1996).

Without fire as a disturbance agent, the forested lands are shifting towards uniform, overstocked stands dominated by shade-tolerant species. These conditions predispose stands to stand-replacing fire events and insect and disease epidemics (Graham et al., 2004). Shade-tolerant species in the Inland Northwest tend to be more prone to a variety of insects and diseases including spruce budworm, Douglas-fir beetle, root disease, and dwarf mistletoe (Hessburg et al., 1994). It is well accepted that ongoing climate changes have pushed regional climates beyond the bounds of the last several centuries. Warmer climates are expected to alter stress complexes that affect forests rendering them vulnerable to increased frequency, severity and extent of disturbances, namely fire and insect outbreaks (Joyce et al., 2008).

HABITAT TYPE GROUPS

Habitat type groups are assemblages of habitat types with similar disturbance response, potential stocking density, potential productivity, potential down wood accumulation, fire frequency, species composition, and stand structures. They are also based on environmental temperature and moisture regimes. The groups used in this analysis are based on the Western Montana Zone, which generally encompasses the area from the Bitterroot Mountain Divide to the Continental Divide in the Rocky Mountains, Montana (Green et al, 1992, errata 2008). Habitat type groups were used instead of Vegetative Response Units (VRUs) because habitat type groups are a consistent classification system utilized across all western Montana Forests for planning and analysis.

Habitat types stratify site conditions on the potential for a site to support plant communities. There are eight habitat type groups that depict forested vegetation on N FS land within the analysis area (see Figure 8). See the Forested Vegetation Specialists Report for a detailed description of these groups relative to the project.

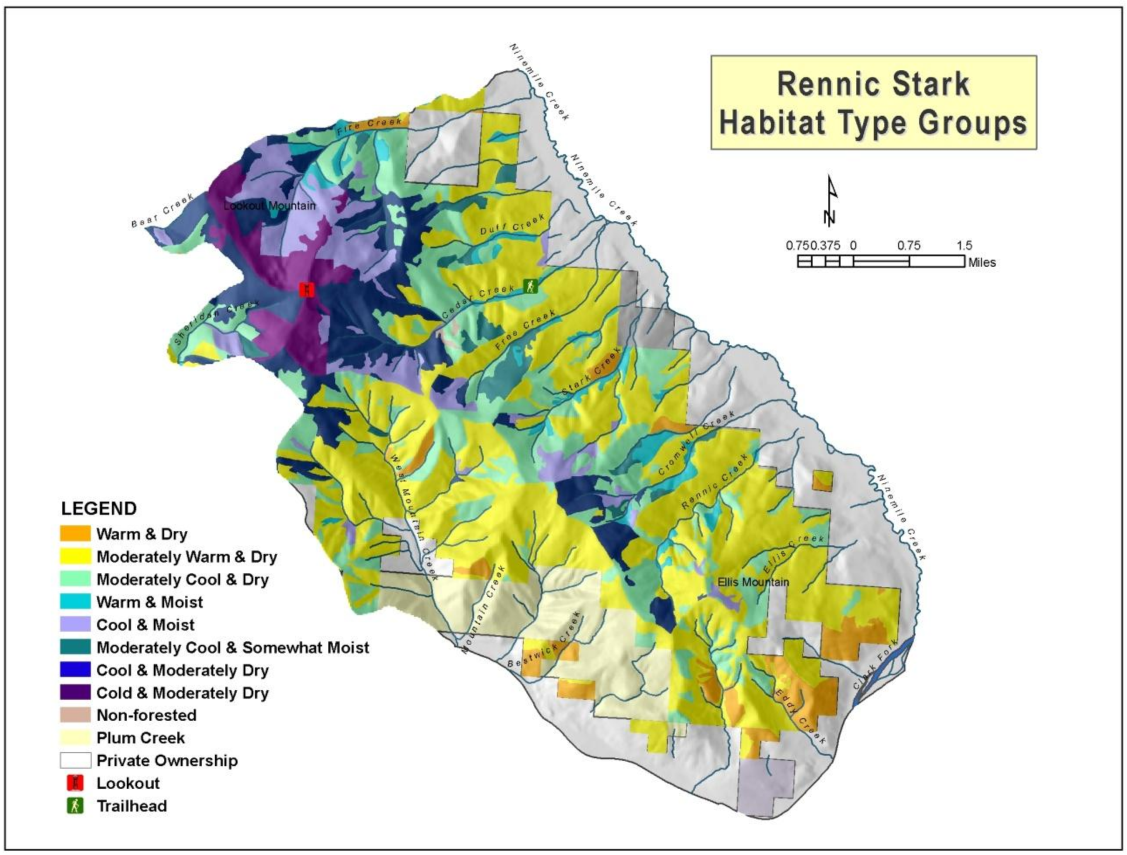


Figure 8 - Rennic Stark Habitat Type Groups

Table 7 Acres of Habitat Type Groups in the project area

Habitat Type Group	Description	Acres in Analysis Area (% of total)
A	Warm and Dry	1,258 (5%)
B	Moderately Warm and Dry	11,129 (45%)
C	Moderately Cool and Dry	4,965 (20%)
D	Warm and Moist	851 (3%)
E	Cool and Moist	1,870 (8%)
G	Moderately Cool and Somewhat Moist	585 (2%)
H	Cool and Moderately Dry	2,926 (17%)
I	Cold and Moderately Dry	1,124 (5%)

STRUCTURAL STAGES AND CANOPY COVER

Tables 8 and 9 show the current structural stage and canopy cover distribution within the Rennic Stark area.

Table 8 Current structural stage and canopy cover in the project area

Vegetation Structure	Existing (R1 VMap)
Water	< 1%
Sparsely Vegetated	1%
Shrub Dominated	4%
Grass/Forb	14%
Seedling/Sapling Tree (< 5" dbh)	5%
Small Tree (5 – 9.9" dbh)	28%
Mature Tree (Medium – Large > 10" dbh)	48%

Table 9 Canopy Cover

Canopy Cover	Existing (R1 VMap)
Water	< 1%
Sparsely Vegetated	1%
Shrub Dominated	4%
Grass/Forb	14%
Low Tree Canopy Cover (10-24%)	13%
Moderate Tree Canopy Cover (25-39%)	21%
High Tree Canopy Cover (40-59%)	47%

The primary characterization of the area is that closed canopy, mature forest occupies approximately one half landscape (see Tables 1 and 2). The landscape pattern is comprised of predominately mid-aged, second-growth forest that regenerated (established) after large scale fires in the early 1900s that burned over 18,000 acres within the analysis area (see Fire and Fuels Specialist's Report). Seedling and sapling stands are not well represented across the landscape (5%). Following the large fire season of 1910, the Forest Service, State and private landowners began to suppress wildfires to protect social values. Effective fire suppression has reduced the role of natural disturbances to shape landscape vegetation patterns and limited tree regeneration has occurred. The result is small patch sizes and disturbance patterns that preclude patterns associated with large-scale disturbance events. The majority of these are due to limited timber harvest, small suppressed fires, and minor insect and disease occurrence. Today, following 80 plus years of successful fire suppression, the mosaic patterns of past burns and associated biological diversity has diminished. Areas that would have burned during the past 80 years have not and areas that burned during the last century are now occupied by an increased representation of mid-aged to mature stands. As a result, continuous, homogenous stand conditions and fuel beds across the landscape coupled with warming trends set the stage for large-scale fires, as the region experienced in 2000, 2003, 2005 and 2007, and epidemic insect outbreaks as evidence by the current elevated mountain pine beetle levels within the landscape (Rafta et al., 2008; Gannon and Sontag, 2010).

MOUNTAIN PINE BEETLE (DENDROCTONUS PSEUDOTSUGAE HOPKINS) (MPB)

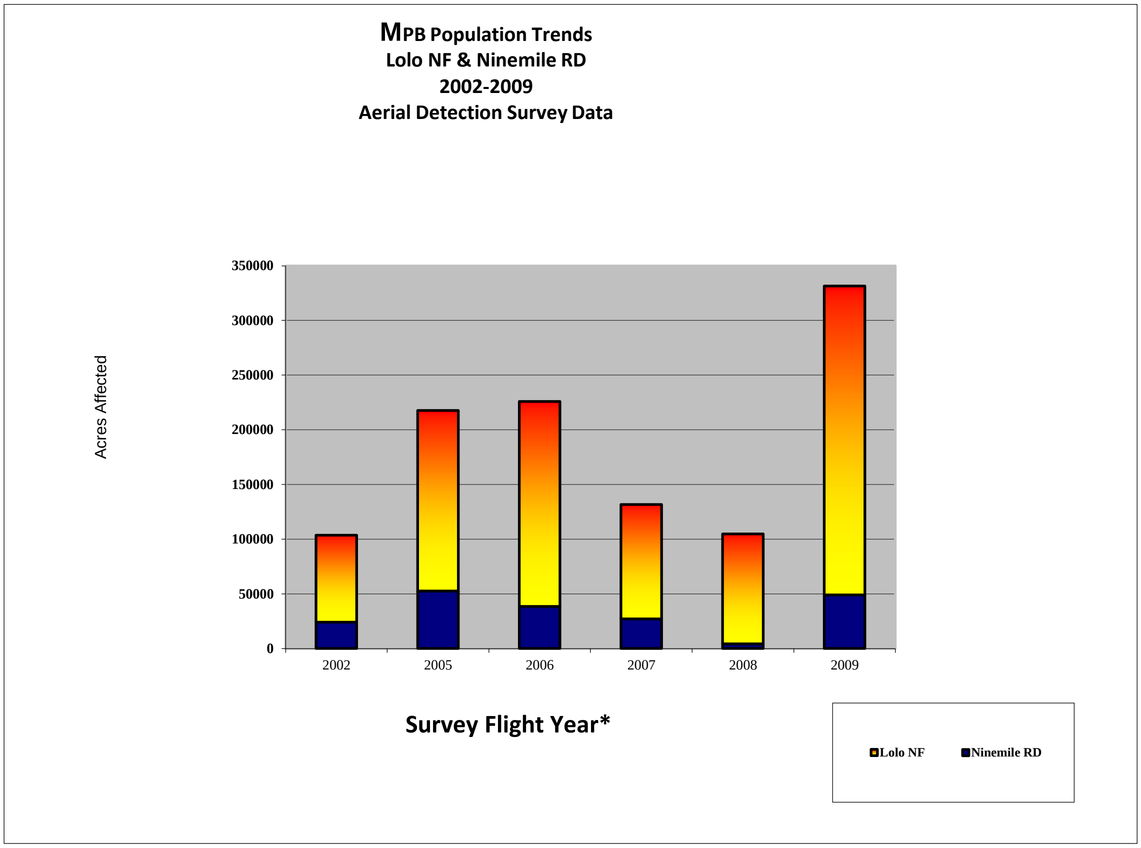


Figure 9 - MPB Population Trends

Mountain pine beetle is the most aggressive bark beetle in the West (Jenkins et al., 2008). Within the Rennic Stark area, mountain pine beetle activity has been escalating over the past few years (ADS, 2009; ADS, 2008; ADS, 2007; Gannon and Sontag, 2010; Gannon and Sontag, 2009; Gibson 2008; Gibson and Aquino, 2007).

DESIRED FUTURE CONDITIONS

The general desired future conditions (DFC) are listed by Habitat Type Group (see Forested Vegetation Specialist's Report). They provide a range of conditions to guide active management based an understanding of how ecosystems respond to changing conditions gained from historical conditions, as well as, recognize that current and future conditions are and will be different. The focus lies on an indeterministic approach of developing structurally and compositionally diverse forests and that are mediated by ecological and disturbance processes. The objective is to hedge bets in the face of an uncertain future and still enable comparison of current conditions, and the trends or direction of change of conditions to assist management decisions. Overall, the desired future conditions address landscape size class and structural distributions and tree-stocking levels as a strategy to minimize forest vulnerability to stressors consistent with the long-term disturbances expected under current and future climates (www.frcc.gov). Managing in the face of uncertainty requires a variety of approaches and strategies that are focused on enhancing ecosystem resistance and resilience. This involves increased emphasis on ecological processes and managing for change, despite uncertainty about the direction or magnitude of a changing climate (Joyce et al., 2008). Furthermore, these desired future conditions should be monitored and adaptively changed as appropriate in both temporal and spatial contexts.

Environmental Consequences

To achieve the purpose and need, stand treatments were designed to: 1) reduce crown fire potential and restore fire as an ecological process focusing on low intensity, high frequency and mixed severity fire regimes; and increased resilience to surface fire and bark beetles; 2) maintain or increase the species composition of fire-resistant shade-intolerant species (western larch, ponderosa pine); and design treatments to retain large diameter, old ponderosa pine and western larch trees and create stand conditions that could provide large trees in the future, and; 3) provide for age class and species structural diversity to reduce vulnerability to stressors (fire, insects, and disease).

The effects analysis is based on the following measurement indicators:

Resilience - Evaluation of vulnerability to stressors and ability of stands to spring back after disturbance. Measurement indicators include bark beetle hazard and resilience to fire under current and future conditions. Attributes that are consistently linked as primary factors associated with bark beetle infestations are stand density, basal area, stand density index, tree diameter, and host density (Fettig et al, 2007).

Resistance - Ability of a forest community to avoid alteration of its present state by a disturbance. Resistance practices seek to improve forest defenses against the effects of rapid environmental changes. Resistance measures are aimed at protecting high value resources that are vulnerable to stressors.

Function - measured by functions and processes characteristic of healthy ecosystems, whether or not those systems are within the historical range of variation. Properly functioning systems can accommodate processes including fire, insects, disease, and climate change and provide a sustainable flow of ecosystem services.

Species composition – measured by percent composition of at-risk shade-intolerant species (i.e., ponderosa pine and western larch). Measures of species composition include establishment of shade-intolerant, root disease resistant species and species diversity at the stand and landscape scale. Managing for a variety of species and genotypes provides resilience to environmental stressors6 (Joyce et al., 2008).

Structure- measured by the horizontal and vertical distribution of components of stands. Age class and structural diversity at the landscape scale is also a measure of forest structure. Measures used include: stand density index (SDI); age class diversity; basal area and trees per acre as measures of density; quadratic mean diameter as a measure of tree sizes; arrangement and levels of ladder fuels and down woody debris.

The analysis addresses how both alternatives would affect the following: resilience, resistance, species composition, structure and function, and restoration of fire as a process. Alternative 2 employs an adaptive approach to make adjustments in the application of historical conditions as a reference point. Flexibility is incorporated to address inherent uncertainty about the local effects of climate change by enhancing the resiliency and resistance of the forests, and specific aspects of structure, composition and function (Joyce et al., 2008; Millar et al., 2007).

[6] A physical, chemical, or biological entity that can induce an adverse response (Joyce et al., 2008).

The issue related to forested vegetation in the Rennic Stark area is the need for a healthy and resilient ecosystem. Indicators of a properly functioning condition include a resilient ecosystem with diverse distribution of seral stages, with composition, structure and pattern that is resilient to natural fire regimes, and insect and disease occurrence under current and future climates. The Northern Regional Overview identified significant ecological indicators of risk to forest ecosystems including: (1) the loss of species composition at the cover type level and changes in landscape distributions, and; (2) stand level structure as measured by density and seral stage/size class distribution (USDA, 1998). For example, ponderosa pine, western larch, whitebark pine, and aspen are key at-risk ecological components within the analysis area. This effects analysis addresses restoration of forest structure, species composition, and function. In addition, each alternative will be addressed as guided by the Forest Plan.

Table 10 Effect Indicators by Acres of Treatment

Effect Indicators as Displayed by Acres of Treatment	Alt 17	Alt 212	Alt 2 % landscape treated
Low MPB susceptibility; substantially reduced bark beetle hazard; high stand resilience to bark beetle attack and fire	0	4,010	11.3%
Moderate to high MPB susceptibility; slightly reduced bark beetle hazard; low to moderate stand resilience to MPB attack; reduced surface fuel loading and reduced crown fire initiation potential	0	1,571	4.4%
Low MPB susceptibility maintained; reduced bark beetle hazard; high stand resilience to bark beetle attack and fire	0	463	1.2%
Fire restored as a process to fire-adapted ecosystems	0	9,201	25.9%
Slight favoritism to at-risk shade-intolerant species and minimal reintroduction of fire as an ecological process	0	1,571	4.4%
At-risk shade-intolerant species and healthy, large diameter individuals featured	0	4,414	12.4%
Provide for landscape-scale age class and structural diversity and reduced fuel continuity; prescribed fire to perpetuate landscape-scale natural diversity of plant communities; restoration and regeneration of bark beetle killed stands by management-ignited fire	0	4,940	13.4%
Reestablish diseased and dying stands; restore sites with disease resistant species adapted for resilience to current and future climate	0	153	0.4%
No improvement in any of the above listed criteria (No Action)	9,201		

Table 10 provides a quantitative comparison of the two alternatives and their effectiveness at meeting elements of the purpose and need within the Rennic Stark landscape. Large-scale thinning to reduce stand density to minimize drought effects, reduce the impact of large wildfire events, manage the potential for increased insect and disease outbreaks, and ensure a wide variety of species and age classes diversity, while managing for processes are approaches to facilitate adaption in the face of the changing climate (Joyce et al., 2008; Millar et al., 2007). Alternative 1 (No Action) does not involve any active management adaption strategies and the landscape would remain highly vulnerable to stressors coupled with a changing climate.

Treatments Affecting at-Risk Shade-Intolerant Species

In Alternative 2, the largest, healthiest trees would be retained to the degree the purpose and need could be met. In general, the project would: focus largely on removing small diameter trees; thinning; and using prescribed fire to modify fire behavior (as measured by the projected reduction of

[7] Acres of treatment

uncharacteristically severe wildfire effects for the forest type); and maximizing the retention of large, trees, as appropriate for the forest type, to promote fire-resilient stands. All treatments proposed under Alternative 2 are designed to retain large, healthy trees to the degree this practice is consistent with the objective of maintaining or restoring healthy fire-resilient stands. Ponderosa pine and western larch are key at-risk species that would be featured by the treatments. By retaining large, healthy dominant and codominant trees, the treatments would promote long-term forest productivity and genetic quality by selecting residuals based on phenotypic expression (Howe, 1995). Alternative 1 would retain all trees onsite, but would not increase their resilience or resistance to wildfire or other disturbance agents.

Where aspen occurs within treatment units, Alternative 2 would stimulate their regeneration. This would occur through either removal of conifer encroachment and/or prescribed burning. These actions would stimulate suckering among aspen clones increasing the of distribution aspen within the treatment areas. Alternative 1 would not stimulate aspen regeneration and would likely result in a further decline of aspen.

Alternative 2 includes planting blister rust-resistant whitebark pine (up to 100 acres) to re-establish this species on suitable sites along Ninemile Divide in the vicinity of Stark Mountain. Whitebark pine restoration would not occur under Alternative 1 and the species would continue to be lost from the landscape due to the effects of whitepine blister rust and mountain pine beetle. Protecting whitebark plus trees (trees that are naturally rust-resistant and are contributors to a Regional rust-resistance breeding program) would continue under both Alternative 1 and Alternative 2.

Treatments Affecting Old Growth and Large Tree Retention

The Lolo Forest Plan defines old growth on page VII-24 and VII-25 as “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”. The Lolo Forest Plan EIS established the strategy of defining and distributing old growth (i.e., trees, stands, forests, and habitat) on the Lolo NF. Page II-61 of the EIS states:

“As a strategy for meeting old growth needs, the Forest was segregated into 71 drainages. A minimum of 8 percent old growth was allocated to most of these drainages where wilderness was not available, although this varies to some degree by alternative (Table II-19). This old growth was then distributed by vegetative type within each drainage recognizing the individual needs of various old growth dependent species.”

Note that Table II-19 shows 488,884 acres under Alternative “D” (the selected Forest Plan alternative) as “Land available in wilderness and roadless areas for old growth-dependent species” or approximately 23 percent of the LNF. In addition, Table II-19, shows 43,854 acres under Alternative “D” for “additional lands allocated to provide vegetative and spatial diversity”; these are the MA21 allocations. The Lolo Forest Plan shows 41,303 acres of MA21 (page III-104). In modeling the outputs and effects of the various Forest Plan alternatives the EIS concludes on Lolo Forest Plan EIS, page IV-37 that:

“In all alternatives, a goal of retaining at least 10 percent of the suitable timber land in old-growth forest at all times was prescribed. The goal was exceeded in all alternatives because other constraints were more limiting, or forested lands not suitable for timber production produce old-growth stands unless catastrophic fire, insects, or diseases kill the trees.”

On page IV-10 of the Lolo Forest Plan EIS, old growth is described in much broader context than Green and others (1992) as follows:

“A wide variety of nongame wildlife occurs on the Forest and they are dependent upon a wide variety of habitats. Some activities that directly benefit nongame habitat are planned and include retention of specified amounts of slash scattered on the ground, the retention of snags where safety permits, and the assignment of old-age timber stands to old-growth dependent wildlife species.”

Management Area 21 (MA21) of the Lolo Forest Plan is described on FEIS page 3-8 as, "a variety of forested lands representing all elevations, aspects, habitat groups, and growing site conditions. They are located throughout the Forest in such a way as to evenly distribute old age stands of timber for wildlife species dependent upon old growth for habitat."

Within the Rennic Stark analysis area, 6,180 acres (17.4%) lie within the Stark Mountain Inventoried Roadless Area. In addition, 1,215 acres (3.4%) acres is currently allocated to MA 21, old growth. Therefore, within the analysis area, 7,395 acres (20.8%) is currently available for old growth-dependent species.

A Forest-wide old growth analysis using Forest Inventory and Analysis (FIA) data validates that the Lolo NF continues to meet the old growth strategy of the Forest Plan. Bush and others (2007) derived statistical estimates of the percent old growth using FIA data and the more restrictive definition provided by Green and others (1992) on all forested lands on the Lolo NF[8]. The 2007 estimate is 9.6 percent[9] old growth that exceeds the 8 percent strategy (Lolo Forest Plan EIS, page II-61). In addition, a 2003 assessment provides statistical estimates by 5th code HUC. The majority of the Rennic Stark analysis area lies within the Ninemile 5th code HUC which was estimated at 17.14 percent old growth. A portion also lies in the Sawmill-Cedar 5th code HUC, which was estimated at 10.37 percent old growth (Bush et al., 2003).

All treatments would retain old growth structure where it exists. Old growth stands, as defined by the Forest Plan and Green and others (1992), are not proposed for any commercial tree removal[10]. In response to public input, the following design criteria were incorporated into Alternative 2: (1) no commercial harvest in old growth stands; (2) no permanent or temporary road construction within or immediately adjacent to old growth stands, and; (3) maintenance of existing year-round road closures within or immediately adjacent to old growth stands to prevent loss of snags by firewood cutting. The old growth stands proposed for treatment are within Units 15, 16, 22 and 103. Non-commercial thinning followed by hand piling and burning treatments would retain the old growth character of these areas. This would be assured by retaining all trees greater than 10" diameter at breast height and by reducing fuels in the vicinity of old trees prior to prescribed burns to reduce fire intensity (Kolb et al., 2007).

Monitoring data collected on the Lolo NF on silvicultural treatments in old growth stands between 1995 and 2005 indicate that treatments are successful at maintaining old growth structure post-treatment (Brewer et al., 2008). Sixteen confirmed old growth stands were treated with a combination of understory thinning, prescribed fire, and/or commercial harvest. Ninety-four percent of the old growth stands treated maintained old growth structural characteristics post-treatment. One stand experienced a high level of bark beetle mortality post-treatment due to losing a portion of the large tree component due to mortality from prescribed fire (Brewer et al., 2008). In response, Alternative 2 includes hand piling and burning when in old growth stands. In addition, duff accumulations around the base of large (21"dbh+) trees would be ameliorated to encourage fine roots to migrate deeper in the soil profile before applying stand level prescribed fire (i.e., underburning). Kolb and others (2007) concluded that raking duff accumulations may increase fine root mortality. However, Jain and Graham (in press) studied various treatments to ameliorate duff accumulations and found that treatments when fine roots are not actively growing can mitigate unintended consequences associated with removing duff accumulations around the base of large trees (Jain, personal communication, 2011). The guidelines developed by Jain and Graham would be incorporated into treatments in old growth stands in Alternative 2. This is consistent with direction outlined in the 1986 Lolo NF Forest Plan adaptive management approach referred to as

[8] Czepleski (2004) validates the Northern Region's approach using FIA data to analyze Forest Plan standard old growth compliance.

[9] 90 percent confidence interval of 7.7 percent to 11.5 percent

[10] Site visits assessing old growth criteria and status were conducted (Project File K7-13, K7-44).

"management control system" to consider monitoring study findings and adjust management activities accordingly. Conversely, monitoring data also indicates that 91% of the old growth stands burned by wildfires lost their old growth characteristics through a combination of direct fire mortality, delayed fire mortality, and mortality caused by post-fire agents such as bark beetles; with the exception of 6 acres on which blowdown was salvaged, these stands had no history of management (Brewer et al., 2008). These results are consistent with the effects that would be expected under the No Action alternative (Alternative 1) in the event of a wildfire.

Treatments in Alternative 2 were designed to protect large diameter (>21" dbh) ponderosa pine and western larch from the risk of stand-replacing wildfire due to ladder fuel accumulations, historically atypical stand densities, and high surface fuel loading11. Under the No Action alternative these trees would remain susceptible to stand-replacing fire, bark beetle attack, and extreme competition for resources. In commercial treatment units under Alternative 2, ladder fuels would be removed in an approximately 20 – 30' radius to protect these trees. Furthermore, the entire stand where these trees reside would be treated to reduce density and increase resilience to wildfire and bark beetles (Project File K7-17).

Recent study results suggest that old growth restoration treatments in warm and dry forests can alter stand biomass allocation providing greater resources for the overstory (Sala and Callaway, 2004). Active management restoration treatments in old growth stands studied include: understory slashing with piling and burning; understory slashing with underburning; and overstory thinning and understory slashing followed by underburning. Slashing treatments removed approximately 500 trees per acre less than 8" dbh and overstory thinning treatments removed approximately 35% of the overstory basal area targeting the least desirable individuals (Project File K7-31). These types of treatments are consistent with understory slashing, prescribed fire, and overstory thinning included in Alternative 2. Results indicate that positive benefits to function and growth of the large tree component12 of old growth stands may be accomplished primarily by removing the Douglas-fir understory that competes for resources. Results also suggest that additional positive effects on overstory function may be accomplished by thinning the overstory in addition to treating the understory. This study provides crucial data and indicates a substantial positive effect on radial wood growth as a result of active management in old growth stands (Sala and Callaway, 2004). In addition, Sala and Callaway (2004) note that while other studies have shown measurable positive responses to restoration treatments in old growth stands 5 to 25 years following treatment, this study indicates immediate positive responses following treatment. Data taken five consecutive years after restoration treatments designed to modify canopy structure towards more historic structure by removing dense Douglas-fir understory effectually allowed for allocation of resources to the large tree component of old growth stands and resulted in measurable positive effects to overstory tree function (Sala and Callaway, 2004).

These findings further ascertain the conclusion that slashing, thinning, and prescribed fire treatments included in this project would not preclude stands from developing into old growth in the future. The treatments would likely hasten diameter accretion and stands may potentially provide the large tree component of old growth habitat in the future. The following project design features, which are incorporated in this project to protect large trees, include:

Where deemed necessary by a Silviculturist, measures would be taken to protect at-risk and/or large diameter (21"+ dbh) trees from excessive crown and bole scorch to the extent feasible to avoid unintentional mortality.

Silvicultural prescriptions would favor the retention of the largest, healthiest dominant/codominant trees to the degree possible to meet unit objectives. To ensure this, a Certified Silviculturist would prepare or

[11] Trees > 21" dbh may be removed to achieve stand objectives and where operations and safety necessitate.
[12] The physiological responses of large, old ponderosa pine and western larch were studied.

review site-specific prescriptions and marking guides. Site-specific silvicultural prescriptions and/or marking guides may include terms such as "thin from below" or specify an upper diameter limit of trees eligible for harvest to meet this objective. This would retain large, healthy trees to the degree the practice is consistent with the objective of maintaining or restoring a given stand.

Avoid removal of large diameter ponderosa pine and western larch (>24" dbh) to the extent possible when locating landings, skid trails and skyline corridors.

TREATMENTS AFFECTING INSECT INFESTATION

Examination of the best science available supports the idea that thinning through silvicultural management as proposed in Alternative 2 would reduce susceptibility to bark beetle attack. As has become commonplace, the term "thinning" is in reference to partial cuttings to reduce the number of stems or density within a forest stand (Graham et al., 1999). All tree cutting treatments under Alternative 2 "thin" stands to different levels using a variety of silvicultural approaches. Based on documented studies and thirty years of operational bark beetle management experience, there is conviction among Northern Region entomologists and practicing silviculturists that reducing stand density through silvicultural means results in substantially less bark beetle-caused mortality.

Attributes that are consistently linked as primary factors associated with bark beetle infestations are high stand density, basal area, stand density index, tree diameter, and host density (Fettig et al, 2007). Since the late 1970s, entomologists have emphasized the altering of stand conditions, through silvicultural means, to ones less susceptible to bark beetle depredations (Amman, et al 1977; McGregor et al, 1985; McGregor et al, 1987; Shore and Safranyik, 1992; Shore and Safranyik, 2000; Schmid et al, 1994). This technique is in contrast to bark beetle "control," in which efforts are expended to kill as many beetles as possible in order to "halt" an outbreak. Direct control is not the purpose or goal of any treatments proposed in the Rennic Stark project. Rather, the commercial thinning treatments in Alternative 2 are intended to enhance the vigor of trees and stands to make them less susceptible to insect attack. This approach provides long-term benefits in reducing beetle depredations, it is not a "quick fix."

In addition, warmer temperatures associated with climate change facilitate bark beetle outbreaks in two primary ways: (1) drought stress makes tree more vulnerable to attack, and; (2) populations of bark beetles can speed up their reproductive cycles potentially leading to more frequent generations (Joyce et al., 2008). Drought-induced stress reduces the number of beetles necessary for a successful mass attack, relaxing the conditions necessary for a bark beetle outbreak to occur (Bentz et al., 2010). Nonetheless, bark beetle response to climate change is highly complex and uncertain as bark beetle populations, community associates, and host trees are influenced by changes in temperature (Bentz et al., 2010).

Alternative 1 would not remove infested trees or reduce susceptibility to bark beetle attack. Alternative 2 would result in or maintain low susceptibility to bark beetle attack through density reduction on approximately 4,473 acres or thirteen percent of the landscape.

TREATMENTS AFFECTING DISEASE

A typical disease in habitat types that support Douglas-fir and true firs is root rot. Some evidence of Armillaria ostoyae is present in the analysis area. Douglas-fir is quite susceptible to Armillaria and partial cutting may intensify root disease infection (Wargo and Harrington, 1991). Armillaria ostoyae causes tree mortality that ranges from diffuse to extensive with Douglas-fir and true firs being the most susceptible with major growth losses (Klopfenstein et al., 2009). Restoring ponderosa pine and western larch where these species are adapted would reduce future mortality (Hagle and Goheen, 1988).

Phaeolus schweinitzii infection is also present within the analysis area; however, its presence has not been confirmed in any of the proposed treatment units. Douglas-fir is one of the most susceptible trees to the disease and root disease infection predisposes trees to bark beetle attack. The presence of P. schweinitzii coupled with high density levels can weaken trees and result in subsequent Douglas-fir beetle attack (Lockman, personal communication). Treatments are designed to reduce losses to P. schweinitzii and bark beetles. Increasing the vigor of root rot-infected trees allows for more adventitious root development to compensate for some loss of main root system due to root rot (Lockman, personal communication). Commercial treatments in Alternative 2 are designed to reduce basal area enough to reduce susceptibility to bark beetle attack while making efforts to avoid opening stands excessively that may predispose root rot infected trees to windthrow. The treatments would favor shade-intolerant species through thinning and planting. This is one of the most effective ways to reduce losses to root disease on infected sites (Hagle and Goheen, 1988).

Annosus root disease has not been confirmed within the analysis area, but its presence is suspected. To ameliorate the potential for spread of the disease, in Alternative 2 susceptible ponderosa pine stumps greater than twelve inches in diameter would be treated with Sporax to prevent spread of Annosus (DeNitto, personal communication).

Dwarf mistletoe infection in western larch or Douglas-fir is present within some of the treatment areas. Dwarf mistletoe is not known to directly kill trees within a short period of time. However, it does predispose trees to bark beetles that can kill them. This is because mistletoe infection weakens trees causing them to lose vigor. Targeting the removal of trees infected with dwarf mistletoe would reduce the amount of infection within stands as well as any ensuing regeneration. Commercial treatments in Alternative 2 would remove western larch and Douglas-fir trees that are moderately to heavily infected with dwarf mistletoe where it occurs on approximately 1,976 acres. This would greatly reduce the incidence of this pathogen within stands and reduce the spread to tree regeneration, while reducing the likelihood of bark beetle attack, resulting in much healthier stands. Alternative 1 would not remove any dwarf mistletoe infected trees or reduce the incidence of the pathogen within the analysis area. In summary, Alternative 2 would reduce dwarf mistletoe infection and increase species composition of root disease-resistant species while Alternative 1 would result in a loss of forest productivity and yield.

Meeting the Desired Future Condition

As previously discussed habitat type groups are assemblages of habitat types with similar disturbance response, potential stocking density, potential productivity, potential down wood accumulation, fire frequency, species composition and stand structures. Therefore, habitat type group is important when considering the effects of treatments on species composition, structure, function, resilience, resistance and regeneration.

Within the Rennic Stark area, the most profound changes have occurred in the warm and dry habitat types (i.e., Habitat Type Groups A and B). Notable changes due to reduced fire activity include: 1) an increase in fuel loadings and biomass resulting in less available nutrients; 2) lack of suitable seedbed and conditions for continued successful regeneration of fire-adapted species like ponderosa pine and western larch; 3) higher insect and disease levels as these disturbance processes attempt to substitute for the lack of fire, and; 4) changes in vegetation composition and structure. Within the analysis area, mid-aged continuous, dense forest dominates much of the landscape and lack of plant species and age and size class diversity coupled with drought and mild winters have contributed to MPB activity in the area.

Alternative 2 proposes treatments in predominantly dry habitat types (Habitat Type Groups A, B, and C) to address shifts in forest structure, composition, and function. All treatments in Alternative 2 work towards restoring the fire-adapted ecosystem by moving towards the desired future condition. As mentioned previously, this is not a static state or structurally/compositionally one specific condition. The desired condition is a mosaic of many vegetation components that vary across the stand and landscape level. In general, Alternative 2 would move stands along the trajectory towards the desired future condition by treating fuels, restoring fire, reducing bark beetle hazard, sanitation of dwarf mistletoe, favoring large trees and at-risk shade-intolerant species by addressing changes in species composition, structure, and function and establishing more resilient stands. Alternative 1 does not move the landscape towards the desired future condition since it does not reduce fuel loading or address forest composition, structure, function, or ecosystem resilience. The Forested Vegetation Specialists Report provides a detailed account of probable responses of treatment by Habitat Group.

SUITABILITY

Identification of lands generally suitable for timber harvest and timber production is made at the land management plan level; however, these identifications are estimates that are validated at the project level (36 CFR 219.12(a)(2)(D)(ii)). Project level suitability determinations were made during silvicultural diagnoses; final suitability determinations on lands proposed for commercial timber harvest will be documented in a site-specific silvicultural prescription prepared or reviewed by a Certified Silviculturist. Timber harvest on lands not suitable for timber production can occur when harvest is necessary or appropriate for other multiple use purposes and to achieve the desired vegetation conditions (16 USC 1604 (k), 36 CFR 219.12(a)(2)(D)(ii)). This is consistent with 16 USC 1604 (k) and 36 CFR 219.12(a)(2)(D)(ii) the implementing regulations of the National Forest Management Act of 1976.

REGENERATION HARVEST AND OPENING SIZE

It is Forest Service policy to prescribe a regeneration harvest when a salvage/sanitation entry will begin the regeneration of even-aged stands (FSM 2471.31). Alternative 2 would result in stand conditions suitable for forest regeneration on approximately 153 acres. Forest Service policy is to normally limit the size of harvest openings created by even-aged silviculture systems in the Northern Region to 40 acres or less. However, where catastrophic events such as fire, windstorms, or insect and disease attacks have occurred 40 acres may be exceeded (FSM 2471.1). Both alternatives would result in regeneration openings larger than 40 acres due to the effects of insect and disease attacks. Regeneration harvest activities would occur in three units (1B, 8, and 23) where insect and disease induced mortality has led to or contributed to high mortality within the stand. Fuels reduction, followed by planting of root disease resistant species would also occur. The high level of mortality in some units would result in even-aged silvicultural regeneration methods. Two-aged regeneration silvicultural systems would be applied to the units specified as regeneration. Each treatment is supported by a silvicultural diagnosis and a detailed prescription would be written or reviewed by a Certified Silviculturist. In addition, Alternative 1 would result in openings consistent with the levels outlined in Alternative 2 due to mortality within the stands; however, regeneration planting would not occur.

COMPLIANCE WITH NFMA AND FOREST PLAN TO RESTOCK AREAS OF EVEN-AGED HARVEST WITHIN 5 YEARS

Assurance is given that all suited lands as outlined in Alternative 2 can be adequately restocked within five years of final harvest. This conclusion is based on experience and regeneration status reports within stand compartments 09, 10, 11, 45, and 46 (K7-45). Even-aged Regeneration Harvests [16 U.S.C. 1604 (g)(3)(F)]: a two-aged seedtree regeneration harvest of Unit 1B, 8 and 23 are appropriate to meet the objectives and requirements of the Forest Plan.

ENVIRONMENTAL CONSEQUENCES ON FORESTED VEGETATION BY TREATMENT TYPE

ECOSYSTEM MAINTENANCE BURNING PRECEDED BY UNDERSTORY SLASHING OR THINNING

Alternative 1 – No Action

Alternative 1 would allow understory vegetation to continue to develop exacerbating ladder fuel accumulations. This would result in a continuation of the shift in species composition to Douglas-fir in the understory. Where young ponderosa pine exists in the understory it would be outcompeted by Douglas-fir, as conditions are favorable for Douglas-fir dominance. Fire occurrence could result in rapidly spreading stand-destroying crown fires due to sapling and pole thickets beneath the main canopy (Fischer and Bradley, 1987). This type of fire is likely to result in high levels of mortality in the ponderosa pine component in the understory and overstory and consume the ponderosa pine seed source, potentially reducing its distribution across the landscape. In addition, such an occurrence would expand the distribution of invasive species that would occupy these sites. Overall, the effects are a degradation of ecologically at-risk native forb and bunchgrass communities and dry, open ponderosa pine and Douglas-fir communities. This alternative would move sites on their present trajectory away from the desired future condition, a reflection of ecologically sustainable conditions.

Alternative 2 – 463 acres

Implementation of Alternative 2 would improve the distribution of open forestland and ponderosa pine communities and enhance ecosystem condition and function on approximately 1.3% of the analysis area. Understory density and ladder fuels would be reduced through slashing or thinning where necessary to facilitate prescribed burning and protect the overstory from crowning. Mechanical fuel treatments followed by prescribed burning has been shown to reduce fire severity over no treatment or prescribed burning alone (Pollet and Omi, 2002). The reintroduction of fire would reduce densities consistent with historical stocking levels and species composition. Ponderosa pine would be favored over Douglas-fir. Fire reintroduction would mimic natural process and move sites towards the desired future condition and increase their resilience to fire in the future. Increased tree vigor gained by reducing density and competition would reduce mountain pine and western pine beetle hazard. Density reduction followed by prescribed burning may increase noxious weed populations; however, the potential for spread would be minimized by roadside weed treatment and implementing mitigation measures.

ECOSYSTEM MAINTENANCE BURNING

Alternative 1 – No Action

Alternative 1 would perpetuate the current condition. Mountain pine beetle activity in mature lodgepole pine and whitebark pine hosts would continue. Shrub and conifer encroachment would continue, reducing the distribution of natural forest openings. These sites would remain highly vulnerable to large, stand-replacing wildfire in close proximity to private land. This alternative would move sites on their present trajectory away from the desired future condition, a reflection of ecologically sustainable conditions.

Alternative 2 – 4,787 acres

Implementation of Alternative 2 would result in patchy burns stimulating lodgepole pine and potentially whitebark pine regeneration in areas with high mountain pine beetle mortality. Vegetation density, forest continuity, and structural stages would be altered creating greater landscape age class and structural stage diversity by restoring fire as a regulating process to this fire-adapted system. Shrub and forb communities would be regenerated potentially increasing palatable forage and browse available to big game. The landscape age class and structural mosaic would be improved by breaking up landscape homogeneity and introducing new seral components in an irregular distribution across 13% of the analysis area. The treatment would likely result in pockets of tree mortality from direct fire effects and/or subsequent bark beetle attack. Fire would be restored as an ecological regulating process improving forest structure, composition and function in the Stark Mountain IRA. Rust-resistant whitebark pine would be established on suitable sites along Ninemile Divide. Sites with desirable sapling whitebark species composition would be protected from stand-replacing fire. In addition, promoting a diverse age class and species mix and spatially heterogeneous and complex vegetation structure would provide a landscape that is more resilient to climate change in the longer term (Joyce et al., 2008).

THINNING TREATMENTS AND PRESCRIBED FIRE

Alternative 1 – No Action

Alternative 1 would reduce the distribution of at-risk dry ponderosa pine and Douglas-fir communities and western larch on these sites. Shifts in species composition, structure, and function would continue favoring Douglas-fir, grand fir, multi-storied structures, and increasing the risk of stand-replacing wildfire and insects and disease. Canopy gaps created due to mortality would likely be rapidly occupied by existing individuals onsite as the level of competition remains extreme. Thinning would not occur resulting in a further decline in tree vigor and insect and disease resistance. Stands would remain highly susceptible to bark beetles and other pathogens. Fuel loading and fire hazard would not be reduced (Project File K7-17). Fire occurrence could result in rapidly spreading stand-destroying crown fires due to sapling and pole thickets beneath the main canopy as well as overstory density (Graham et al., 2004). This type of fire would likely result in high levels of mortality of the ponderosa pine component in the understory and overstory (Fischer and Bradley, 1987). This further threatens the distribution of ponderosa pine, an ecologically at-risk species, across the landscape. In addition, the No Action alternative would allow understory vegetation to continue to develop exacerbating ladder fuel accumulations. The quadratic mean diameter would continue to decline as smaller trees are favored over large that continue to be lost due to insects, disease, and density dependent mortality. Suppressed, unfavorable, unhealthy trees would remain on-site reducing stand productivity and perpetuating dysgenic stands over time. Dwarf mistletoe infection would be retained and spread. The healthiest, largest, residual trees would not be favored and freed to grow with adequate light and nutrients. Bark beetle hazard and susceptibility would not be reduced (Project File K7-17 and K7-18).

Alternative 2 - 1,823 acres

Alternative 2 would thin the live residual overstory from below to improve vigor increasing resilience to bark beetle attack. Alternative 2 would increase the resilience of mid-aged ponderosa pine/Douglas-fir and mixed conifer (western larch, Douglas-fir, ponderosa pine, lodgepole pine) forest communities over 5.1% of the landscape. Density reductions would favor ponderosa pine, western larch and the largest, healthiest and dominant residual trees rendering them less prone to insect or disease attack and reducing the risk of stand-destroying wildfire (Graham et al., 1999). Treatments would leave fewer trees, reduce ladder fuels, and break up crown continuity. FVS modeling results indicate canopy bulk density would be reduced to less than 0.10 kg m-3 (Project File K7-20). Thinning below this level has been recommended to reduce the likelihood of crown fire occurrence (Agee, 1996; Graham et al., 1999). The residual trees would be larger, have thicker bark and higher crown heights making them more fire-resistant. These benefits coupled together would result in reduced potential for crown fire occurrence and less severe effects (Pollet and Omi, 2002). Stand structures would be altered to more closely mimic historic conditions that can reduce beetle depredations in the near term as well as the likelihood of damaging outbreaks in future years.

Fuel loading reductions would reduce fire hazard. Existing surface fuel loading and activity fuels would be reduced though consumption or removal to acceptable levels through yarding and/or prescribed fire (Project File K7-20). Reducing surface fuel amounts through prescribed fire and mechanical means reduces the risk that the overstory would ignite in a wildfire (Graham et al., 2004). Understory density and ladder fuels would be reduced through slashing or precommercial thinning where necessary to facilitate prescribed burning and protect the overstory from crowning (Project File K7-20). Mechanical thinning and fuel treatments have been shown to reduce fire severity and crown scorch (Pollet and Omi, 2002). Prescribed fire would be applied through primarily underburning and jackpot burning. Fire reintroduction would mimic natural processes and move sites towards the desired future condition and increase their resilience to fire in the future.

A mix of species would provide a system more resilient to insect and disease outbreaks. Resistance to root disease would be greatly enhanced by favoring resistant shade-intolerant species. Suppressed, unfavorable, unhealthy trees would be removed in favor of healthy dominant and codominant residuals ensuring long-term stand productivity. Dwarf mistletoe infection would be reduced. Where openings are created, these sites would be reforested within five years of harvest with desirable species and stocking levels. Reforesting with species tolerant to low soil moisture and high temperature using a variety of genotypes under an uneven-aged management regime would creature conditions that are more resistant and resilient in a changing climate (Joyce et al., 2008). Increasing vigor through reductions in density and competition would reduce Douglas-fir, mountain pine, and western pine beetle hazard.

NON-COMMERCIAL THINNING FOLLOWED BY HAND PILING AND BURNING

Alternative 1 – No Action

Fuel loading and fire hazard would not be reduced (Project File K7-27). Fire occurrence could result in rapidly spreading stand-destroying crown fires due to sapling and pole thickets beneath the main canopy as well as overstory density (Graham et al., 2004). In addition, the No Action alternative would allow understory vegetation to continue to develop exacerbating ladder fuel accumulations. The quadratic mean diameter would continue to decline as smaller trees are favored over large that continue to be lost due to insects, disease, and density-dependent mortality. Crown fire initiation potential would not be lowered. Bark beetle hazard would remain high (Project File K7-27).

Alternative 2 - 1,571 acres

Treatments would occur in old-growth stands adjacent to powerline infrastructures and would consist of slashing or thinning small diameter trees, and piling and burning material. Understory density and ladder fuels would be reduced through slashing, piling, and burning. This would reduce the likelihood of a surface fire crowning. Density reductions would result in a small increase in vigor by freeing up growing space.

This treatment is effective at reducing ladder fuels, fuel loading, and lowering crown fire initiation potential by removing understory trees and fuels that could carry a surface fire into the forest canopy. Modeling results indicate that an average of 121 trees per acre less than 10” dbh would be removed, piled, and burned (Project File K7-26). While this treatment would reduce crown fire initiation potential, it does not thin the overstory sufficiently to lower bark beetle hazard or markedly increase stand resilience. In addition, canopy base height would increase; however, negligible changes in canopy bulk density would occur (Project File K7-25). The treatment would not thin trees sufficiently to create insect and fire-resilient stands. Changes in overstory density, basal area, and quadratic mean diameter would be negligible to minimal. For example, basal area would be reduced by approximately nineteen feet per acre and quadratic mean diameter would increase from 11.2 to 12.6 inches (Project File K7-26). While some localized individual tree resilience would likely occur, stand resilience to mountain pine beetle would not change substanbtially as modeling results indicate a post-treatment average SDI of 209 and high bark beetle hazard (BA >120) (Project File K7-26).

Western Larch and Ponderosa Pine Regeneration and Prescribed Fire

Alternative 1 - No Action

Under Alternative 1, ongoing mortality from root disease and insect attack would continue. The remaining overstory would remain highly vulnerable to stressors including, insects, fire, and disease. Mistletoe and root disease would be perpetuated infecting residual trees and regeneration. Douglas-fir would continue to develop in the understory creating ladder fuels and perpetuating root disease. This condition combined with fuel loading from mortality would pose a hazard adjacent to private land in the event of a wildfire. Healthy western larch or ponderosa pine would not be favored or regenerated and would likely decline and potentially be lost from the site. Diseased, suppressed, unfavorable, unhealthy trees would be retained on-site reducing stand productivity and perpetuating diseased, dysgenic stands over time. Desirable individuals and at-risk species would remain at risk from competition, insect or disease attack, and wildfire. Regeneration is not assured and re-establishment of ponderosa pine and healthy western larch is not anticipated under Alternative 1. Stand resilience and resistance would remain low.

Alternative 2 - 153 acres

The distribution of western larch and ponderosa pine, which are at-risk species, would increase on the landscape through natural regeneration or planting. A mix of species and age classes would provide a system more resilient to insect and disease outbreaks. Suppressed, unfavorable, unhealthy trees would be removed in favor of healthy dominant and codominant residuals to facilitate seedling establishment and ensure long-term stand productivity. Mistletoe infection would be reduced, as most infected trees would be removed to ensure healthy seedling establishment. Natural regeneration or planting of shade-intolerant species such as western larch and ponderosa would prevent infection in this component of the regeneration. Reforestation of fire, drought, and disease-resistant species like ponderosa pine would provide increased resistance and resilience to potential future drought and wildfire that may be associated with a changing climate (Joyce et al., 2008).

Existing surface fuel loading and activity fuels would be reduced through consumption or removal to acceptable levels through yarding and/or prescribed fire. Reducing surface fuel amounts through prescribed fire and mechanical means reduces the risk that the overstory would ignite in a wildfire (Graham et al., 2004). This would create conditions conducive to forest regeneration by providing site preparation for planting and natural regeneration. These sites would be reforested within five years of harvest with disease-resistant species. Planting is the only reasonable course of action to restore genetic diversity and ecosystem function in cases where areas of cone-bearing donors for desirable natural regeneration are scant or absent. The planting program in the Northern Region relies on the most sophisticated seed transfer guidelines for conifers, modeling patterns of genetic variation in adaptive traits in three dimensions to capture patterns of variability and adaptation. Reforestation with desired species composition and stocking levels would ensure the productivity of the sites and enhance ecosystem resilience and sustainability.

Young Stand Thinning and Prescribed Fire

Alternative 1 - No Action

Under Alternative 1 stands would remain highly susceptible to mountain pine beetle attack in the short and long term. Their ability to support stand-replacing wildfires would increase over time due to high stand density and interlocking crowns (Graham et al., 1999). Diameter growth rates would continue to decline and density-dependent mortality would increase. The genetic quality of the stands would not be enhanced. Big game winter range quality would continue to decline, as understory forage species would be reduced due to inadequate light. Due to high stem density these sites are experiencing high levels of competition and are susceptible to mountain pine beetle and stand-destroying wildfire (Graham et al., 1999).

Alternative 2 - 404 acres

Alternative 2 would enhance growth and vigor; reduce competition for sunlight, water, and nutrients; and modify stand conditions to lessen the risk of potential mountain pine beetle-caused mortality and stand-replacing fire on approximately 1% of the landscape. Small diameter sub-merchantable trees would be felled to a stocking of approximately 150 - 200 trees per acre favoring the most vigorous, dominant, and best-formed trees. Long-term fire hazard and tree mortality from insects and diseases would be lowered as a result of this treatment. Low density canopies are less prone to rapidly spreading crown fires than very dense canopies (Graham et al., 2004). Growth rates would accelerate increasing the diameter of residual stems. The genetic quality of the residual stands would be improved by selecting residual trees based on phenotypic expression. Surface fuel loading would be increased in the short term due to slash accumulations; however, existing fuel loading levels are extremely low since these sites were dozer-piled following the previous harvest activities. In addition, fuels will be treated by lopping and scattering tops and limbs to speed decomposition. Hand piling and burning piles or underburning would be completed in areas where the fuel loading is determined to be an unacceptable risk. Furthermore, treatments are designed to reduce wildfire hazard over the long term by rendering stands more resilient to natural fire occurrence and ecosystem processes.

The treatment would enhance big game winter range habitat. This would be accomplished by reducing canopy coverage allowing for more sunlight to penetrate the forest floor. High value forage species would benefit as a result. Increases in water yield would be minor since additional available moisture would be taken up by the residual stand. The treatment would increase stand resilience to disturbance in the long term and favor shade-intolerant species addressing shifts in species competition that have occurred at the landscape level. The treatment would move the landscape towards the desired future condition.

Cumulative Effects

Past, present and reasonably foreseeable actions within the Rennic Stark analysis area were considered and analyzed to determine the potential for cumulative effects on sustainable forest conditions. The cumulative effects analysis summary is found in Table 11. Only past (P), present (C) and reasonably foreseeable future (F) activities within the Rennic Stark analysis area that are pertinent to the forest resource were addressed in the cumulative effects analysis. The Rennic Stark analysis area was used for the cumulative effects analysis area for forested vegetation since it represents a watershed scale in which to analyze a diverse array of forested communities and the incremental contribution of the proposal is negligible at the next larger watershed.

Table 11 Cumulative Effects Summary for Forested Resource

Activity	Cumulative Effect	P	C	F
DOCUMENTED PAST FOREST SERVICE VEGETATION TREATMENTS (1980-2011)				
REGENERATION HARVEST: Seed Tree Silvicultural System: 132 acres, Shelterwood Silvicultural System: 59 acres, Clearcut: 280 acres **INTERMEDIATE HARVEST**: Sanitation/Salvage: 155 acres, Improvement Cut: 120 acres, Liberation: 216 acres, Commercial Thin: 3 acres **UNEVEN-AGE HARVEST**: Single Tree Selection: 1,131 acres, Group Selection: 55 acres **TREATMENTS DURING THE 2000'S:** Barrette Fuels II: 18 acres improvement cut **TREATMENTS DURING THE 1990'S:** Ellis Mountain, Stark Horse, West McG, High Valley, Moose Point: 63 acres seed tree silvicultural system, 38 acres shelterwood silvicultural system: 31 acres clearcut,	Documented past timber sales that have occurred within the last thirty years within the analysis area are listed by the amount of acres affected by various silvicultural systems or treatments. Specific sale names, where known are listed. Between 1980 and 2010 approximately 494 acres of intermediate harvest occurred within the project area. Intermediate commercial treatments are designed to enhance growth, quality, vigor, and composition of the treated stand. These treatments involved the removal of dead, dying, and diseased trees in the form of salvage and sanitation. Other intermediate treatments included improvement cutting, commercial thinning, and liberation cutting. Following these intermediate treatments intact forest canopies were retained. These treatments combined with the effects of Alternative 2 serve to enhance growth, quality, and vigor and reduce the levels of mistletoe and fuel loading within the landscape. They also increase stand resilience to stressors (insects, disease, fire). Alternative 2 would accomplish this on approximately 1,174 acres. Alternative 1 would not accomplish this, as there is no cumulative effect of No Action. Where shelterwood, clearcut, and seed tree silvicultural systems have occurred within the analysis area, these activities served to break up landscape homogeneity by adding disturbance to the system. This served to increase age class and species diversity by establishing predominantly young, shade-intolerant stands over approximately 471 acres. These sites are occupied by young, healthy seedling to sapling-sized stands at present. These activities have been the primary mechanism on the landscape that has enabled the reestablishment of young, healthy, vigorous stands and are a primary contributor to the age class, size class and species diversity within the landscape. Where regeneration harvest has occurred, these sites have been regenerated with desired species and stocking levels from locally adapted seed. Alternative 2 would reduce fuels, and establish a healthy, young, vigorous stands on the 153 acres proposed for even-aged regeneration harvest. Alternative 1 would have no cumulative effect. An additional 1,168 acres within the analysis were harvested under an uneven-aged system between 1980 and 2011. This silvicultural system is designed to maintain and regenerate a stand with three or more age classes. Where this occurred in the	X		

Activity	Cumulative Effect	P	C	F
11 acres sanitation/salvage, 98 acres improvement cut, 20 acres liberation, 3 acres commercial thin, 1,045 acres single tree selection, 55 acres group selection **TREATMENTS DURING THE 1980'S:** Nemote Creek, Ellis, No Sale Name: 69 acres seed tree silvicultural system, 21 acres shelterwood silvicultural system: 249 acres clearcut, 144 acres sanitation/salvage, 4 acres improvement cut, 196 acres liberation, 86 acres single tree selection	analysis area the stands were regenerated by creating small openings or through single tree selection that retains an overstory age class, but also creates an environment suitable for regeneration of shade-intolerant species (ponderosa pine and western larch). These treatments invoked a new age class as described above, but also achieved the traits associated with intermediate harvest. A portion of the Stark Horse project did not create suitable conditions for the establishment of ponderosa pine and western larch under a single tree selection system as intended. This area is proposed for treatment to ensure regeneration is established (Alternative 2, Units 9 and 10). Alternative 2 proposes uneven-aged management on 649 acres. Alternative 1 would have no cumulative effect			
DOCUMENTED PRE-1980 FOREST SERVICE VEGETATION TREATMENTS (all documented sales during this period in the analysis area were prior to the enactment of the National Forest Management Act of 1976)				
REGENERATION HARVEST: Shelterwood: 53 acres, Clearcut: 458 acres **INTERMEDIATE HARVEST**: Sanitation/Salvage: 19 acres, Improvement Cut: 235 acres, Liberation: 80 acres **UNEVEN-AGE HARVEST** Single Tree Selection: 195 acres **TREATMENTS DURING 1970-1971**	Forest Service timber sales that occurred prior to 1976 were designed primarily for efficient wood fiber extraction. Areas were heavily roaded for efficient logging systems and modern mitigation measures to protect other resource values seldom used as these activities occurred prior to the enactment of the National Forest Management Act of 1976. Prior to 1980, approximately 334 acres of documented intermediate harvest occurred within the project area. These treatments involved the removal of dead, dying, and diseased trees in the form of salvage and sanitation, and improvement cutting, or liberation. All these treatments retained intact forest canopies. Other undocumented activities were predominantly in the form of intermediate harvests. In the 1940s, prior to detailed historic timber sale record keeping on the Lolo National Forest, some selective harvesting of mature, large diameter ponderosa pine did occur in the Rennic Stark area. These activities were a contributing factor in reducing the distribution of large diameter ponderosa pine and western larch and led to some dysgenic selection. In contrast to these past activities, Alternative 2 and would favor ponderosa pine and western larch in all treatment units where it is present as well as restore ponderosa pine and western larch where their distribution has declined. Alternative 1 would result in no	X		

Activity	Cumulative Effect	P	C	F
unknown sale name (Stark Stoney) 297 acres clearcut **TREATMENTS DURING 1960'S**: unknown sale name (Stark Stoney), unknown sale name (Nemote Creek): 161 acres clearcut, 19 acres sanitation/salvage, 235 acres improvement cut, 80 acres liberation, 195 acres single tree selection **TREATMENTS DURING 1950'S:** unknown sale name (Nemote): 53 acres shelterwood silvicultural system **UNDOCUMENTED TREATMENTS**: (Include activities in the project area prior to detailed historic timber sale record keeping on the Lolo National Forest) **NOTE**: Evidence suggests that these activities occurred predominantly in areas with easy access in the form of salvage and selective harvesting over relatively small areas (1-50 acres).	cumulative effect. Within the Rennic Stark area, prior to 1980, approximately 511 acres of even-aged regeneration harvest occurred. The majority of these sites were clearcut (458 acres) with lesser amounts managed under shelterwood silvicultural system (53 acres). Many of these sites were dozer piled and nearly all coarse woody debris was burned on-site. These stands are now typically characterized by historically atypical densities and are experiencing extreme competition and associated low individual tree growth rates. Many are currently vulnerable to insects, fire, and other stressors. These past timber harvests did break up landscape homogeneity by adding disturbance to the system. This served to increase age class and species diversity by establishing young, shade-intolerant stands. However, in many of these areas fire or other density reduction treatments have not been implemented or sufficient to create resilient stands today. Alternative 1 would not addresses stocking level concerns that are a function of altered fire regimes as there is no cumulative impact of No Action. As discussed in indirect and direct effects section, No Action would perpetuate high levels of competition and increase susceptibility to mountain pine beetle and crown fire. Under Alternative 2, approximately 404 acres of young stands with past regeneration harvest would be thinned and with fire restored to these sites. The treatment would favor the most dominant and adapted individuals to a particular site reducing concerns over offsite planting stock. These treatments would render sites more resilient to pathogens in the near and long term, as well as wildfire over the long term. Alternative 1 would not improve the genetic constitution on these sites and result in no cumulative effect. An additional 195 acres within the analysis were harvested under a single tree selection uneven-aged system prior to 1980. These treatments invoked a new age class as described above, but also achieved the traits associated with intermediate harvest. As addressed above, Alternative 2 proposes this type of treatment on 649 acres. Alternative 1 would have no cumulative effect			

Activity	Cumulative Effect	P	C	F
	PLANTING/THINNING/WEED/FIRE TREATMENTS			
Pre-1990s Planting	Planting that occurred prior to the 1990s was typically conducted at a very high density with the primary objective of wood fiber production. Sites were planted with primarily ponderosa pine that served to reestablish this component on a portion of the landscape. However, planting was uniform, dense, and the species or stock was often planted on inappropriate sites. Stands were planted with the intention of at least one precommercial thinning entry. Not until the late 1970s was local seed adaptability and transferability given extensive consideration. Under Alternative 2, approximately 404 acres of young stands with past regeneration harvest would be thinned and fire would be restored to these sites. The treatment would favor the most dominant and adapted individuals to a particular site reducing concerns over offsite planting stock. These treatments would render sites more resilient to pathogens in the near and long term, as well as wildfire over the long term. Alternative 1 would not improve the genetic constitution on these sites and would result in no cumulative effect.	X		
Hand Tree Thinning	Alternative 2 would enhance growth and vigor and modify stand conditions to lessen the risk of potential mountain pine beetle caused mortality and stand-replacing fire through young stand thinning on approximately 404 acres. The treatment would favor the healthiest individuals and adapted species for a given site. This would result in a cumulative benefit when considered in the context of the landscape with past precommercial thinning activities within the analysis area. Documented precommercial thinning has occurred on 476 acres within the analysis area. Under Alternative 1 stands would remain highly susceptible to mountain pine beetle attack and their ability to support stand-replacing wildfires would continue to increase over time. No cumulative benefits would be achieved.	X		
Noxious Weed Treatments	Noxious weed treatments within the analysis area serve to reduce the percent cover and expansion of invasive plants. Alternative 2 would treat weeds along roads and adjacent openings on approximately 2000 acres. When noxious weed treatments are considered in conjunction with the action alternatives a small immeasurable cumulative benefit may occur as efficacy may be improved. Noxious weed treatments in the analysis area may also potentially ameliorate weed increases post-treatment. Under Alternative 1 no cumulative effect would occur		X	X

Activity	Cumulative Effect	P	C	F
Fire Suppression	The effects of past fire suppression with respect to the project and forest conditions was described in the existing condition section of this report. Alternative 2 would restore changes in forest composition, structure, and function that have occurred within some of the treatment units due to fire suppression. It would enable more effective fire suppression efforts in the future within and potentially adjacent to treatment areas due to changes in fire behavior attributable to reduced fuel loading. Alternative 1 would not restore lost forestland integrity and resilience that have occurred due to altered fire regimes. No cumulative effects would occur. The ability to suppress fires where deemed appropriate in or adjacent to proposed treatment areas would not be enhanced. It may also result in more active fire suppression due to concerns over heavy fuel loading levels and potential for more extreme fire behavior.	X	X	X
Prescribed Fire	Prescribed fire activities coupled with the fuel reduction and prescribed fire associated with Alternative 2 would cumulatively reintroduce fire to the landscape in controlled situations to restore it as an essential process of fire-dependent communities on approximately 9,102 acres. This would result in a cumulative benefit to restoring fire-resilient forested communities within the analysis areas. Alternative 1 would result in no cumulative benefits associated with prescribed fire.	X	X	X
Wildfire	Wildfire occurrence coupled with the associated treatments in Alternative 2 would result in less severe fire behavior within the treatment units. This would enable improved suppression efforts when deemed the appropriate action. In addition, reduced potential fire behavior as a result of the treatments may also result in less active suppression and allow some natural fire to occur. Alternative 1 would not improve the ability to suppress fires within treatment units. No cumulative benefits would occur. It may also result in more active fire suppression due to concerns over heavy fuel loading levels and potential for more extreme fire behavior.			X
Firewood Cutting	The effects of continued firewood cutting would remove additional large fuels along open roads within the analysis area and potentially provide a small benefit by reducing fuel loading hazards and utilizing mortality following treatment under Alternative 2. Firewood cutting would provide some small benefit by removing some fuel loading along open roads. Alternative 1 would result in no cumulative effect in conjunction with firewood cutting.	X	X	X
Christmas **Tree Harvesting**	The effects of personal use Christmas tree harvesting would remove negligible amounts of potential ladder fuels of primarily shade-tolerant species. Alternative 2 would accomplish this within many of the treatment units; however, due to the small amount of Christmas tree harvesting in the analysis area the cumulative benefit would be negligible. Alternative 1 would not treat shade-tolerant ladder fuels and no cumulative effect would occur	X	X	X
MPB Infestation	In 2009 approximately 900 acres were infested with MPB in the Rennic Stark analysis area.		X	X

Activity	Cumulative Effect	P	C	F
	Alternative 2 would remove MPB infested trees on approximately 1,976 acres. Some insects may be removed from the forest by removing material before they emerge from trees. In addition, opening up stands and reducing competition through basal area reduction within stands would reduce the likelihood of MPB attack in remaining susceptible ponderosa pine and lodgepole pine trees within the treated stands. Alternative 1 does not address MPB infestation and no cumulative effect would occur.			
Fuel reduction work on private land	These treatments did serve to break of the age class and structural homogeneity of the landscape a small degree.	X	X	X

THREATENED, ENDANGERED, SENSITIVE AND CULTURAL PLANTS

Whitebark pine, which was designated a Forest Sensitive plant species effective December 2011, occurs in the upper subalpine forest at Stark Mountain Lookout in Units 102 and 103.

Some of the project area was previously surveyed during the development of other projects. No sensitive plant species, other than whitebark pine as mentioned above, were found during those surveys. A new population of Heterocodon rariflorum (rareflower heterocodon), a Forest sensitive plant, was found in the project area in 2010. No other Forest sensitive plants were found during these surveys.

Based on habitat information and known Forest sensitive plant populations in the project vicinity, the project area contains potential habitat for the following sensitive plant species: Ageratina occidentale (western snakeroot); Allium acuminatum (tapertip onion); Clarkia rhomboidea (diamond clarkia); Cypripedium fasciculatum (clustered lady's slipper); and Heterocodon rariflorum (rareflower heterocodon).

ENVIRONMENTAL CONSEQUENCES

Effects Common to Both Alternatives

Vectors such as vehicle traffic, wildlife, and recreationalists would continue to spread invasive plants in the project area. Potential habitat for Allium acuminatum, Clarkia rhomboidea, Cypripedium fasciculatum, and Heterocodon rariflorum would be degraded as invasive plants become more widespread, but the viability of these species would not be adversely affected. Potential habitat for Ageratina occidentale would experience wildfires, but the viability of this species would not be adversely affected.

Ongoing trail traffic at Cedar Creek would affect the Heterocodon rariflorum population. Individual plants could be killed. The population has persisted, so continuation of this use would not adversely affect the population.

Alternative 1 (No Action)

The rate of invasive plant spread in the project area may be greater under Alternative 1 because herbicide treatment of roads, trails, recreation sites, and potential landings (as proposed in Alternative 2) would not occur under this alternative. If so, potential habitat for Allium acuminatum, Clarkia rhomboidea, and Heterocodon rariflorum could be degraded more rapidly than under Alternative 2; and to a lesser extent Cypripedium fasciculatum habitat. Potential habitat for these species would remain widespread in the project area, but perhaps of lower quality due to a greater presence of invasive plants.

If the No Action Alternative was implemented, an array of different scenarios could take place with regard to effects on whitebark pine:

The area could remain as is for several years and no impacts could occur or additional negative impacts by blister rust and mountain pine beetles could impact existing trees further and seed sources could further decline. Eventually a wildfire will burn through the area.

Under another scenario, a wildfire could burn through this area under severe dry, windy, and hot weather conditions, resulting in most or all of the area being severely burned and many of the present whitebark pine trees killed.

At another extreme, a wildfire could burn under less severe conditions and burn hot enough to produce pockets of suitable regeneration habitat that could be seeded naturally resulting in beneficial impacts; similar to what is prescribed in Alternative 2.

In summary, No Action could have little to no negative impacts on whitebark pine in the short term, but at some point in the future the trees in the area will burn and potential impacts could be beneficial or detrimental; which would be dependent on several variables including the condition of the existing whitebark pine trees, weather conditions, and on-the-ground site conditions.

There would be no other effects on any other sensitive plant species besides those mentioned under Effects Common to Both Alternatives.

Alternative 2 - Direct and Indirect Effects

Ageratina occidentale

Potential habitat for *Ageratina occidentale* is unlikely to be affected by the proposed activities. *Ageratina occidentale* grows in cracks of bedrock outcrops and in associated talus fields in the montane and lower subalpine zones. This plant has been found at elevations from 5,500 to 7,800 feet. Potential habitat for *Ageratina occidentale* may exist in upper elevations of thinning and burning units and within the proposed EMBs. Thinning forested stands to open the forest canopy and light to moderate underburns could increase habitat for this plant. This plant's habitat in a way protects it from fires. The proposed EMBs could provide additional openings in and around outcrops and could enhance habitat for this plant. If plants were present, they could be killed by burning. Most likely the tops would burn and the roots would remain viable since the plants are rooted in the rock outcrops. A mosaic of fire intensities is planned within the EMB, which also reduces the potential risk to this plant.

Allium acuminatum and Clarkia rhomboidea

Allium acuminatum is found in open forested stands on the Lolo NF that have been thinned and underburned (e.g., 2005 Munson Creek Underburn, personal observations). Thinning forested stands to open the forest canopy and light to moderate underburns would likely increase the habitat for this plant. *Clarkia rhomboidea* is an annual plant that is found in dry, open forest slopes with gravelly soils in the montane zone. It occurs on the Plains/Thompson Falls District of the Lolo NF, mainly on southern aspects in Douglas-fir/ninebark habitat types. It has been found at elevations from 3,200 to 4,400 feet. This plant has been located in areas that were treated with EMBs and appears to be well-adapted to burns, including those that burn hot (e.g., Weber Gulch 2007, personal observations). *Clarkia rhomboidea* has a very small seed, and when this seed germinates on sites with several inches of duff and organic matter the stem is very elongate and the plant is short. This plant grows taller and more robust in disturbed areas where mineral soil is exposed, especially after fires (personal observations).

Most of the proposed thinning and burning units contain potential habitat for *Allium acuminatum* and *Clarkia rhomboidea*. Both of these species occur in relatively dry, open montane forest dominated by ponderosa pine and Douglas-fir. These plants are adapted to periodic fire since they occur in habitats that historically burned, on average, every 10-20 years (Pfister et. al, 1977). On the Plains/Thompson Falls Ranger District, populations of *Allium acuminatum* and *Clarkia rhomboidea* have been burned using prescribed fire in the last 15 years; these populations persisted after burning (personal observations). *Allium acuminatum* is also known to occur on a site between Plains and Thompson Falls where the forest has been selectively thinned. Selective thinning and prescribed burning in the project area would maintain dry, open forest similar to sites where *Allium acuminatum* and *Clarkia rhomboidea* have been found. Dry montane forest in the project area frequently contains invasive plant species such as spotted knapweed and cheatgrass. Prescribed burning and thinning often create habitat conditions, such as disturbed soil and reduced forest canopy, that favor the spread of invasive plants. If prescribed burning and thinning cause invasive plants to spread in the project area, potential habitat for *Allium acuminatum* and *Clarkia rhomboidea* could be degraded (Wilcove et al 1998). Proposed weed treatments and weed mitigations would reduce this risk.

Heterocodon rariflorum

Heterocodon rariflorum occurs at scattered locations in the Bitterroot and lower Clark Fork valleys. Three populations are known on the Lolo NF, two on the Superior and one on the Plains/Thompson Falls Districts.

Heterocodon rariflorum sites are characterized by vernal moisture seepage and/or seasonal pooling of shallow water. Known sites are on mossy rock ledges where seepage moistens the soil, seasonally saturated riparian swales, and damp depressions. The occurrence in the project area is associated with depressions in a lightly used trail in Cedar Creek. The seasonal pooling of rainwater and snowmelt in the road depressions apparently mimics the vernal moisture conditions that typify “native” *Heterocodon rariflorum* sites. This site is not considered native because the plants are only growing in the road and no suitable native habitat is found nearby.

Protecting a sensitive plant population that is restricted to a trail or road is difficult. The population may not be there without the trail or road, because native understory vegetation in Cedar Creek is too dense for *Heterocodon rariflorum.* Occasional traffic from recreationalists suppresses competing vegetation, compacts the soil, and maintains the exposed, damp soil where the *Heterocodon rariflorum* plants are growing. Improving the trailhead by gravelling it would be detrimental to the population because the existing micro-hydrology and soil texture would be altered; however the population in Cedar Creek would be buffered from trail maintenance activities. Keeping the trail in its existing condition may be the best strategy to maintain this *Heterocodon rariflorum* population. The site would also be buffered from herbicide spraying.

Potential habitat for *Hetercodon rariflorum* may occur throughout the project area in seasonally saturated riparian swales, vernally moist rock ledges, and damp depressions and these populations may come and go dependent on yearly precipitation. Proposed road treatments (decommissioning, storage, and temporary road construction), culvert replacements, and rehabilitation of an old road/skidding operation in Cromwell Creek may impact individual plants or habitat since Heterocodon populations are found in damp depressions along old roads, other disturbed areas, and open riparian draws. Heterocodon populations could occur in thinning and burning units in damp depressions and open canopied riparian swales. Proposed thinning and burning activities would open the canopy and may provide additional habitat for this plant if existing habitat conditions are present (seasonally wet depressions). Proposed prescribed burns that occur in the spring are unlikely to affect potential habitat for *Heterocodon rariflorum* because the habitat is wet from seepage at that time of year and would not burn. A fall prescribed fire is more likely to burn through potential habitat for *Heterocodon rariflorum* because the vegetation is drier then. On the Plains/Thompson Falls Ranger District, a *Heterocodon rariflorum* population was burned within the last 15 years. The population’s persistence after burning suggests the proposed Rennic Stark burning would not directly reduce potential habitat for *Heterocodon rariflorum.* Prescribed burning in the project area does carry some risk of indirectly degrading potential habitat if it contributes to invasive plant spread (Wilcove et. al,1998). Invasive plants such as *Centaurea stoebe* (spotted knapweed) and *Bromus tectorum* (cheatgrass) are already established in potential habitat for *Heterocodon rariflorum* in the project area, and they could become more common after burning.

Human-created potential habitat for *Heterocodon rariflorum* – such as damp depressions in dirt roads – in the project area would be affected by proposed road decommissioning, road maintenance, and log skidding. During project activities some patches of potential habitat would likely be destroyed and some created. Of course, many dirt roads with potential habitat would continue to exist in the project area. Proposed herbicide spraying of roads in the project area could help to maintain this potential habitat by decreasing competition from invasive plants.

Cypripedium fasciculatum

Cypripedium fasciculatum (clustered lady's-slipper) is a perennial orchid that grows in several different habitats across its geographical range. This plant grows from a rhizome. It has been found on the Ninemile, Superior, and Plains/Thompson Falls Districts of the Lolo NF. Populations typically occur in Douglas-fir/ninebark and grand fir/ninebark habitat types at elevations of 2,500-4,700 feet. *Cypripedium fasciculatum* sites usually have a discontinuous (40-60% cover), multi-layered mature forest canopy, a well-developed mosaic of understory shrubs (especially ninebark), several inches of duff accumulation on the forest floor, an abundance of fallen woody debris at various stages of decay, and minimal soil disturbance. Small pockets of diseased, dying trees are often present.

Several populations of clustered lady's-slipper have been monitored on the Lolo NF after tree harvesting and underburning and plants have survived. This orchid is adapted to fires. A clustered lady's-slipper population on the Ninemile District was monitored several years following tree harvesting and burning treatments. Three plots were monitored, two commercial thin and burn plots and one control plot. Plants survived at all plots. In the treatment plots, one plot burned at a hot intensity as compared to the other that burned at a cool-moderate intensity. Where it burned hot, clustered lady's-slipper plants did not show up until 3 years after the burn. Where it burned cool-moderate, some plants continued to grow that season and were present every year after the treatments.

In another monitoring area on the Superior District, a population was in a forest stand that was thinned and burned. These plants did not respond as well as those mentioned earlier. The plants are still present but turn yellow and dry early in the season. They are on a warmer exposure than the plots on the Ninemile Ranger District.

Areas of potential habitat for *Cypripedium fasciculatum* occur in most of the proposed thinning and burning units and in lower elevations of the EMBs, and would be affected by these activities. Several *Cypripedium fasciculatum* populations on the Superior Ranger District have been found in historically thinned and/or underburned forest, suggesting that these activities would not reduce potential habitat for the species. If thinning and prescribed burning reduces the risk of a stand-replacing fire, they could help maintain potential habitat for *Cypripedium fasciculatum* in the project area. Considering the project area contains thousands of acres of potential habitat for *Cypripedium fasciculatum*, the proposed activities would not have an adverse effect on the species.

If prescribed burning and thinning do cause invasive plants to spread in the project area, potential habitat for *Cypripedium fasciculatum* could be degraded (Wilcove et al 1998). Proposed weed treatments and mitigation measures (herbicide treatment of roads, and open weedy areas adjacent to units) would reduce the risk of weed spread into treatment areas.

Pinus albicaulis (whitebark pine)

Whitebark pine is present in the upper elevations in the Rennic Stark project area in the proposed EMB Units 101 and 102. The proposed silviculture prescription for this EMB is as follows: no slashing, thinning, or other tree cutting is proposed and prescribed fire treatments would involve broadcast or underburning. Aerial ignition devices may be used to ignite fire in a strip or spotty pattern to achieve the desired fire intensity. All ignition areas would avoid well-established whitebark pine trees (Sheryl Meekin, December 20, 2011, personal communication). Treatment also includes planting blister rust-resistant whitebark pine (up to 100 acres) on suitable sites along Ninemile Divide in the vicinity of Stark Mountain.

The proposed EMB could have beneficial impacts to this plant species if the burn is hot enough to produce pockets of suitable regeneration habitat. The planting could also be beneficial if trees survive and produce viable seeds.

Cumulative Effects

Past and ongoing activities have affected the *Heterocodon rariflorum* population in Cedar Creek. As noted previously, the population is restricted to a trail and would not be there if the trail had not been built. The effects of other historic activities on the population are unknown. With mitigation to buffer the population from trail maintenance activities and herbicide spraying, project activities are not expected to have detrimental effects on the population, and therefore would have no adverse cumulative effects.

Potential habitat for *Allium acuminatum, Clarkia rhomboidea, Cypripedium fasciculatum,* and *Heterocodon rariflorum* may have been affected by past prescribed burning, logging, and road building, and recreational developments.

Some past logging in the project area overlaps the currently proposed units. Since these historic activities are similar to the currently proposed activities, they would have similar effects on potential habitat for *Allium acuminatum, Clarkia rhomboidea, Cypripedium fasciculatum,* and *Heterocodon rariflorum.* Perhaps the greatest cumulative risk to potential habitat for several of the above species, especially *Allium acuminatum, Clarkia rhomboidea*, and *Heterocodon rariflorum* – is the ongoing spread of invasive plants in the project area. Past and ongoing management activities have undoubtedly contributed to invasive plant spread in the project area, along with other factors such as recreational use, vehicle traffic, and wildlife use. If Rennic Stark project activities contribute to invasive plant spread in the project area, they would add to the cumulative degradation of potential habitat for *Allium acuminatum, Clarkia rhomboidea,* and *Heterocodon rariflorum.* Potential habitat for these species would remain widespread in the project area; some of it would be degraded by invasive plants, but much of it would still be dominated by native vegetation. Overall, the project would not cause adverse cumulative effects on any of these species.

Fire and Fuels

Fire Regime Condition Class (FRCC)

The Rennic Stark analysis area is primarily represented by Fire Regime Condition Class I (FRCC I) (31% of the total acres) and FRCC III (52% of the total acres). FRCC I represents ecosystems with a low fire departure and those lands that are still within the estimated historical range of fire variability during a specific reference period. FRCC III depicts ecosystems with a high fire departure from reference conditions (Hann et. al. 2001).

Fire Regime I is characterized by 0 – 35 year fire frequency and low to mixed severity fire. Less than 75% of the dominant overstory is typically replaced. This fire regime is best represented in the Stark, Cromwell, Rennic, and Ellis Creek drainages.

Fire Regime III is described as 35 – 200 year fire frequency and mixed severity. Again less than 75% of the dominant overstory is typically replaced. This Fire Regime is represented in all drainages throughout the project area. In treatment areas it is most prevalent in the Cedar and Free Creek drainages and West Mountain Creek.

Fire Behavior

The Rennic Stark project area is represented by Fire Behavior Fuel Models 8 and 10 (FBFM 8 and 10). In Fuel Model 8, fires burn in surface litter with generally low flame lengths. Concentrations of dead, down, woody material will contribute to possible flare ups. Under severe weather conditions involving high temperatures, low humidities, and high winds fuels may pose fire hazards. Under summer fire weather conditions (dead fuel moisture 8%, live fuel moisture 100%, and mid-flame wind speed of 5 mph) fire spread rates of 1.6 chains (about 106 feet) per hour and 1-foot flame lengths are exhibited.

Fire that occurs in Fuel Model 10 generally burns with greater fire intensity in the surface and ground fuels, more than any other timber fuel model. Under the same summer conditions for dead and live fuel moistures and mid-flame wind speeds, fire spread rates of 8 chains (528 feet) per hour and 5-foot flame lengths can be expected. Crowning out, spotting, and torching of individual trees is more frequent in Fuel Model 10, and often leads to potential control difficulties. Fires occurring in Fuel Model 10 exhibit fire behavior that is at the upper limit of control by direct attack methods. Drier conditions and higher wind speeds could result in an escaped or larger fire situation. Fire hazard and resistance to control are highest when large woody fuels exceed 25 to 30 tons per acre with small woody fuels on 5 tons per acre or more (Anderson, 1982).

Fire Occurrence

The National Interagency Fire Management Integrated Database (NIFMID) stores the fire history occurrence data for the U.S. Forest Service. Within NIFMID, the Forest Service uses Individual Wildland Fire Reports (FSH 5109.14) to document and report every fire. NIFMID was used to analyze the fire occurrence in the Rennic Stark Project area. Most recent fire occurrence data from 1980 through 2008 was utilized. During this period, the project area experienced an average of zero to six fires annually. The number of fires ranged annually from 0 to 17, either due to environmental factors or number of ignitions. Lightning accounted for 65% of the fire starts. The other 35% were a variety of human-caused starts, with debris burning being the highest percentage at 12%. Graph 1 illustrates the fire occurrence trend in the project area from 1980-2008.

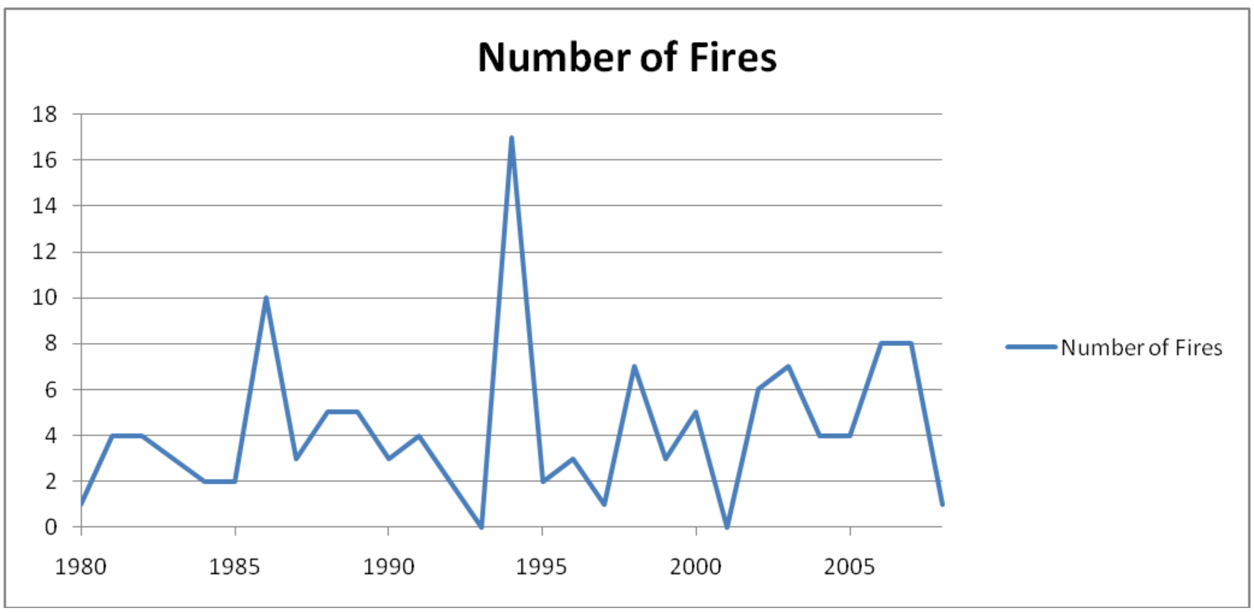


Figure 10 - Annual Fire History Occurrence in Rennic Stark Project Area from 1980-2008.

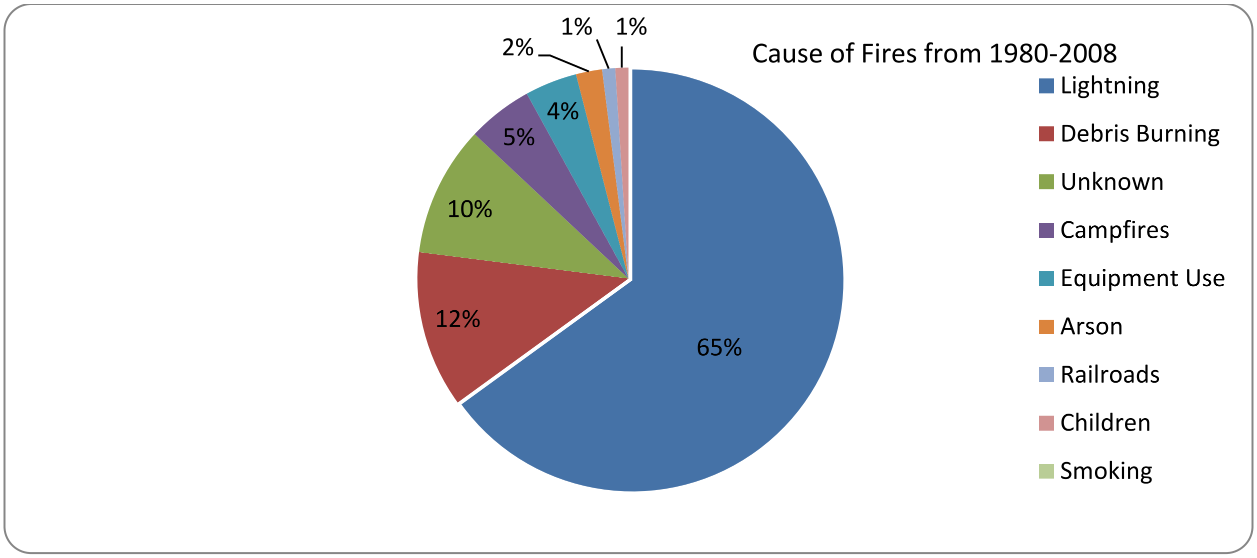


Figure 11 - Statistical Causes of Fires in Rennic Stark Project Area from 1980-2008.

Large Fire History

The period of record for large fire history in the Rennic Stark Project area covers 1870 through 2008. During this timeframe a total of 19,620 acres burned in the analysis area. Table 12 shows large fire years and associated acres burned.

Table 12 Summary Table of Large Historic Fires 1870-2008.

Fire Year	Acres Burned
1910	18,645
1920	287
2000	689

Fire History

The Ninemile Ranger District had a fire history study conducted recently in Butler Creek (Heyerdahl et. al., 2008). Using stumps and snags, 41 trees were sampled, and of these 38 samples were cross-dated. Of this sampling study, 817 fire scars were identified ranging in time frame from 1650 through 1900.

This information can be used to estimate historical fire interactions within similar vegetation types of the District. The dominate LANDFIRE biophysical setting for the area is Northern Rocky Mountain Dry-mesic Montane Mixed Conifer Forest-Larch. Fire return intervals ranged from 3 to 23 years.

The McCormick Creek drainage was also sampled. Eighteen ponderosa pine stumps across 367 acres were collected with cross-dating effective on 94% of the samples. The dominate LANDFIRE biophysical setting for the area is Northern Rocky Mountain Ponderosa Pine Woodland and Savanna. Fire return intervals ranged from 3 to 30 years.

This extensive fire history data compliments Fire Groups four and six, estimated fire return intervals, and ecological roles of fire.

Wildland-Urban Interface

The primary interface in the Rennic Stark Project area is Intermix Interface. Intermix Interface is defined as locations where structures are scattered throughout lands with wildland fuels continuous outside and within the developed area. Within the project area there is approximately 19,540 acres that are deemed wildland-urban interface. These acres are located along the Ninemile Valley, town of Alberton, and the West Mountain Creek Drainage.

ENVIRONMENTAL CONSEQUENCES

Alternative 1 – No Action - Direct and Indirect Effects

The result of taking no action would be the current condition as it changes over time due to natural forces. This alternative continues standard protection and maintenance activities such as fire suppression, access management, and routine scheduled road maintenance. Ecosystem processes such as vegetation succession with fire exclusion would continue on their current trends. No fuel reduction activities would occur.

Forest Vegetation Simulator (FVS) Fire and Fuels Extension was utilized to examine the crown fire potential in the existing stand condition and into the foreseeable future. Units 13, 14, 15, 16/103, and 17 were chosen for analysis as these units are representative of the treatments that would be completed on the landscape. Thinning treatments, non-commercial thinning, hand piling, pile burning, and prescribed burning are proposed in these units. Displayed in Table 13 are results from 2010 and years out to 2050. These years were chosen to display the existing condition and the time period where the most dramatic change in the stand conditions contributing to crown fire potential exist. The entire Fire and Fuels Extension outputs are available in the Project File (PF, K2-15).

The crown fire initiation characteristic relied on was crown bulk density, which is the amount of material in the crown available for consumption. Also evaluated was crown base height, which quantifies the lowest height above ground at which there is a sufficient amount of canopy fuels to propagate a fire vertically into the canopy (the higher the crown base height, the more difficult it is to initiate a crown fire).

Torching and crown fire index were also used. This is a 20-foot wind speed needed to support an active or running crown fire (a higher torching index means that higher wind speeds are needed to initiate and maintain torching or a crown fire).

Basal area for these stands was also evaluated to observe increases in the stand which lead to higher crown bulk densities. A 100% probability of mortality to these stands was observed with severe weather conditions under this alternative.

The type of fire (surface, passive, active, or conditional) describes the potential fire type, with surface fire burning only in the surface ground fuels and not intense enough to impact the canopy. The other classifications involve crown fire as in active sustained running crown fire, or conditional crown fire that is dependent on intense surface fire or wind to initiate, or passive crown fire as in torching with limited sustained crown fire runs.

Fuel loadings for these stands were also evaluated as they too contribute to vertical crown fire development.

Table 13 displays the modeling outputs for Alternative 1 (No Action) completed in FVS which was done using severe weather parameters and worst case fuel moistures for live and dead available fuels. Under Alternative 1, the table displays the results of continued potential for conditional crown fire, the lowering of the torching index, and increased basal area which can all contribute to severe fire behavior and undesirable stand conditions.

Table 13 Crown Fire Potential for Alternative 1 - No Action

Year	Fuel Loading Tons/Acre	Torching Index Mph	Crown Fire Index Mph	Type of Fire*	Crown Bulk Density Kg/M3	Crown Base Height Ft.	Basal Area (BA) Ft2/Acre	Probability of Mortality % of BA
Unit 13								
2010	26.4	44.9	21.8	Conditional	.095	5	126	100
2041	27.7	3.4	22.6	Active	.091	1	134	100
Unit 14								
2010	19.5	132	23.5	Conditional	.083	5	113	100
2049	26.2	88.6	23.2	Conditional	.085	8	129	100
Unit 15								
2010	31.4	165.7	17.2	Conditional	.119	23	143	100
2049	35.2	102.3	17.2	Conditional	.119	30	148	100
Unit 16/103								
2010	8.3	328.2	21.1	Conditional	.094	12	128	100
2050	18.4	201.2	22.4	Conditional	.087	13	141	100
Unit 17								
2010	34.7	20.7	24.7	Active	.063	17	90	100
2030	32.4	0	24.4	Active	.064	1	102	100

Referencing the FVS outputs from the Forested Vegetation Specialist's Report, transition of fuel models in the units are quantified over time. Fuel Model 8 would progress to a Fuel Model 10 due to increasing dead and live surface fuel loadings. Fire exclusion would continue to facilitate shade-tolerant species establishing an understory which allows the stand to be more susceptible to crown fire initiation.

The following table displays expected Fuel Model conditions under severe environmental conditions. The Behave Plus input parameters used were the following: 1-hour = 2%, 10-hour = 4%, 100-hour = 8%, 1,000-hour = 10%, air temperature = 85° Fahrenheit, wind-speed = 25 mph, slope = 5%, and live woody = 70%.

Table 14 Fuel Model outputs under severe environmental conditions for Alternative 1-No Action.

Year	Fuel Model	Fuel Loading Tons/Acre	Rate of Spread Chains/hour	Flame Length In Feet	Type of Fire
Unit 13					
2010-2049	8	26.4	10.2	2.6	Conditional
	10	27.7	122.6	19.4	Active
Unit 14					
2010-2032	8	19.5	10.2	2.6	Conditional
2032-2049	10	26.2	122.6	19.4	Conditional
Unit 15					
2010-2013	8	31.4	10.2	2.6	Conditional
2013-2049	10	35.2	122.6	19.4	Conditional
Unit 16/103					
2010-2031	8	8.3	10.2	2.6	Conditional

Year	Fuel Model	Fuel Loading Tons/Acre	Rate of Spread Chains/hour	Flame Length In Feet	Type of Fire
2031-2049	10	18.4	122.6	19.4	Conditional
Unit Number 17					
2010-2048	8	34.7	10.2	2.6	Active
2048-2049	10	32.4	122.6	19.4	Active

This table shows the change in fuel model and loading over time under the No Action Alternative. The table shows that under the same conditions fuel model 10 would generate more severe fire behavior then fuel model 8. With no treatment, the analysis area would trend toward a continuance of increased potential for the likelihood of severe fire behavior. Under these conditions, suppression efforts would be limited to indirect attack and safety and protection of resource and public values could be hampered.

Cumulative Impacts

The cumulative impacts from the no action alternative would result in stand conditions continuing to trend towards conditions of conditional and active crown fire under severe weather conditions. Probability of mortality rates would not decrease in the stands due to continued lowering of torching index wind speeds over time, thus initiating vertical crown fire movement.

Basal area in the stands would continue to increase crown bulk densities. Increased fuel loadings would also contribute to higher surface fire intensities. Both would contribute to crown fire initiation. Fire as an ecosystem function would continue to be excluded due to suppression. The Fire Regime Condition Class would continue to trend towards a greater degree of departure from the desired condition.

The ability to maintain habitat in these forest types is dependent on the interaction of fire, however at current conditions the fire effects are deemed unacceptable based on modeled crown fire severity and mortality. Modeling displaying the continued and increased potential for crown fire is unacceptable from a human risk perspective, firefighter and public safety as well as a forest ecosystem perspective regarding functioning habitat.

There would be an overall continuing decline in forest health due to unnatural excess biomass and a long-term absence of beneficial fire effects. The No Action Alternative would cumulatively counteract the previous treatments done adjacent to the project area in the Starkhorse Timber Sale. Increasing risk to firefighters and public, as well as, high fire suppression costs would occur if severe wildfire became initiated.

Alternative 2 – Direct and Indirect Impacts

All of the same elements were evaluated for Alternative 2 that were evaluated in Alternative 1.

The proposed treatments are designed to reduce ladder fuels, raise crown base heights, reduce surface fuel loadings, and create a mosaic of size and age classes within the treatment area. Additionally, treatments are designed to create structural diversity, favor ponderosa pine and western larch, increase forage for big game, and increase the vigor and resilience to insects and fire. By reducing hazardous fuels, ladder fuels, and surface fuel loadings in multistoried mixed conifer stands, these treatments would aid in reducing wildfire hazard over the long term by rendering stands more resilient to natural fire occurrence and disturbances. The proposed treatments are designed to reduce the chance of a stand-replacing fire and increase the effectiveness and safety of initial attack resources. The removal of these fuels and separation of tree crowns would decrease the chance of crown fire initiation. As a result, fireline intensity would be lowered creating a fire behavior manageable by initial attack ground resources.

FVS Fire and Fuels Extension modeling indicates that a combination of thinning and prescribed fire would effectively modify fire behavior to reduce the probability of crown fire initiation and create surface fire conditions.

Modeling shows the proposed treatments would increase crown base heights due to a decrease in fuel loading and ladder fuels in the stands which results in lowered overstory mortality.

The separation of tree crowns, through commercial thinning, would result in decreased crown bulk densities. This creates a lowered probability of mortality to the desired basal area of the stands.

Modeling also shows the treatments would increase the torching index for both torching and sustained crown fires. The torching index is the 20-foot wind speed needed to support an active or running crown fire. In this case, results from treatments would have a higher probability of being surface fire versus a crown fire.

Modeling for Unit 15 shows the chance of conditional crown fire still exists. This unit contains a non-commercial thinning treatment which would not separate crown bulk density to the extent the commercial treatment would. As a result, the models still show a high probability of mortality within the stand. However, other proposed treatments in the stand show effectiveness in reducing the surface and ladder fuels loadings which increases torching index and crown base height.

The designated areas along the Ninemile Divide and within the Stark Mountain Inventoried Roadless Area are proposed for prescribed fire treatments on 4,787 acres to rearrange and reduce fuel continuity and provide for age class diversity. Concentrations of dead and down fuels and pockets of pine beetle mortality would be targeted to create a mosaic pattern on the landscape. Resulting conditions would be discontinuous fuels and a reduction in the probability of large crown fire becoming established. This area is a functioning wildlife habitat and is used for various recreational activities, which would be maintained by the proposed treatment.

Table 15 displays the modeling outputs for Alternative 2, which lists the crown characteristics, fuel loadings, and type of fire predicted in each stand. The results, when compared to Alternative 1 (shown as 2010 – current condition) show improved resilience to vertical crown fire development and sustained crown fire behavior. For modeling purposes, it was assumed that all proposed fuel treatments would be accomplished by 2014; as a result, modeling outputs for 2015 were used to display treatment effectiveness and the resulting crown and surface fuel characteristics.

Table 15 Crown Fire Potential displaying the existing conditions (2010) and post-treatment conditions (2015) of Alternative 2.

Year	Fuel Loading Tons/Acre	Torching Index Mph	Crown Fire Index Mph	Type of Fire	Crown Bulk Density Kg/M3	Crown Base Height Ft.	Basal Area (BA) Ft2/Acre	Probability of Mortality % of BA
Unit 13								
2010	26.4	44.9	21.8	Conditional	.095	5	126	100
2015	14	714.7	41.5	Surface	.040	46	57	11
Unit 14								
2010	19.5	132	23.5	Conditional	.083	5	113	100
2015	10.2	197.3	43.5	Surface	.037	11	74	6
Unit 15								
2010	31.4	165.7	17.2	Conditional	.119	23	143	100
2015	20.3	414.1	19.4	Conditional	.103	26	126	100
Unit 16/103								

Year	Fuel Loading Tons/Acre	Torching Index Mph	Crown Fire Index Mph	Type of Fire	Crown Bulk Density Kg/M3	Crown Base Height Ft.	Basal Area (BA) Ft2/Acre	Probability of Mortality % of BA
2010	8.3	328.2	21.1	Conditional	.094	12	128	100
2015	7.6	548	26.4	Surface	.071	24	110	10
Unit 17								
2010	34.7	20.7	24.7	Active	.063	17	90	100
2015	17.6	542.5	49.9	Surface	.028	35	55	8

Again referencing the same FVS outputs from the Forested Vegetation Specialist's Report, following all proposed treatments, stand conditions would remain a Fuel Model 8 through 2049. Outputs were modeled for severe conditions to calculate crown fire initiation, which transitions to mostly surface fire due to the proposed treatments. The following table displays expected Fuel Model conditions under severe environmental conditions. The Behave Plus input parameters used were the following: 1-hour = 2%, 10-hour = 4%, 100-hour = 8%, 1,000-hour = 10%, air temperature = 85° Fahrenheit, wind-speed = 25 mph, slope = 5%, and live woody = 70%. In response to comments concerning fire risk and fuel loading, models show the decrease in fuel loading between the alternatives due to proposed treatments, thus effectively removing sufficient tons per acre leading to more acceptable conditions for effective suppression activities.

Table 16 Fuel Model outputs under severe environmental conditions for Alternative 2.

Year	Fuel Model	Fuel Loading Tons/Acre	Rate of Spread Chains/hour	Flame Length In Feet	Type of Fire
Unit 13					
2013-2029	8	13.2	10.2	2.6	Surface
2030-2049	8	15	10.2	2.6	Passive
Unit 14					
2010-2048	8	9.8	10.2	2.6	Surface
2049	8	15	10.2	2..6	Surface
Unit 15					
2013-2049	8	20.1-23.7	10.2	2.6	Conditional
Unit 16/103					
2013-2049	8	7.4-13.5	10.2	2.6	Surface
Unit 17					
2013-2039	8	16.7	10.2	2.6	Surface
2040-2049	8	18.4	10.2	2.6	Passive

Cumulative Effects

The cumulative effects from implementing Alternative 2 would result in stand conditions trending towards conditions that lower the probability of crown fire initiation under both moderate and severe weather conditions. Stand conditions would move closer towards desired conditions which would support habitat function, in the event of a wildfire.

Effects on the suppression response would be the same as in Alternative 1; however, Alternative 2 provides a higher percentage of firefighter and public safety during initial attack and leading to lower suppression costs. This is a result of treatments creating a lower potential for crown fire initiation, resulting in a higher percentage of initial attack success. This would aid in direct attack suppression methods with ground resources providing protection to powerline corridors and the lands within 1½ miles of the wildland-urban interface.

The ability to maintain habitat in these forest types is dependent on the interaction of fire, and Alternative 2 lessens the potential for severe fire effects. The FVS model outputs display acceptable results. They are acceptable from a human risk perspective, firefighter and public safety, as well as a forest ecosystem perspective regarding functioning habitat.

The FVS Fire and Fuel Extension outputs quantify that the treatments would reduce the potential for crown fire initiation and reduce fireline intensities, thus enhancing firefighter initial attack efficiency and public safety. Alternative 2 fuels reduction treatments would provide stand conditions more conducive to surface fire, as opposed to Alternative 1 where stand conditions would go unchanged and result primarily in crown fire behavior. The proposed treatments show reductions to surface fuel loadings, ladder fuels, and crown bulk densities. These reductions would decrease the available combustible materials in the ground, surface, and aerial fuels categories. The proposed treatments would result in breaking up the fuel continuity on the landscape which would provide opportunities for utilizing natural fire on the landscape for resource benefit. As a result, the proposed treatments would provide conditions which favor direct initial attack suppression methods to protect and ensure the safety of firefighters, private lands, and values at risk.

Alternative 2 would promote forest health, distribute beneficial fire effects, and be advantageous to wildfire suppression efforts. Proposed treatments would create areas with a more vigorous, healthy, heterogeneous vegetative component adding biodiversity to the project area. Collectively these treatments would adjoin with previous treatments from the Starkhorse Timber Sale to the north along the western side of the Ninemile Valley.

WILDLIFE

ANALYSIS AREA DESCRIPTION FOR WILDLIFE

The Rennic Stark Analysis Area provides a diversity of forested habitat types with scattered grass/forb parks that range in elevation from 2,500 feet along the Ninemile Creek/ private land boundary to 7,349 feet at Stark Mountain Lookout.

The analysis area encompasses a portion of the Ninemile Divide that forms a hydrologic divide or ridgeline corridor that extends from the Ninemile Creek/Clark Fork River confluence north and east to the Reservation Divide and beyond. A portion of the Stark Mountain Inventoried Roadless Area bisects the analysis area and provides security habitat for a number of wildlife species. The Ninemile/Reservation Divide and Ninemile Valley is considered part of a broad-scale linkage zone that provides connectivity for forest carnivores (e.g., grizzly bear, Canada lynx, wolverine, and others) from the Mission and Rattlesnake Wilderness areas to the Selway-Bitterroot Wilderness and beyond (IGBC 2004, MTFWP 2010). The project analysis area encompasses a portion of the Ninemile Divide. For forest carnivores, providing connectivity between populations that may be subdivided geographically or to suitable areas that are currently unoccupied is crucial to recovering and maintaining species viability.

There is a diversity of dry Douglas-fir (Pseudotsuga menziesii), dry mixed coniferous forest (Douglas-fir, ponderosa pine (Pinus ponderosa), western larch (Larix occidentalis), and cool, and somewhat dry Douglas-fir forests at low- to mid-elevations. Warmer aspects have scattered large diameter trees with bluebunch wheatgrass, Idaho fescue, and pine grass understories where such species as flammulated owl and pileated woodpecker are found nesting and foraging. Cooler aspects have higher canopy cover for nesting northern goshawks and shrub understories (e.g., ninebark, snowberry) for a number of birds and mammals (e.g., grouse, rabbits, deer, and black bears). Some moist coniferous, subalpine fir and upper subalpine forests occur in patches on the north aspects in cool draws at low-to mid -elevations and all aspects at high elevations, providing fisher, lynx, and snowshoe hare with denning and foraging habitat. Grass/forb/shrub parks are scattered throughout the area with drier slopes at lower elevations providing critical elk winter range. Whitebark pine occurs in the upper subalpine at Stark Mountain Lookout (an important species for Clark's nutcracker, grizzly bear, and squirrels). Landforms in this area are composed of a glacial cirque headwall (suitable wolverine denning habitat) and alpine ridges with the Ninemile Divide at about 6,800 to 7,300 feet.

Table 17 provides a summary of the structural stages (dominant tree size class), and includes acres covered by moderate to high tree canopy cover (> 40%), important for nesting goshawks and other closed forest associates. The table also provides a summary of acres treated in Alternative 2 with specific impacts to each species detailed in the effects sections below. Over half of the forested landscape provides relatively high canopy cover for closed forest associates (i.e., northern goshawk, elk cover, etc.) with the remaining half providing for more open forest and grassland associates (i.e., flammulated owl, wintering elk). Due to large-scale fires in the early part of the century and subsequent growth of trees over the last 80 to 90 years, the landscape is dominated by stands of mid-aged (5 to 9.9 and 10 to 14.9 in. diameter at breast height) size classes and less represented by stands of young (0 to 4.9") and older (> 15") size classes.

Table 17. Rennic Stark analysis area forested and non-forested acres and percent (%) of the total available within each dominant tree size class (in inches (in.) diameter at breast height (DBH)). Table also includes forested acres covered by > 40% canopy cover. Acres include all land owners with total Forest Service (FS) acres in parentheses () as well as a summary of acres (%) impacted by proposed treatments in Alternative 2.

Table 17 Acres of Dominant Tree Size Class and percent canopy cover

Dominant Tree Size Class (in. DBH)	Total Acres	%	Acres > 40% Canopy Cover	%
>=15	4,404	12	3,250	
10-14.9	12,774	36	7,865	
5-9.9	9,924	28	5,409	
0-4.9	1,790	5	n/a	
Total forested all ownerships	28,892 (24,708 FS)	81	16,524	57
Acres (% of forest) impacted by proposed treatments			**871 commercial 44 EMB 312 noncommercial 1,227 Total**	**53***
Herb	4,970	14		
Shrub	1,363	4		
SPVeg	240	<1		
Water	51	<1		
Total non-Forested	6,624	19		
Total Analysis Area	35,516 (25,403 FS)			

[16,524 existing acres (with > 40% canopy) -1,227 acres (with estimated post treatment canopy < 40%)] ÷28,892 total forested acres = 53% forest remaining with > 40% canopy cover.

Past harvest on Forest Service lands pre- and post-1980 has occurred on about 3,191 acres (13% of 25,043 acres), of which a modest 982 (4% of 25,043 acres) received regeneration harvest to create young age class (see Vegetation Report with data in the Project File). The remaining acres were thinned using a variety of intermediate and uneven-aged techniques that retained a significant overstory component and allowed for varying degrees of regeneration of trees/grasses/forbs/shrubs in the understory (Table 18). About 4,692 acres (20%) were prescribe burned over the last decade to maintain the ecological role of fire in drier forest types by reducing conifer encroachment, stimulating grass/forb/shrub production, and maintaining open forested conditions. Refer to the Fire and Fuels Specialist's Report for a full description of the fire history in the analysis area. Table 18 provides a summary of past harvest, prescribed fire, and wildfire from 1980 to 2010 and pre-1980. Pre- and post-1980 was chosen because 30+ years (from 1980 to present) is generally a sufficient timeframe for a burned area to regenerate into forested cover. Most of the treatments proposed in Alternative 2 are located in stands that received past treatments. A line was added in the table to show Alternative 2 treatments (with effects discussed in the individual species sections), but adding acres in the columns would provide an overestimate of cumulative acres affected given the large degree of overlap (see Vegetation Report, with stand data in the Project File).

Table 18. Acres of past harvest, prescribed fire and wildlife fire pre-1980 and from 1980 to 2010 in the Rennic Stark Analysis Area. Table also provides acres proposed for treatment in Alternative 2 (Alt. 2).

Table 18 Acres of past treatments and treatments proposed in Alternative 2

Decade	Acres Regeneration Harvest (Seed Tree; Shelterwood and Clearcut)	Acres Intermediate Harvest (Sanitation/Salvage, Improvement Cut, : Liberation, and Commercial Thin)	Acres Uneven-age Harvest: (Single Tree and Group Selection)	Total Acres Treated	Acres Large Wildfires	Acres Prescribed Fire (Ecosystem Maintenance Burn)
	young age class created	stands thinned from below; overstory retained	overstory with multiple canopy layers retained, treatment promotes regeneration in the understory by day lighting individual trees or groups of trees			reduces conifer encroachment in understory, stimulates grass/forb/shrub production, maintains open forest conditions
Pre-1980	511	334	195	1040	18,932	
1980-2010	471	494	1186*	2151	689	4692
Total	**982**	**828**	**1381**	**3191**	**19621**	**4692**
Alt. 2	**153**	**1174**	**649**	**1976**		**4786**

The analysis area has about 192.9 total miles of road, with 107.7 of those located on Forest Service lands (Table 19), with the rest on other state and private lands, 14.9 miles of which are under county jurisdiction. About 25.4 miles of Forest Service roads (23.6%) are drivable and open to public motorized travel from October 15 through December 1, for a an overall minimum open road density of 0.6 miles per square mile. This provides high elk and other wildlife security during the big game rifle season, a time when public presence with firearms increases the risk of mortality through legal and illegal shooting. About 47 miles are open to public motorized use from December 2 through October 14 for an overall maximum of 1.2 miles open road density per square mile. This equates to moderate (lower elevations) to high (IRA) wildlife security during the lion hunting, furbearer trapping, and denning/nesting/calving periods for mid/large carnivores and small mammals, birds, large ungulates and others.

Forest Service system roads and trails provide access to the area for dispersed recreation activities which primarily include hiking, hunting, horseback riding, driving for pleasure, and viewing natural features (see Recreation Specialist's Report). The main roads used by recreationists include Rennic Road (#5511), Cedar Rennic Road (#5515), and Ellis Road (#380). The Stark Mountain Lookout is staffed during the summer months and is a popular destination for Forest visitors driving up from the east side of the Ninemile Divide. The area is also used extensively by the public for firewood cutting and during the hunting seasons. There is little snowmobile use in the analysis area. Several of the main use gated roads are commonly used for hunting, firewood gathering, berry picking, and horseback riding. Many of the roads adjacent to private land receive frequent use by residents.

Three non-motorized system trails receive light use by hikers/hunters traverse the IRA (Stark Mountain Trail #58, Ninemile Divide Trail #51 and West Mountain Creek Trail #50). The Stark Mountain Trailhead, located in the analysis area, currently provides parking for 3 to 5 vehicles and 1 truck with a trailer.

Table 19. Rennic Stark roads by ownership (existing condition and post-project implementation). Tables shows (a) total acres (square miles = mi2); (b) total miles of road; (c) minimum miles of drivable road open to public motorized travel from October 15 to December 1); and (d) maximum miles of drivable road open to public motorized travel from December 1 to October 15. Columns (e) shows open road

density (mi/mi2) during the big game rifle season and (f) shows open road densities during the furbearer trapping season as well as during spring summer and early fall (December 1 to October 15).

Table 19 Roads by Ownership

Ownership	(a) Total Acres (sq. mi.)	(b) Total Miles of Road	(c) Minimum Miles of All Drivable Road Open to Public Motorized Travel (Oct. 15 to Dec. 1)	(d) Maximum Miles of All Drivable Roads Open to Public Motorized Travel (Dec. 1 to Oct. 15)	(e) Open Road Density During Big-game Rifle Hunting Season	(f) Maximum Open Road Density (occurs from Dec. 1 to Oct. 15)**
EXISTING CONDITION						
NFS	25,043 (39.1 mi2)	107.7	25.4	47.0	0.6 mi/mi2	1.2 mi/mi2
Other State and Private	10,428 (16.3 mi2)	70.3	43.8	43.9	3.6 mi/mi2***	3.6 mi/mi2***
County	0	14.9	14.9	14.9		
TOTAL EXISTING	35,471 (55.4 mi2)	192.9	84.1	105.8	1.5 mi/mi2	1.9 mi/mi2
POST-PROJECT IMPLEMENTATION ALTERNATIVE 2						
NFS	25,043 (39.1 sq. mi.)	78.0 (a 29.7 mile reduction)	19.9 (5.5 mile reduction)	33.3 (13.7 miles reduction)	0.5 mi/mi2 (0.1 mi/mi2 reduction)	0.9 mi/mi2 (0.3 mi/mi2 reduction)

* Calculated as column (c) ÷ (a) (sq. mi.) = open road density in miles per square mile of land
** Calculated as column (f) ÷ (a) (sq. mi.) = road density in miles per square mile of land
*** Calculation includes all other State, Private and County roads, since the county does not own land in the analysis area, but has jurisdiction over some roads on state and private lands.

THREATENED, ENDANGERED, PROPOSED SPECIES ASSESSMENT

CANADA LYNX (THREATENED)

Existing Lynx Habitat and Use of the Analysis Area

The analysis area is not located in designated critical habitat, but the area is managed as occupied habitat (USDA-FS 2007). Official records of Canada lynx occurrences have not been reported in the analysis area in over a decade (MNHP 2011). Snow track surveys conducted in the winters of 2010 and 2011 did not document lynx presence in or near the analysis area, however, mountain lion and wolf sign were recorded relatively frequently (data in Project File).

The Rennic Stark analysis area is bisected by the southern tip of the Divide LAU that is surrounded on three sides by non-lynx habitat (Figure 12). Suitable lynx habitat begins to occur in small scattered patches at higher elevations near the Ninemile Divide that then extends north and west out of the Rennic Stark analysis area to the boundary between the Ninemile Ranger District and the Bureau of Indian Affairs land (Figure 12, Reservation Divide).

Stands at lower elevations are comprised primarily of Douglas-fir, larch, and ponderosa pine. These stands are typically drier, have relatively open understories, and, as such, do not represent potential lynx habitat (Squires et al. 2010). With increasing elevation, subalpine fir begins to occur intermixed with Douglas-fir, larch and lodgepole pine. These wetter stands have more complex understories with small, shade-tolerant trees and shrubs such as sitka alder (Alnus sinuata) and menziesia (Menziesia ferruginea) that provide some structural complexity for snowshoe hares. Suitable lynx foraging habitat is most present in patches in mature, multi-storied stands with a spruce/fir component on north aspects above

5,500 feet, generally from Lookout Mountain north along the Ninemile Divide and beyond. The project analysis area is considered more of a movement corridor for wide-ranging species, such as lynx, moving from the Reservation Divide south to the Clark Fork River and beyond. The majority of the project analysis area is located on the lower elevation fringe of where lynx habitat begins and is separated from the Clark Fork River and Ninemile Creeks by large expanses of non-lynx habitat (white area in Figure 12 below).

Table 20 displays the existing habitat conditions, as influenced by past activities, by the vegetative structural stages displayed in Figure 12. The table also displays acres treated in Alternative 2 for comparison with the discussion of effects in the effects section. Mature multi-story and stand initiation (winter forage) are assumed to provide high quality hare habitat. Stand initiation (summer forage), intermediate forage/stand reinitiation and stem exclusion do not provide suitable winter foraging habitat. Temporarily unsuitable includes areas that are regenerating from vegetation management activities or a wildfire that occurred in the past 15 years (see Environmental Consequences section below). The majority of the temporarily unsuitable acres are from two fires that occurred during the summer of 2000 in the northern portion of the Divide LAU several miles north of the project analysis area boundary (Figure 12). No large wildfires have occurred inside the project analysis area since the early 1900s (Project File). A small wildfire (689 acres) in 2000 occurred in the Rennic Stark Analysis Area, however, the fire burned outside the LAU boundary and did not impact lynx habitat. Figure 12 also shows some large fires that occurred in 2000 in adjacent LAUs that burned at varying intensities and have been regenerating for over a decade.

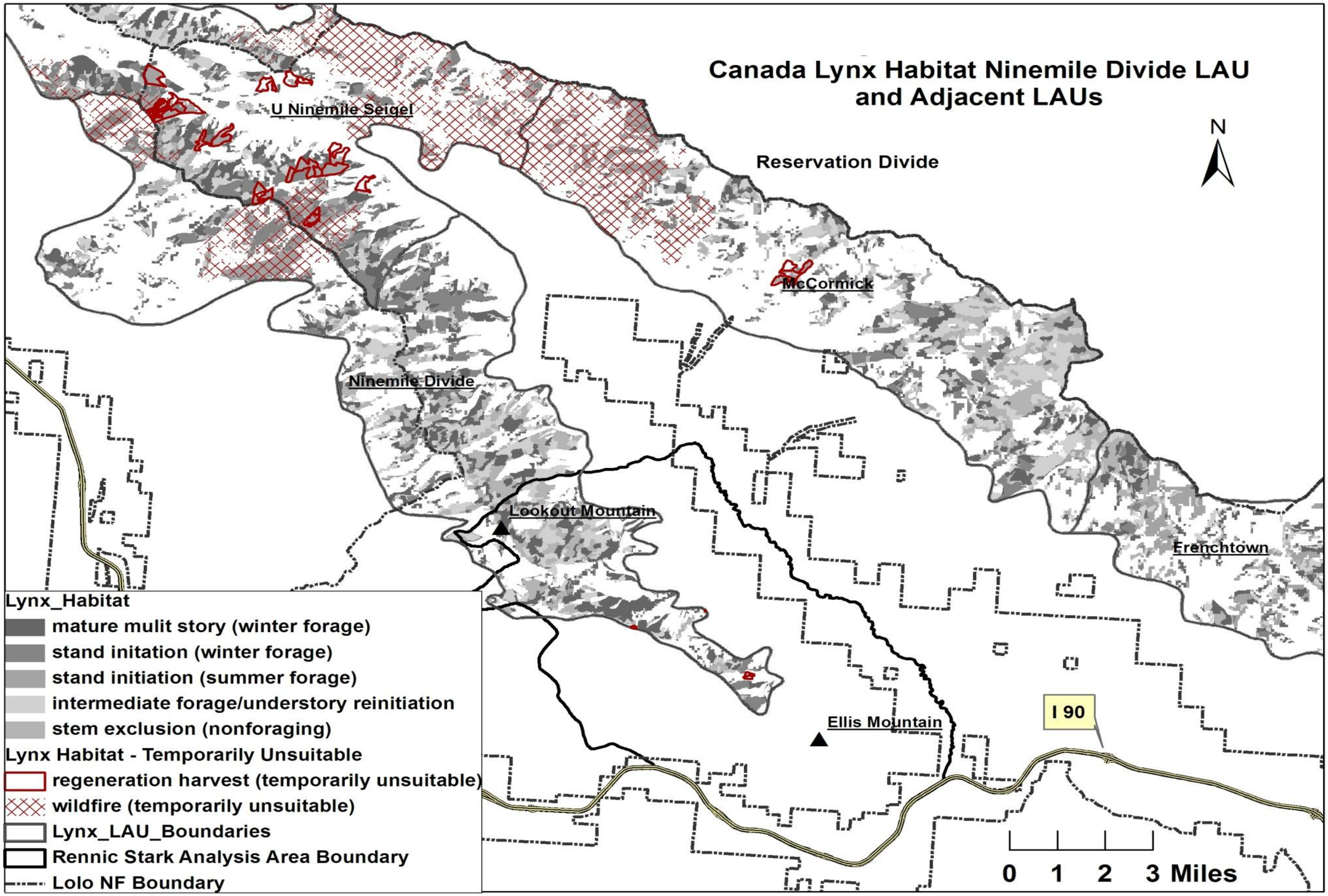


Figure 12 - Rennic Stark Canada lynx habitat Ninemile Divide LAU and adjacent LAUs.

Table 20. Composition of lynx habitat by vegetative structural stage in the Divide LAU, Rennic Stark Project Analysis Area. Table also displays acres of mapped lynx habitat proposed for treatment in Alternative 2 (Alt. 2).

Table 20 Composition of lynx habitat by vegetation structural stage in the Divide LAU and lynx habitat proposed for treatment in Alternative 2

Vegetative Structural Stages (Oliver and Larsen 1996)	Acres Lynx Habitat Divide LAU	Percent (%) of Total Acres Lynx Habitat*	Acres Lynx Habitat Project Area	Acres Lynx Habitat Proposed for Treatment Alt. 2
mature multi story (with many age classes and vegetation layers that provide winter snowshoe hare habitat)	4,693	31.1%		0
stand initiation (winter foraging habitat - 30 to 45 years)	2,341	15.5%		77 (32 acres EMB unit 102; 45 acres STSC unit 23)*
stand initiation (summer foraging habitat – 16 to 29 years)	1,210	8.0%		125 (47 acres IC unit 12; 78 acres PCT 85)*
understory reinitiation - open or closed canopy, intermediate age class, with some canopy layering that may or may not provide some foraging opportunities, > 45 years old, not yet mature)	3,569.6	23.7%		81 (68 acres IC & STSC units 14A&14B ; 13 acres PCT unit 84)
stem exclusion (non-foraging – closed canopied with understory limited (often single storied lodgepole or western larch)	3,272	21.7%		84 (14 acres EMB unit 101; 12 acres EMB unit 103; 58 acres IC unit 24)
Total acres of potential lynx habitat	15,086		4,150	367 (77 mapped as winter foraging)
temporarily unsuitable from past fire or harvest (0 to15 years)	992	6.5% (992/15086)		
Total acres of potential lynx habitat	15,085.5		4,149.8	367
Non-lynx habitat (dry forest, rock, water)	19,682.4			
Total LAU acres	34,767.9			
% OF MAPPED LYNX HABITAT IMPACTED BY PROPOSED BURNING AND THINNING TREATMENTS				2.4% maximum

CT= commercial thin, EMB=ecosystem maintenance burn, IC=improvement cut (commercial), PCT=precommercial thin, STSC=single tree selection (commercial)
*See Effects Section below.

Snowmobile use and cross-country skiing is limited to nonexistent because the area is heavily forested, does not contain groomed snowmobile routes or play areas, and is not a destination spot for this activity (see Recreation Specialist's Report).

Environmental Consequences – Canada Lynx

Effects Discussion

The Fish and Wildlife Service (FWS) listed Canada lynx as a threatened species in March 2000. FWS determined that the main threat to lynx was "the lack of guidance for conservation of lynx and snowshoe hare habitat in National Forest Land and Resource Plans and BLM Land Use Plans" (USDI -FWS 2000a).

In March of 2007 the Forest Service issued the Northern Rockies Lynx Management Direction (NRLMD) Record of Decision (ROD). The ROD was amended to forest plans in the Northern Rockies and established management direction to conserve and promote recovery of the Canada lynx, by reducing or eliminating adverse effects from land management activities on National Forest System lands, while preserving the overall multiple use direction in existing plans.

The NRLMD provides standards and guidelines to apply to lynx habitat. The Lynx Conservation Assessment and Strategy (LCAS; Ruediger et al. 2000 p. 7-2) discusses the use of lynx analysis units (LAUs) to analyze project impacts to Canada lynx. LAUs approximate the area used by an individual lynx and are the units used to analyze the effects of a project (USDA-FS 2007, FEIS Vol. I, p. 370). The Lolo NF is considered occupied lynx habitat; therefore, all standards and guidelines in the NRLMD apply to treatment units located in the affected LAU for this project, the Divide LAU (Figure 12 and Table 20).

Appendix C summarizes the objectives, standards, and guidelines from the NLRMD that apply to the effects analysis for this project, including cumulative effects. Additional objectives, standards, and guidelines apply to other activities such as livestock grazing; however, these will not be addressed as they do not apply to this project.

Vegetation management

Lynx productivity and lynx persistence is dependent on the quantity and quality of winter snowshoe hare habitat (USDA-FS 2007, FEIS, p. 153, ROD, p. 11). Winter snowshoe hare habitat consists of young regenerating forests, where the trees protrude above the snowline and in multistoried forests where limbs of the overstory touch the snowline, in addition to shorter understory trees that provide horizontal cover (Ibid. ROD at p. 11). Certain activities, such as timber harvest, prescribed burning and wildfires, can affect the amount and distribution of these habitat elements, which can in turn affect lynx productivity (Ibid FEIS at p. 154). Timber harvest can be beneficial, benign, or detrimental depending on the harvest method, the spatial and temporal occurrence on the landscape and the inherent vegetation potential of the site (Ibid. FEIS Appendix P).

To provide for lynx needs the NRLMD established direction that define objectives for lynx habitat, and standards that are management requirements designed to meet objectives. There are four standards specific to vegetation management. Two standards (VEG S1 and VEG S2) address the quantity of winter snowshoe hare habitat and rate of management induced change. The 30 percent per LAU limit on stand initiation phase habitat (VEG S1) and the 15 percent change per decade limit on regeneration timber harvest (VEG S2) serve as cumulative effects thresholds. As directed by the NRLMD stand-replacing wildfire, high intensity prescribed burning and regeneration timber harvest are the mechanisms by which lynx habitat may be rendered unsuitable.

In addition to the above standards, the NRLMD established standards that address the quality of winter snowshoe hare habitat, which is a limiting factor for lynx persistence. Standard VEGS5 limits precommercial thinning in winter snowshoe hare habitat in the stand initiation stage with some exceptions (Ibid. at pp. 11-13). Standard VEGS6 limits all vegetation management activities that reduce winter snowshoe hare habitat in multistory forests, with some exceptions.

Guidelines VEG G1 and G4 provide design criteria for project implementation. VEG G1 provides suggestions on where to conduct regeneration harvest to benefit lynx. VEG G4 provides design criteria for prescribed fire activities.

Guidelines VEG G5 and VEG 11 provide guidance on habitat for alternate prey and denning habitat.

Guideline VEG G10 provides exceptions for fuel treatment projects.

Over-the-snow routes

Objective HU O1 says to maintain the lynx natural competitive advantage over other predators in deep snow, by discouraging the expansion of snow-compacting activities in lynx habitat. Although research has not investigated whether snowmobiles directly impact lynx habitat use patterns, field observations suggest that this species exhibits little response to the noise and activity associated with snowmobile recreation (Squires personal communication, 2002). It has been hypothesized that snow compaction from winter recreation may alter carnivore community structure (Ruggiero et al. 1999), but recent science shows that this may have been overemphasized (Kolbe et al. 2007).

Lynx connectivity

Habitat connectivity is defined as those areas that consist of an adequate amount of vegetation cover arranged in a way that allows lynx to move around (NRLMD definition). Standard ALL S1 addresses habitat connectivity. Maintaining habitat connectivity means providing enough of this cover to conserve lynx. It does not mean to keep the status quo (see NRLMD definition of habitat connectivity). Habitat connectivity can be maintained as long as there is enough connectivity for lynx to move through an area (NRLMD FEIS, Volume 2, response to comment, p 23).

In order to evaluate this standard the analysis considers the juxtaposition of existing development and vegetation structure. Management direction found in the land management plans to retain riparian cover provides for lynx movement between and within vegetation management units (NRLMD FEIS p. 97-98). Generally, vegetation treatments do not impede lynx movement; however, in some situations special considerations may be needed (e.g., areas with recent large forest-fires) (NRLMD FEIS, Vol 2. Response to Comments p. 54).

Appendix C provides a detailed list of applicable NRLMD Standards and Guidelines with a description of how the project complies with them.

Alternative 1 – No Action - Direct, Indirect, and Cumulative Effects

Taking no action is not expected to cause any measurable direct or indirect effects to lynx or lynx habitat; therefore, cumulative effects are not expected. As such, Alternative 1 would have no effect on lynx or lynx habitat.

Currently 6.5% of lynx habitat in the Divide LAU is temporarily unsuitable from past fire or tree harvest (Table 20). As such the LAU currently meets Standard Veg S1 and S2 and is expected to continue to meet standards unless a large fire occurs on the landscape. Other management activities will continue as described in the cumulative effects section for the Alternative 2 below and as shaped by past activities.

No road decommissioning or storage would occur in this alternative.

When compared with Alternative 2, taking No Action would result in:

- Less vegetative diversity in the inventoried roadless area
- Higher total and open road densities that could be used at any time
- Less fire on the landscape unless a large stand-replacing event occurs that is resistant to suppression efforts

Alternative 2 –Proposed Action - Direct and Indirect Effects – Canada Lynx Vegetation

The majority of proposed treatments (from Table 3) are concentrated outside the LAU in non-lynx habitat at lower elevations adjacent to existing roads along the private land boundary. Treatments would include noncommercial thinning, ecosystem maintenance burning (EMB), and/or commercial thinning (tractor and/or skyline logging system) in 367 acres of potential lynx habitat distributed in patches across nine units (12, 14a, 14b, 23, 24, 84, 85, 101, and 102) (Table 20). This equates to a modest 2.4% of the 15,086 acres available. Larger contiguous patches of more suitable lynx habitat are available adjacent to proposed treatment areas, particularly in unroaded habitats along the Ninemile Divide providing for adequate dispersal areas (refugia).

NRLMD Standards Veg S1 and S2 address lynx habitat in an unsuitable condition; defined as lynx habitat in the stand initiation structural stage where the trees are generally less than 10 to 30 years old and have not grown tall enough to protrude above the snow during winter. Stand-replacing fires or certain regeneration harvest techniques (i.e., clear-cuts, seed tree, and shelterwood cuts) can create temporarily unsuitable conditions (LCAS). Based on average site conditions for the Ninemile Ranger District, stand initiation from 0 to 15 years is assumed temporarily unsuitable. Standard Veg S1 states: "If more than 30% of lynx habitat in a LAU is in a stand initiation structural stage, no additional lynx habitat may be regenerated by vegetation management projects," and S2, "Timber management projects shall not regenerate more than 15% of lynx habitat on NFS lands within an LAU in a 10-year period" (Appendix C). Currently 6.5% of lynx habitat in the Divide LAU is temporarily unsuitable (Table 20). Proposed treatments would commercially thin a modest 1.5% (232 of 15,086 acres) and apply prescribed fire on an additional 0.9% (135 acres) of potential lynx habitat. As a result, a maximum 8.9% of lynx habitat could be temporarily unsuitable (6.5% +1.5% +0.9% = 8.9%) for approximately 10 years after project implementation. Given the above, the project more than meets the 30% and 15% habitat thresholds in Standards VEG S1 and S2.

NRLMD standard Veg S5 addresses precommercial thinning projects that reduce winter snowshoe hare habitat in regenerating (or stand initiation) units (USDA-FS 2007, ROD p.11). Units mapped as lynx habitat in the stand initiation phase from Table 20 include winter forage units 23 (45 acres) and 102 (32 acres) and summer forage units 12 and 85 (summer forage).

The stand diagnosis (Project File) shows that Unit 23 was mapped incorrectly as lynx habitat. The unit is located on a dry southeast to southwest aspect, is two-storied in structure, and comprised of 50% Douglas-fir, 40% lodgepole pine, and 10% ponderosa pine and western larch (not spruce/subalpine-fir). The desired outcome is to regenerate larch and ponderosa pine. Unit 102 is a 3,290 acre unit partially within the IRA in mixed severity to high severity fire regimes. The unit is diverse with pockets of dense mountain pine beetle-killed lodgepole, drier habitats on south aspects, and spruce/fir on north aspects at higher elevations. The unit would be underburned by hand or aerially-ignited to create pockets of low, moderate, and higher intensity burned areas across approximately 50% of the unit. The 32 acres of potential winter snowshoe hare habitat in the 3,290 acre unit cannot be avoided during burning. Overall prescribed burning across the unit would increase structural diversity in the area by providing burned snags and downed logs and creating small openings that would stimulate shrub/tree growth (see Fire and Fuels Specialist's Report).

Precommercial thin unit 85 and commercial thinning unit 12 were mapped as summer foraging habitat; however, the units are comprised of ponderosa pine, Douglas-fir and western larch (not spruce/subalpine-fir) and therefore do not provide suitable lynx habitat (Figure 13). Treatments are designed to favor shade-intolerant species, whereas lynx habitat is comprised of shade-tolerant species (see Vegetation Report).

Figure 13 - Unit 85

To summarize, the project is in compliance with Standard VEG S5 because no precommercial thinning would occur in regenerating (or stand initiation) units that currently provide suitable winter (or summer) snowshoe hare habitat. Three units (12, 23, and 85) were incorrectly mapped as lynx habitat and in fact are comprised of drier habitat types. About 32 acres of winter snowshoe hare habitat may be impacted by prescribed fire in Unit 102 that cannot be avoided. However, the intent of the treatment is to increase structural diversity. Guideline VEG G1 provides design criteria that allows for and encourages prescribed fire to enhance foraging conditions for lynx.

Standard VEGS6 limits all vegetation management activities that reduce winter snowshoe hare habitat in multistory mature or late successional forests, with some exceptions (USDA FS 2007, ROD p. 11-12). During project design, mature and older stands with a spruce-fir/multi-story component were intentionally not proposed for treatment. Table 20 shows that 0 acres of mature multi-story foraging habitat would be impacted, which is further demonstrated in the Vegetation Specialist's Report (with data in the Project File). All stands of mature and old growth that are proposed for thinning/burning treatments are located in non-lynx habitat outside the LAU at lower elevations or in non-lynx habitat on south aspects in the LAU (Vegetation Specialist's Report with data in the Project File). Given the above, the project is consistent with Standard VEG S6.

A portion of Unit 84, mapped as understory reinitiation (Table 20), has a dense spruce/fir component that would provide winter foraging habitat; therefore, this portion of the unit would be removed from treatment altogether. The remaining units have small scattered patches of lynx habitat (surrounded by drier habitat types) in the understory reinitiation or stem exclusion phase, with little or no canopy layering (Units 14a, b, 24, 84, 101, 102, 103, Table 20). Treatments in these units call for improvement cuts (understory thinning and burning) or ecosystem maintenance burning designed to stimulate shrub production and improve structural diversity across the project area. These treatments do not include regeneration harvest nor are they in winter snowshoe hare habitat, therefore, Standards VEG S5 and S6 do not apply.

In summary, the project avoids winter foraging habitat, except for a small amount (32 acres) scattered in patches in the IRA that would be underburned, would not reduce the quality and/or quantity of lynx habitat, and may increase foraging potential for lynx in the long-term.

Road Treatments

Guidelines HUG6 through G9 apply to road upgrades; permanent road building (connectivity), and effective closures on temporary roads to address long-term disturbance and habitat connectivity in LAUs. During project design, after field reviews of suitable lynx habitat located adjacent to FS Road 4235, the interdisciplinary team omitted the area from treatment consideration to conserve lynx foraging values. Of note, FS Road 4235 would remain closed to public motorized travel, would not be used for log hauling during this project, and would remain in long-term storage year-round. Log hauling would occur during late summer/fall (outside the lynx denning period) on FS Road 5511 that bisects the southeast tip of the LAU. Hauling on FS Road 5511 is necessary because it is the main access route to the ponderosa pine restoration treatments proposed on the south side of the Ninemile Divide.

About 3.6 miles of road in mapped lynx habitat on or near the Divide (in or near Units 84, 14B and 102) would be placed into long-term storage with no plans for reuse over the next 15 to 20 years. About 1.3 of those miles is currently open to motorized use with the remaining 2.3 miles under a yearlong or seasonal closure. No temporary or permanent road construction is planned in lynx habitat (maps and data in Project File).

Overall a 29.7 mile reduction in total roads (including a 5.5 mile reduction in roads open from October 15 to December 1; and 13.7 miles from December 1 through October 15) (Table 19) is expected to increase habitat security and landscape connectivity in and between LAUs. No permanent roads would be constructed. As such, the project is consistent with Guidelines HUG6 through G9.

Snow Compaction

Guideline HU11 applies to snow compacting activities to ensure that lynx maintain their "natural competitive advantage over other predators in deep snow by discouraging the expansion of snow compacting activities in lynx habitat"). The project area has no designated snow routes and is not considered a key destination for snowmobilers (see Recreation Specialist's Report). Winter harvest is required in Units 9 and 10 to protect soil and water resources that would require log hauling on FS Road 5511. The route and road are located outside the Divide LAU (at lower elevation); therefore, the potential for disturbance and displacement of lynx is low and would occur over a short timeframe (one winter season). Overall, a long-term decrease in total and open roads would occur (Table 4) and no large openings would be created; therefore, the project is not expected to contribute to increased snowmobiling/compaction in the area. A net increase in wildlife security during all times of the year is expected in the long-term. Snow compacting activities as defined in the NRLMD would not increase, therefore, the project is consistent with Guideline HU11.

Habitat Connectivity

Standard All S1 states that "New or expanded permanent developments and vegetation management projects must maintain habitat connectivity." No new or expanded recreation or other developments would occur.

Habitat connectivity is defined as those areas that consist of an adequate amount of vegetation cover arranged in a way that allows lynx to move around (USDA-FS 2007 FEIS p. 367). Management direction in the Forest Plan that addresses retaining riparian cover provides for lynx movement between and within vegetation management units (NRLMD FEIS p. 97-98). Generally, vegetation treatments do not impede lynx movement; however in some situations special considerations may be needed (e.g. areas with recent large forest-fires) (NRLMD FEIS, Vol 2. Response to Comments p. 54).

Lynx do not require dense forests as travel corridors, but use a variety of forest cover types. All proposed treatments would maintain a mosaic of forested cover to provide for lynx travel. The substantial reduction in total and open road densities (including during the trapping season) would improve habitat connectivity for lynx (Table 4). Given no new expanded permanent developments would occur and a mosaic of forested cover would remain on the landscape for lynx travel, the project is consistent with Standard All S1. The project is not located in a lynx linkage zone (USDA FS 2007 Figure 12).

Cumulative Effects – Canada Lynx

Past, present, and reasonably foreseeable actions on private and public lands were evaluated for cumulative effects to lynx. The Analysis Area Description for Wildlife above, including Tables 18, and 19 provide a summary of actions with the data and maps provided in the Project File. Activities that have the potential to impact lynx productivity, and survival, movement, and dispersal include habitat modification from vegetation management, prescribed fire, and wildfire, road building, human development, and snow compacting activities such as snowmobile use (USDA 2007, FEIS).

As directed by the NRLMD, high intensity wildfire or prescribed burning and regeneration harvest are the mechanisms that change lynx habitat to an unsuitable condition. Wildfire and regeneration harvest from 1980 to present (see Table 11 and Figures 10 & 11) temporarily reduced the quality of a modest 8% of lynx habitat in the Divide LAU (1210.5 of 15,085.5 acres, Table 20). These burned and treated areas have been in various stages of regeneration for over a decade and will continue to increase in quality for several decades. No wildfires have impacted lynx habitat inside the Rennic Stark Analysis Area since the early 1900s. A small fire (689 acres) that occurred in 2000 (Table 11 and Figures 10 & 11) in the project analysis area did not burn suitable lynx habitat and therefore had no impact on lynx. The 2000 fire in the northern portion of the LAU (figure 12) that occurred outside the project analysis area is expected to provide lynx with abundant foraging habitat, once the burned area regenerates sufficiently to provide for hare foraging above the snow levels in winter (in approximately 3 or more years).

Since 1980, prescribed fires have been applied on 4,692 acres in the project analysis area. These fires were concentrated outside the LAU boundary in non- lynx habitat to maintain open forested conditions in drier habitat types and had no impact on lynx or lynx habitat.

The project would treat an additional 2.4% of mapped lynx habitat, 1.5% through commercial thinning, and 0.9% through prescribed fire. This would result in a temporary, cumulative change of 8.9%. The project would not exceed the 30% per LAU upper threshold established for the amount of lynx habitat in the stand initiation phase (NRLMD Standard VEG S1) or the 15% change per decade threshold on regeneration timber harvest (VEG S2). Adequate amounts of lynx habitat would remain in the LAU to provide for lynx foraging, movement, and dispersal, barring any unforeseen wildfire that could not be suppressed. As such, vegetation treatments in Alternative 2 would not add negative cumulative effects to lynx.

In addition, Alternative 2 would improve vegetation diversity in the Divide LAU through ecosystem maintenance burning in the IRA, and would not impact suitable winter snowshoe hare habitat as these areas were eliminated from commercial and non-commercial treatments altogether. Treatments in the wildland-urban interface (WUI) at lower elevations (in non-lynx habitat) would reduce the risks to private homes that may allow the Forest Service to move towards a fire-use management strategy in the IRA.

NRLMD Objective HU O1 says to maintain the lynx natural competitive advantage over other predators in deep snow, by discouraging the expansion of snow-compacting activities in lynx habitat. Although research has not investigated whether snowmobiles directly impact lynx habitat-use patterns, field observations suggest that this species exhibits little response to the noise and activity associated with snowmobile recreation (Squires personal communication, 2002). It has been hypothesized that snow compaction from winter recreation may alter carnivore community structure (Ruggiero et al. 1999), but recent science shows that this may have been overemphasized (Kolbe et al. 2007).

Existing NFS road and trail use by Forest visitors is described and displayed in the Analysis Area Description for Wildlife section above. Snow compacting activities that may impact lynx productivity and survival (USDA-FS 2007) are mainly concentrated on a few open roads in the analysis area with the majority of suitable lynx habitat concentrated in unroaded areas where snowmobile use is prohibited. Improved access for snowmobiles is not expected with this proposal or at any time in the foreseeable future. The project would not change snow-compacting activities as defined in the NRLMD.

Existing open road density is low during the big game rifle hunting season and moderate from December 1 to October 15th. The road decommissioning and storage proposed in Alternative 2 (Tables 4 & 19) would reduce total and open road density and result in an increase in habitat security/landscape connectivity for lynx in the short- (5 years) and long-term (> 10 years). As such, Alternatives 2 is not expected to contribute negative cumulative effects to lynx.

All other activities in lynx habitat are expected to continue, including summer and fall road and trail maintenance and use and light winter use.

The Nature Conservancy (TNC) in partnership with the Trust for Public Land negotiated the sale and purchase of large blocks of PCTC lands in and adjacent to the analysis area. These lands were conveyed to TNC in December 2008 and resold to the MFWP, with conservation restrictions in place that will preserve wildlife habitat, including landscape connectivity, for lynx long into the future.

Use of adjacent private (7,568 acres), state (384 acres), and Plum Creek Timber Company (2,476 acres) (figure 12) lands will continue to provide a source of disturbance for an occasional individual lynx that may travel across unsuitable habitats in the Ninemile Valley into more suitable habitats on NFS lands in the analysis area. NFS lands in the Divide LAU and adjacent LAUs (Figure 12) will continue to provide lynx with large, unroaded security areas for lynx that may occupy or move through the area long into the future.

DETERMINATION/SUMMARY OF EFFECTS - CANADA LYNX

Alternative 2 “May Affect, But Is Not Likely to Adversely Affect” (NLAA) lynx or lynx habitat for the following reasons:

- The project is consistent with all standards and guidelines for vegetation management projects as outlined in the NRLMD .
- Treatments would occur on a modest 2.4% of potential lynx habitat, resulting in a maximum cumulative change of 8.5% in the past 15 years. Therefore the project more than meets habitat thresholds established for lynx in NLRMD Standards Veg S1 and Veg S2.

- Vegetation diversity in the LAU would increase from vegetation treatments, therefore, foraging habitat would also increase.
- Treatments would not reduce the quantity or quality of winter foraging habitat, therefore lynx productivity would not be impacted.
- Habitat connectivity would be maintained because treatments would maintain a mosaic of forested cover to provide for lynx travel. Road decommissioning/storage is expected to increase habitat security and landscape connectivity for lynx in the short- and long-term.
- No increase in snow-compacting activities as defined in the NRLMD would occur.
- The project is consistent with standards and guidelines in the NRLMD.

GRIZZLY BEAR (THREATENED)

The Lolo NF encompasses portions of three grizzly bear recovery areas, the Northern Continental Divide, Cabinet Yaak, and Bitterroot.

The Rennic Stark Analysis Area is located outside any grizzly bear recovery zones and is not in the current, mapped occupied distribution area of grizzly bears (USDI-FWS 2004). The higher elevations on the Ninemile Divide in the analysis area provide bears with some unroaded security habitat with stringers of alpine/subalpine coniferous forest that connect to larger unroaded areas north and west of the analysis area. Lower elevations provide bears with spring foraging habitat along riparian areas, however, these areas are adjacent to private lands and therefore do not provide bears with spring security habitat.

State and Tribal wardens have received reports of grizzly bear sightings and activity in the Ninemile drainage and upper Ninemile Divide region (outside the project analysis area), the following five of which were confirmed by fish and wildlife agencies (compiled by E. Edge, Defenders of Wildlife).

- An adult male was captured and radio collared in 2001. This bear ranged widely along the Ninemile/Reservation Divide. The bear spent considerable amount of time in Valley Creek (on Tribal lands), Sixmile Creek, Ninemile Creek and the drainages draining into the Clark Fork River between Ninemile House and Superior. The bear was destroyed that same year in First Creek after numerous conflicts involving residential attractants.
- A female grizzly with two cubs of the year was photographed in May 2008 in the upper Ninemile Drainage.
- A lone grizzly was photographed on the Check Point Ranch in June 2010.
- In the spring of 2010 a female grizzly with one cub was trapped by Wildlife Services in Valley Creek on the Flathead Indian Reservation. The bear was able to pull out of the trap when researchers arrived.
- In the spring of 2010 a lone grizzly was observed by Wildlife Services. The bear was feeding on a dead horse in Valley Creek.

Table 21 Bear Management Unit information

Bear Management Unit	Sub-unit	Visual Sightings	Den Sites	Mortality
Not Applicable	Not Applicable	None verified in the analysis area in 10 years. In 2009 a female with two cubs was documented on private land within 2 miles of the analysis area boundary, and in 2010, a male was sighted on numerous occasions in the Ninemile drainage.	None Known	No known mortalities in the analysis area.

Because this project is not within what is currently considered occupied grizzly bear habitat, this report will not go into detail regarding grizzly bear habitat requirements and management direction.

Features of the existing environment that are relevant to grizzlies include motorized access, cover, habitat suitability, and food and garbage attractants. The Forest Service recognizes that the species is expanding its range in northwestern Montana and is sensitive to issues that impact grizzly bear mortality. In April 2011, the Forest signed an expanded food/wildlife attractant storage order requiring all users of the Lolo NF to properly store all attractants in a "bear-resistant" manner.

Environmental Consequences - Grizzly Bear

Alternative 1 – No Action - Direct, Indirect, and Cumulative Effects

Taking no action is not expected to cause any measurable direct or indirect effects to grizzly bears or grizzly bear habitat; therefore, cumulative effects are not expected. As such, Alternative 1 would have no effect on grizzly bear.

Activities on Forest Service and adjacent private lands will continue as described in the Analysis Area Description for Wildlife above and as shaped by past activities.

- No road decommissioning or storage would occur in this alternative therefore habitat security would not improve above the existing situation.
- When compared to the Action Alternative, taking No Action would result in:
- Less vegetative diversity in the inventoried roadless area
- Higher total and open road densities that could be used at any time
- Less fire on the landscape unless a large stand-replacing event occurs that is resistant to suppression efforts

Alternative 2 – Direct, Indirect, and Cumulative Effects

Because the project area is located outside of a grizzly bear recovery zone and outside the mapped, occupied distribution area of bears (USDI-FWS 2004), it is not considered occupied habitat by federal management agencies, the project as proposed would not have any direct effects to grizzly bears. It is recognized that grizzly bears use the Ninemile Valley from time to time. The project would reduce total and open road densities which reduces impacts to species sensitive to human presence such as grizzly bears. Thinning and burning treatments in Alternative 2 would increase grass/forb/shrub production and maintain forested connectivity that may provide a grizzly moving through the area with foraging opportunities and cover. Food and other bear attractant storage would be required of anyone working in the area from April 1 to December 1. Given that direct effects would not occur, and the potential for negative indirect effects is low to non-existent, cumulative effects to grizzly would not occur and therefore will not be analyzed in detail.

Determination/Summary of Effects - Grizzly Bear

Implementing the proposed activities would have "No Effect" on the threatened grizzly bear. This determination is based on the following rationale:

- The analysis area is not currently considered occupied by grizzly bears.
- Security at higher elevations within the project area is high, and is high at all elevations during the big game rifle season. Road decommissioning and storage in Alternative 2 would further increase security and connectivity throughout the analysis area.
- The proposed treatments would retain forest cover to maintain landscape connectivity.

- Food and other bear attractant storage would be required of anyone working in the Ninemile area in association with implementation of this project from April 1 to December 1. All Forest users are required to properly store food via a Forest-wide order.
- The No Effect determination is consistent with the programmatic screens developed by the Level 1 Team (USDA-FS 2010).

Gray Wolf (Delisted from Endangered)

The Rennic Stark analysis area provides a portion the home range for the Ninemile wolf pack that has inhabited the Ninemile Valley since 1990. The analysis area supports a prey base of elk (see Elk section below), deer, and some moose that allow wolves to successfully forage throughout the valley. Livestock use does occur on private lands adjacent to the analysis area. In 2010, 4 wolves were removed from the Ninemile pack due to predation on local livestock. By the end of 2010, at least 8 wolves remained in the pack.

Wolves are considered habitat generalists that use a diversity of forested and grassland habitats, but tend to avoid areas with heavy human use (summarized in USDA-FS 2010, Programmatic BA). Vegetative cover affects wolf survival by providing shelter for prey species such as deer and elk. In general, healthy wolves need little cover.

Environmental Consequences - Gray Wolf

To ensure conservation of wolf populations, the Forest Service uses the three limiting factors identified in the Gray Wolf Recovery Plan (USDI-FWS 1987) to evaluate impacts from forest management: 1) potential for wolf/human interaction; 2) effects on the wolf prey base; and 3) impacts to the integrity of key wolf habitat (rendezvous and den sites).

Alternative 1 – No Action - Direct, Indirect, and Cumulative Effects

Taking no action would have no measurable direct or indirect effects on the existing potential for wolf/human interaction, the wolf prey base, or the integrity of key wolf habitat. Therefore, cumulative impacts are not expected and will not be analyzed in detail. Given the above, Alternative 1 would have no impact on wolves.

FWP identified a decline in forage plants for elk prey on Forest Service lands in the analysis area (MTFWP 2005). The decline has been attributed to a lack of disturbance in areas where shrub fields, created by past fires and timber harvest, have grown in with conifers. Winter range on the periphery of the analysis area has been actively managed with prescribed fire and noxious weed treatments. No large wildfires have occurred since the early 1900s (see Fire and Fuels Specialist's Report); however one small fire (689 acres) occurred in 2000. In Alternative 1, aggressive fire suppression would continue that, if effective, could contribute to the downward trend in elk forage in some areas.

Invasive plants, particularly knapweed, have become an issue along roads and trails that bisect elk winter range. This has the potential to reduce forage for elk, the primary prey species for wolves. Invasive plant treatments would continue to be pursued under the existing Forest weed management program (USDA-FS 2008a).

Alternative 2 – Proposed Action - Direct and Indirect Effects

Wolf/human interaction

Wolf mortalities are most often related to livestock conflicts (72%) on private lands, car collisions on major highways, and train strikes all of which are outside Forest Service control. The remaining causes include illegal and legal killing and incidental trapping/snaring. These activities can be influenced by access (open road densities). In fact, access (via roads and trails) during the general big-game rifle and furbearer trapping seasons (October through February) on public and private lands is considered the number one factor that increases the risk of wolf/human interactions and the potential for wolf mortalities through accidental or illegal shooting or trapping (Jensen et al. 1986, Boyd and Pletscher 1999, and Claar et al. 1999).

In Alternative 2, the reductions in total and open road densities during the general big game hunting and trapping seasons (Tables 4 & 19) would increase security for wolves and the wolf prey base in the short and long term.

Prey base

Productivity can be influenced by food quality and availability. The main diet of wolves includes elk, the populations of which are managed and monitored by the Department of Fish, Wildlife and Parks (see MFWP 2005). Overall, elk numbers in the analysis area have been stable or increasing over the last several years, indicating forest management has not influenced population numbers (see Elk section below).

MFWP has identified elk forage quality and quantity as an issue (Ibid). To address this issue, thinning treatments, ecosystem maintenance burning, and invasive plant treatments are expected to maintain or enhance forage for big game, especially on critical winter range (MAs 18 and 23), and thus, the foraging potential for wolves (Fire and Fuels and Vegetation Specialists' Reports including internal citations).

Key wolf habitat

No current known den or rendezvous sites occur in or near proposed activities; therefore, impacts to these key features are not expected.

Cumulative Effects

Past, present, and reasonably foreseeable actions on private and public lands were evaluated for cumulative effects to wolves. The Analysis Area Description for Wildlife above, including Tables 8 and 9 provides a summary of actions with the data and maps provided in the Project File. Of the past and reasonably foreseeable activities, access (via roads and trails) during the big-game hunting and trapping seasons (October through February) on public and private lands increases the risk of wolf mortalities through accidental or illegal shooting or trapping, more than any other factor (Jensen et al. 1986, Boyd and Pletscher 1999, and Claar et al. 1999). In the Ninemile Valley, conflicts between the persistent wolf population and private landowners who own livestock and domestic pets through the valley pose the greatest risk to wolf mortality because the wolf population is periodically reduced by wildlife management agencies to reduce the potential for conflict. In addition, wolves are now a hunted population.

The analysis area provides wolves with large areas of unroaded security habitat in the Stark Mountain IRA, and existing road densities during the big game hunting and trapping season are low to moderate (Table 19 and the Transportation Specialist's Report). Alternative 2 is expected to improve the security habitat for wolves and elk through extensive road decommissioning and storage (Table 4).

Use of the remaining roads and trails is expected to continue on private and public lands long into the future. Conflicts between private landowners (including livestock and domestic pets) is also expected to continue long into the future.

Determination/Summary of Effects - Gray Wolf

Implementation of Alternatives 2 would have "No Impact" on wolves or key wolf habitat. The determination is based on the following rationale:

- Vegetation diversity is expected to increase for wolf prey species through ecosystem maintenance burning.
- Vegetation treatments are not expected to impact the wolf prey base and are expected to improve foraging conditions on ungulate winter range.
- Existing habitat security during the big game rifle season is high. Road decommissioning/storage is expected to further increase habitat security and landscape connectivity for wolves in the short and in the long term.

FISHER (SENSITIVE)

Conservative estimates of fisher habitat on the Lolo NF using Forest Inventory Analysis (FIA) data show that fisher habitat is relatively abundant comprising 530,782 acres in winter and 159,136 acres in summer (Samson 2006b). The estimated critical habitat threshold for maintaining a minimum viable population of fisher across all of Region One is 100,078 acres (Ibid.). Thus, habitat on the Lolo NF appears more than sufficient to maintain fisher viability Forest-wide.

Large patches of optimum fisher habitat in the analysis area is limited to the upper headwater drainages of Fire Creek in the IRA, the entire Cedar Creek drainage, and the upper reaches of Cromwell and Rennic Creeks (Table 22 with maps in Project File). At lower elevations, adjacent to private lands, the remaining fisher habitat is distributed in smaller patches in narrow drainages surrounded by the drier habitat types that fisher tend to avoid (Jones and Garton 1994, pp. 377–378). Given the narrow distribution of moist habitats (influenced by elevation, aspect, and topography), the entire analysis area has the potential to support a portion of about one female home range (Foresman 2012). Large diameter spruce/fir and moist grand fir are limited in the analysis area from stand replacing fires that occurred in the early 1900s (discussed above). Table 22 provides a summary of estimated acres of potential fisher habitat; including acres that meet summer and winter habitat requirements. Criteria for estimating habitat were adapted from FIA models developed by Samson (2006b) for fisher in the Northern Rockies using standard methods developed by the Region One Vegetation Analysis Team (methods in Project File). In general habitats include a variety of mature (overstory greater than 15" dbh, depending on the habitat type) and older, moist coniferous and deciduous forest habitat types at low-to mid-elevations with at least 40% canopy cover. Habitat use in summer appears more restricted to riparian corridors compared to a broader range of habitat use in winter (discussed above). Potential habitat includes moist coniferous forest types at mid-to low-elevations, where stand structure does not meet the canopy cover or size class requirements; but could grow into fisher habitat in the future. Suitable winter habitat comprises 38% ((1048+993)/5362 acres, Table 22) of the total estimated potential fisher habitat, whereas suitable summer habitat comprises 20% (1048/5362 acres).

Table 22. Rennic Stark estimated acres of suitable summer and winter habitat, estimated acres of additional winter habitat that does not meet summer habitat requirements, and estimated acres of other potential that currently does not meet summer or winter habitat requirements but has the potential to grow into suitable fisher habitat in the future.

Table 22 Estimated acres of suitable Summer and winter Habitat

Total Acres FS Lands Only	Estimated Acres Summer and Winter Fisher Habitat	Estimated Acres Additional Winter Habitat that does not meet summer habitat requirements	Estimated Acres Of Other Potential	Total Estimated Acres of Potential
25,043	1,048	993	3,321	5,362

Limited DNA hair trap surveys for fisher have been conducted in potential habitat in accessible areas along the Ninemile Divide, with fisher presence confirmed through DNA analysis in 2007 in two survey areas located about 1 mile north of the analysis area. Snow track surveys were also conducted along the Ninemile Divide. Neither carnivore track surveys nor fisher hair traps have detected a fisher in the analysis area (data in Project File). However, mountain lion and wolf tracks were observed relatively frequently in 2010/2011. Given the patchy distribution of fisher habitat and the difficulty in surveying for the species one cannot assume that fisher aren't present in the analysis area from time to time.

Existing habitat security, measured by road densities that in turn influence access within the analysis area, is high during the big game rifle season and moderate during the trapping season when fisher are most vulnerable to human-caused mortality (Table 4 and 19). Lower elevations tend to be more roaded and higher elevations, including the IRA tend to be unroaded. The analysis area does receive substantial use by lion hunters and some use by trappers. Snowmobile use, which can facilitate access during the trapping season, is limited to non-existent in the analysis area (see Recreation Report).

ENVIRONMENTAL CONSEQUENCES - FISHER

Direct and Indirect Effects Overview

Research on the impacts of vegetation treatments on fisher is limited (summarized in 38532 Fed. Reg. Vol. 76, No. 126, June 30, 2011). Powell and Zelinski (1994) purported that fishers may tolerate small patch cuts or other small-scale disturbances, provided these occur in a larger matrix of relatively dense, closed canopy, late succession forest. They went on to state that such openings, with adequate woody debris left on site, might even increase the value of habitat by providing a diversity of prey, which would support a diverse diet for fishers.

In its' 12-month status review of the species, the FWS stated that "due to its need for forest cover and susceptibility to capture and mortality from furbearer harvest…precautionary measures to protect the species [should] be continued" (38504 Fed. Reg. Vol. 76, No. 126, June 30, 2011). The FWS concluded that:

"Timber harvest and management have significant potential to alter the suitability of a landscape for fishers; conversely, management of forests using mechanical means or fire can assist in creating conditions that foster larger trees, create snags, increase woody debris, or open densely stocked areas to provide habitat for fisher prey species. Fishers in the US NRMs [Northern Rocky Mountains] evolved in forest types where fire frequency and intensity was mixed, and wind throw was common, resulting in a complex and intricate landscape mosaic of young, mixed-age, and late-seral components (Jones 1991, p. 111; Arno et al. 2000, pp. 225–227). Thus, the result of silviculture treatments or harvest may resemble the natural disturbances and the succession that follows (Powell and Zielinski 1994, p. 64)" (Ibid at. p. 38520).

Forest Service management recommendations for the conservation of fisher (Wittmer et al. 1998) include: (1) conservation of 20% late succession forest at low to mid elevations; (2) maintenance of riparian corridors for use by individuals and populations; (3) maintenance of links between populations; and (4) management of trapping pressure (facilitated by road and snowmobile access from December 1 through February 15). As stated above, 38% of potential fisher habitat in the analysis area provides suitable late successional forest in winter and 20% in summer, which meets or exceeds the recommendations of Wittmer et al. 1998).

The Forest measures impacts on fisher by evaluating the potential for disturbance and displacement effects from ground-disturbing activities, changes in habitat from vegetation treatments and related roadwork; and changes in road/trail and snowmobile access that may impact trapping pressure (December 1 through February 15).

Alternative 1 – No Action - Direct, Indirect, and Cumulative Effects

Because this alternative would not change the existing vegetative condition on the project area or change existing road densities it would have no impact on fisher.

Because taking no action would have no immediate direct or short-term indirect impacts on fisher, cumulative impacts are not anticipated. Existing road densities would not change, and active fire suppression would continue. These activities and others would continue with related impacts described in the Cumulative Effects section for Alternative 2 below.

Alternative 2 – Proposed Action - Direct and Indirect Effects

Because of their naturally rare and wide distribution and the naturally limited amount and distribution of suitable habitat (discussed above, including internal citations), the potential for direct and indirect effects to even one individual fisher is relatively low. Direct effects, if they occurred, would be in the form of disturbance and displacement caused by mechanical treatments, prescribed burning, and road work. Evidence of fisher response to disturbance and displacement from vegetation management is limited, with mixed conclusions (38504 Fed. Reg. Vol. 76, No. 126, June 30, 2011). There is no scientific evidence that suggests fisher mortality would occur from proposed activities. Because of the spatial and temporal variability of proposed activities across the project analysis area, and because suitable, large displacement areas occur in and adjacent to the project area, effects may be small in scale at any one time dispersed over a large area over a 5-year period for commercial treatments and up to a 10-year period for noncommercial treatments and road decommissioning. Vegetation and road treatments are not expected to result in fisher mortality. Commercial treatments and roadwork would not occur in areas that provide large patches of suitable fisher habitat and are concentrated in small disjunct patches across numerous treatment units, in less suitable habitat (discussed above, and shown in Table 23).

Indirect effects to fisher could occur from vegetation treatments (Table 23). Habitat would be modified through commercial treatments on 480 acres (9% of available habitat distributed in small disjunct patches across 23 treatment units) and through non-commercial treatments on 2,960 acres (53%). The majority of treatments (2,732 acres) include ecosystem maintenance burns (Units 101 and 102) in the IRA that are designed to mimic mixed-severity fire regimes and increase structural diversity that may benefit fisher and fisher prey in the long-term (Fire and Fuels Specialist's Report; Jones 1991, p. 111; Powell and Zielinski 1994, p. 64; Arno et al. 2000, pp. 225–227; and well summarized in 76 FR 38504, June 30, 2011).

After applying INFISH buffers, all riparian corridors and riparian/forest ecotones would be eliminated from commercial and non-commercial treatments, that would ultimately reduce the total acreage treated and conserve optimum fisher habitat across the analysis area. No old growth would be treated in habitat types that provide fisher habitat; and treatments would not preclude treated stands from developing into old growth in the future (Vegetation Specialist's Report). Commercial treatments are designed to favor growth of large trees and stimulate understory shrubs, grasses and forbs production for fisher prey species. A modest 7 acres of summer and winter habitat (Unit 14B) and 19 acres of potential habitat (Unit 14B) would be regenerated through stand liberation silviculture methods (Table 23). These treatments would be nested among forested areas with denser canopy and understory conditions; therefore the forested nature of the area would be maintained. Such treatments are not expected to impact fisher and may provide for prey such as ground squirrels (Powell and Zielinski 1994).

While forest structure would change, forested stands would not be converted to non-forest; therefore forested connectivity would be maintained. All proposed treatments in winter and summer fisher habitat are intermediate harvests and therefore would not change the age or size class distribution of fisher habitat. A decline in the large woody debris component is expected in all commercial and non-commercial treatment units that receive activity fuels treatment and underburns. This could reduce habitat suitability for fisher denning and fisher prey (Ibid.). However, large woody debris would be left in all treatment units consistent with Forest Plan standards and soils mitigation measures would aid in offsetting impacts. All riparian corridors and wet areas in units, that provide optimum fisher habitat, would be avoided altogether or protected through the use of INFISH buffers that require maintenance of the woody debris and vegetation component to further offset impacts.

Table 23. Rennic Stark fisher habitat affected by treatments. Table includes total acres of existing summer and winter habitat, winter only not used in summer, total acres treated by treatment type, and portions of units affected. Percentages of available fisher habitat are displayed where appropriate.

Table 23 Fisher habitat affected by treatments

FISHER HABITAT	TOTAL ACRES EXISTING	TREATMENT TYPE*	TOTAL ACRES (% of available) BY TREATMENT TYPE	TOTAL TREATED ACRES (% of available)	PORTIONS OF UNIT NUMBERS AFFECTED
NON-COMMERCIAL TREATMENTS					
SUMMER & WINTER	1,002	EMB	542 (54%)		101-103
		PCT	41 (4%)	583 (59%)	83-85
COMMERCIAL TREATMENTS					
		CT	21		3, 27
		IC	22		2, 7, 12, 13, 14A.17, 19
		STS	57		1B, 4, 8-11, 23
		STSC/LIB	7	107 (11%)	14B
NON-COMMERCIAL TREATMENTS					
WINTER	1,260	EMB	747	747 (59%)	101-103
COMMERCIAL TREATMENTS					
		IC	103		1A, 2, 5B, 7, 12, 13, 14A,
		STS	46	149 (12%)	1B, 4, 8, 9, 10, 11
NON-COMMERCIAL					
POTENTIAL	3,296	EMB	1443(44%)		101- 103
		PCT	104 (3%)		80, 82-85
		PCT/EMB	52 (2%)		21, 60, 61
		THIN/HPB	31	1630 (49%)	15, 16, 22
COMMERCIAL					
		IC	95		1a, 2, 5B, 7, 12, 13, 14a, 18, 24
		STSC/LIB	19		14B
		STS	107	224 (7%)	1B, 4, 8, 9, 10, 11, 23
NON-COMMERCIAL					
TOTAL	5,558			2960 (53%)	2732 acres are concentrated in EMB units 101-103 in the IRA, with the remaining 228 acres scattered in disjunct, small patches among 14 units
COMMERCIAL					

FISHER HABITAT	TOTAL ACRES EXISTING	TREATMENT TYPE*	TOTAL ACRES (% of available) BY TREATMENT TYPE	TOTAL TREATED ACRES (% of available)	PORTIONS OF UNIT NUMBERS AFFECTED
				480 (9%)	480 acres scattered among 18 treatment units

CT= commercial thin, EMB=ecosystem maintenance burn, HPB=handpile and burn, IC=improvement cut (commercial), PCT=precommercial thin, STSC=single tree selection (commercial)

There is no scientific evidence to suggest that direct and indirect effects of roadwork and log hauling associated with vegetation treatments have a negative impact on fisher (summarized in 76 FR 38504, June 30, 2011). Ground disturbance associated with road improvements to facilitate log hauling and road decommissioning and storage would occur in the dry season after young fisher have emerged from their dens and during the time that habitat use is more narrowly tied to riparian areas (discussed above including internal citations). Winter harvest proposed in Units 9 and 10, with associated log hauling on the main access roads, would be short in duration (one season) and small in scale.

Optimum fisher habitat in the IRA, at the heads of drainages, and in riparian corridors would not be impacted by roadwork. In the long-term, (10 years out) motorized access would be reduced substantially from extensive road decommissioning and storage (Table 4), including during the trapping season; therefore, the risk of mortality from trapper access may also decline as landscape linkage and security increases.

Cumulative Effects - Fisher

Historical trapping, increased road access, and clearcutting, especially in riparian areas, all likely impacts fisher populations across the western U.S. (discussed above, including internal citations). Fishers were released in some areas of western Montana to augment nearly extinct populations (Powell and Zielinski 1994). Montana Fish Wildlife and Parks regulates trapping of fisher and have reduced quotas over the years, but the species remains vulnerable to trapping pressure. Clearcutting, riparian harvest, and road access has decreased on public lands over the last two decades and has likely stabilized impacts to fisher (summarized in 76 FR 38504, June 30, 2011, including internal citations). Of note, fisher abundance and distribution has increased in concert with the above activities.

Past, present, and reasonably foreseeable activities in and adjacent to the project analysis area that have likely reduced the quality of fisher habitat are described in the text and tables in the “Analysis Area Description for Wildlife” section above, with associated data and maps in the Project File. Activities that reduce the quality of fisher habitat include: road building, maintenance, and use (Table 19); timber harvest (Table 23); wildfire; recreational use (including trapping); BPA powerline development and maintenance on the Ninemile Divide; and private land development.

Private land development and high road densities on adjacent State and private lands (Table 19) have reduced the quality of fisher habitat with associated disturbances and increased risks of mortality that will continue into the future with uncertain impacts. Road decommissioning and storage in association with this project and continued regulated road use on NFS lands, particularly during the trapping season, may offset and stabilize these impacts (Ibid.).

Past timber harvest has occurred within the analysis area using various prescriptions and logging systems. Past harvest on NFS lands pre- and post-1980 has occurred on about 3,191 acres (13% of 25,043 acres), of which a modest 982 (4% of 25,043 acres) received regeneration harvest to create young age classes. The remaining acres were thinned using a variety of intermediate and uneven-aged techniques that retained a significant overstory component and allowed for varying degrees of regeneration of trees/grasses/forbs/shrubs in the understory (Table 23). All pre-1980 and many post-1980 stands now likely provide a variety of conditions for fisher foraging and travel. The project would commercially treat a modest 480 acres of additional fisher habitat distributed in small patches across 23 treatment units. At this small scale, treatments are not expected to add negative cumulative impacts to the species. Any impacts would be in form of disturbance and displacement and habitat modification that would be at the scale of a portion of one individual fisher home range. The risk of disturbing even one individual is relatively low (see above). We know that fisher occupy adjacent disturbed and undisturbed areas; therefore impacts at the population scale are not anticipated.

The fires in the early 1900s likely reduced the quantity and quality of fisher habitat across a large portion of the analysis area (18,932 acres, Table 23). Uncertain impacts of these fires in northwestern Montana are summarized in 76 FR 38504, June 30, 2011. Many stands that provide potential fisher habitat are now heavily stocked with 5-to 9-inch diameter trees that may provide suitable summer and winter habitat in the future (Table 22 with data in Project File). The Forest has also treated about 4,692 acres with prescribed fire over the last decade to maintain the ecological role of fire in drier forest types that have likely had no additional impacts on fisher habitat (discussed above). The project would non-commercially treat a large portion of suitable and potential fisher habitat; up to 2,960 acres; the majority of which (2,732 acres) are concentrated in EMB units 101-103, with the remaining 228 acres scattered in disjunct, small patches among 14 units. The EMBs are designed to reintroduce mixed severity fire into the system that is expected to increase heterogeneity of fisher habitat in the long-term (Fire and Fuels Specialist's Report).

The project would retain down woody material as directed by the Forest Plan and mitigation measures for soils and other resources. In addition, the action alternative would only include regeneration harvest using small patches of irregularly shaped units within larger improvement cut units so the forested nature of treated stands would be maintained. Finally, the overall reduction in total and open road densities following project completion would benefit fisher and other species that are subject to trapping pressure.

DETERMINATION/SUMMARY OF EFFECTS - FISHER

Alternative 2 "May Impact Individuals or Habitat" (MIIH) but is not likely to lead to a trend towards federal listing or loss of viability for the population or species because:

- The potential for negatively impacting even one individual fisher is low.
- The project proposes to commercially treat a modest 9% of suitable and potential fisher habitat distributed in small, disjunct patches across multiple treatment units. Impacts would be temporary in nature and small in scale.
- EMBs in the IRA are expected to restore ecological processes consistent with mixed-severity fire regimes, providing a mosaic of burned and unburned patches of varying intensity which may "resemble the natural disturbances and the succession that follows" (Fire and Fuels Specialist's Report; Jones 1991, p. 111; Powell and Zielinski 1994, p. 64; Arno et al. 2000, pp. 225–227; and 76 FR 38504, June 30, 2011 p. 38520).
- Forest/riparian ecotones, where optimum fisher habitat occurs, would be adequately protected through no harvest buffers (INFISH) and road decommissioning and storage.
- Coarse woody debris and snags would be retained consistent with Forest Plan Standards. No old growth fisher habitat would be impacted.
- Trapper access would not increase, and total and open motorized densities would be reduced. Habitat security and landscape connectivity would increase in the long term.
- The project would not change the age or size class distribution of fisher habitat. The alternative is consistent with management recommendations for fisher (Wittmer et al. 1998 and others).

- Fisher habitat appears abundant and well-distributed on the Forest and Region to maintain viable fisher populations.

North American Wolverine (Sensitive)

Based on the Land Systems Inventory (LSI) database (Lolo NF) and local knowledge, there is one small area in the analysis area on the Ninemile Divide just below the Stark Mountain Lookout that provides a cirque basin or similar landform with denning habitat potential (Figure 14). The Mission Mountains Wilderness northeast of the analysis area and Montana/Idaho divide west of the analysis area appear better-suited to provide wolverine denning; compared to the immediate project analysis area. Snowmobiling is allowed seasonally, but does not occur frequently within the analysis area and is not allowed in the IRA. The analysis area is not high quality wolverine habitat and would provide only a small portion of a home range or linkage habitat between the Reservation Divide and the Clark Fork River below. The analysis area supports a diverse array of prey including large ungulates.

Figure 14 - Glacial cirque basin north of Stark Mountain Lookout. Photo on right is a close up of the lower left hand corner of the photo on the left.

Environmental Consequences - Wolverine

Direct and Indirect Effects Overview

The U.S. Fish and Wildlife Service concluded that because wolverine habitat is generally inhospitable to human use and occupation and most of it is also federally managed, wolverines are somewhat insulated from impacts of human disturbances from industry (e.g., logging), agriculture, infrastructure development, or recreation. More than any other factor, wolverine need deep, persistent, and reliable spring snow cover (April 15 to May 14), which is the best overall predictor of wolverine occurrence in the contiguous U.S. (Aubry et al. 2007, pp. 2152 in Fed. Reg. 239; Copeland et al. 2010). As stated above, the primary threat to the contiguous U.S. population is the risk of eventual habitat and range loss due to climate warming (Factor A), with secondary threats from B (trapping/wolverine harvest - also see Squires et al. 2007), D (disturbance associated with human developments and transportation corridors), and E (loss of genetic stochasticity due to isolation between snowy habitats due to climate change). Based on the above, and discussions in previous sections, impacts to wolverine are evaluated based on secondary threats from trapping (facilitated by road access); the potential for disturbance near denning habitat from proposed activities; and the potential for changes in the prey base, particularly large ungulates.

Alternatives 1 and 2 - Direct, Indirect, and Cumulative Effects

This project would not have measurable effects on wolverine under either alternative because: the size of the proposed project is much smaller than an average wolverine home range; the area lacks quality wolverine denning habitat; the potential for disturbing even one individual is low; and the treatments would not convert the area to non-forest, reduce ungulate densities, or increase motorized access (including snowmobiles). The decreases in road densities (Table 4) would reduce hunter/trapper access and increase security to wolverine moving through or using the analysis are in the long term. The project would have no measurable impact on wolverine population viability in the analysis area or on the Lolo NF.

Because the project would have no measurable direct or indirect effects on wolverine, cumulative effects are not anticipated and will not be analyzed.

Determination/Summary of Effects - Wolverine

Implementation of the proposed activities would have "No Impact" on the sensitive wolverine. This determination is based on the following rationale:

- Denning habitat for this species is very limited/absent within the project area. The analysis area would provide only a portion on one home range.
- The potential for disturbing even one individual is low.
- Motorized use is moderately restricted in the analysis area so wildlife habitat security is moderate to high. Winter snowmobiling is low and restricted to roaded areas.
- The decrease in road densities (Table 4) would reduce hunter/trapper access and increase security to wolverine moving through or using the analysis are in the long-term.
- Forest cover would be retained on the landscape to provide habitat connectivity (Table 17).
- Roadless areas and wilderness occur in close proximity to the project area and provide for suitable displacement and security habitat.

Northern Bog Lemming (Sensitive)

Potential bog lemming habitat comprises less than 100 acres in the analysis area scattered in patches that range in size from < 1 to 10 acres that could support a number of home ranges. The analysis area contains no sedge or alder-willow bogs or sphagnum bog mats. Due to the lack of suitable habitat, no specific surveys have been conducted for this species within the analysis area and no occurrence records exist.

Environmental Consequences – Northern Bog Lemming

Direct and Indirect Effects Overview

Vegetation treatments can impact bog lemming by causing direct mortality through collisions or crushing by heavy equipment, or by destroying plants and compacting soil that in turn can alter plant foraging, nesting, resting, and cover habitat (Hickman et al. 1999). Skid trails or roads in lemming habitat may divert or alter surface water flows, thus changing water levels and drainage patterns and altering wet meadow habitat (Ibid.).

Alternative 1 – No Action - Direct, Indirect and Cumulative Effects

The No Action alternative would have no direct, indirect, or cumulative impacts on the northern bog lemming.

Alternative 2 – Proposed Action - Direct, Indirect, and Cumulative Effects

Alternative 2 would have no direct, indirect, or cumulative effects on northern bog lemmings because: the analysis area lacks sedge or alder-willow bogs or sphagnum bog mats; all riparian areas and wet areas would be buffered from any ground-disturbing activities; and motorized use or other human recreational activity is not expected to increase. As such, the project would have no impact on bog lemming.

Determination/Summary of Effects – Northern Bog Lemming

Implementation of the proposed activities would have "No Impact" on northern bog lemming. This determination is based on the following rationale:

- Habitat for this species is very limited within the analysis area and no high quality habitat is known.
- All wet meadows, seeps, springs, bogs, and riparian areas would be buffered under Alternative 2 and no treatment would occur within these buffers.
- Alternative 2 would reduce total and open road densities.
- Alternative 2 would not promote or facilitate increased motorized or non-motorized human use.

Townsend's Big-Eared Bat (Sensitive)

A review of geologic maps and a discussion with the Lolo NF soil scientist revealed that limestone parent soils with cave-forming potential for bats are not present within the analysis area (T. Carlson, pers. com.). Further, there are no known mines or adits. The best known, high quality habitat for this species on the Lolo NF occurs on the Superior and Plains/Thomson Falls Ranger Districts.

Riparian foraging habitat for bats is available in wet meadow and riparian areas distributed throughout the analysis area. Cave and abandoned mine roosting habitat has not been documented. The analysis area provides the bat with large areas of mature and older tree size classes with high canopy cover with abundant snags (Table 17 and see Snag-Dependent Species analysis below). Based on the above, no surveys were conducted for this species in association with the proposed project and the species has not been documented within the analysis area.

Environmental Consequences – Townsend's Big-eared Bat

Alternative 1 – No Action - Direct, Indirect and Cumulative Effects

The No Action alternative would have no direct, indirect, or cumulative impacts on the Townsend's big-eared bat.

Alternative 2 – Proposed Action - Direct, Indirect, and Cumulative Effects

Because of a lack of suitable cave roosting habitat, the presence of this species is highly unlikely within the analysis area. No activities associated with this project would occur directly around any open adit, cave, or mine that would provide suitable roosting habitat. Riparian or wet meadow foraging habitat would not be impacted. All activities associated with the project would occur during daylight hours, whereas bats forage at night, therefore the potential to disturb even one foraging individual is low. Vegetation treatments would impact a small portion of the analysis area, and all treatments would maintain the largest trees in the stands while maintaining large snags and allowing for future snag recruitment; therefore snag roosting habitat would be maintained across the landscape (see MIS section below). Given the above, this project would have no impact on Townsend's big-eared bats under either of the alternatives, and no further effects analysis will be conducted.

Because the project would have no direct or indirect effect on Townsend's big eared bats, cumulative effects are not expected and will not be analyzed.

Determination/Summary of Effects – Townsend's Big-eared Bat

Implementation of the proposed activities would have "No Impact" on Townsend's big-eared bat. This determination is based on the following rationale:

- Low to no potential for disturbance.
- Cave/mine roosting habitat is limited/non-existent within the analysis area - all foraging habitat (wet meadows, seeps, springs, bogs and riparian areas) would be adequately buffered through the use of INFISH and other no harvest buffers and no treatment would occur within these buffers.
- The proposed treatments would retain adequate forest cover to maintain landscape connectivity and habitat conditions for forest-dependent species.
- No removal of commercial trees would occur in old growth, and protection of large diameter snags (> 20" dbh) is addressed in resource protection measures and prescriptions.

American Peregrine Falcon (Sensitive)

Peregrine falcons occur in low densities across the Lolo NF as breeding individuals and seasonal migrants. Active nests were found on the Lolo NF during surveys conducted in 2004 and 2005 (Sumner 2004-2005), and results indicate the species is reproducing successfully on the Lolo NF and seem to be doing well in western Montana.

There are no records of peregrines nesting in or near the analysis area. The closest peregrine nests to the analysis area are located along the Clark Fork River. Because of limited nesting habitat and no known nests occurring within the watershed, peregrine falcon management is not a noteworthy wildlife concern in this analysis.

Environmental Consequences – Peregrine Falcon

Alternatives 1 and 2 - Direct, Indirect, and Cumulative Effects

The analysis area does not support high quality cliff nesting habitat, and no nesting peregrines have been documented here. The nearest nests occur on the Clark Fork River that supports a high density of waterfowl, shorebirds, and other bird prey. The project would not impact nesting habitat or riparian foraging habitat. As such, the project would have no impact on peregrine falcons under any alternative and no further effects analysis will be conducted.

Because the project would have no direct or indirect effect on peregrine falcons, cumulative effects are not expected and will not be analyzed in detail.

Determination/Summary of Effects – Peregrine Falcon

Implementation of the proposed activities would have "No Impact" on the peregrine falcon. This determination is based on the following rationale:

- There is no known nesting or nesting habitat within or immediately adjacent to the analysis area and the area does not support high quality cliff nesting habitat.

Bald Eagle (*Haliaeetus leucocephalus*)

A recently active and productive bald eagle nest occurs at the Duff Creek/Ninemile Creek confluence on private land on the northeast boundary of the analysis area (Table 24 and displayed in mtnhp.org Tracker map in Project File); accessed December 11, 2011). The nest is closer to human dwellings than the Forest boundary. Additional foraging habitat exists in the analysis area, where eagles may forage on elk, deer, and other carrion. The analysis area does not contain winter concentrated use areas. Historic nests are also located near Interstate 90, along sections of the Clark Fork River that receives a relatively high amount of recreational use in the summer, indicating a relatively high tolerance for disturbance by the eagles that nest there.

Table 24 Bald Eagle status relative to the Rennic Stark analysis area.

Bald Eagle Activity	Nest Site w/in ¼ mile of activities (Zone I)	Primary Use area w/in ½ mile of activities (Zone II)	Foraging Habitat w/in 2-1/2 miles of known nesting activity (Zone III)	Concentrated winter use area
Known	No	No	Yes	No

Environmental Consequences - Bald Eagle

Direct and Indirect Effects Overview

The Forest Service assesses project and cumulative impacts on bald eagles by using the guidelines outlined in the Montana Bald Eagle Management Plan (1994). Management includes protecting nest sites and primary use areas from disturbance during the breeding season as well as sites where eagles concentrate to feed in winter. Typically, eagles are most sensitive to direct human disturbance during the nest building, egg-laying, and incubation periods (February 1 to May 30). Human activities in close proximity to the nest may cause abandonment of the nest by the adults, thus causing egg failure due to exposure. Once young have hatched, a breeding pair is less likely to abandon the nest. However, eagles may leave the nest due to prolonged disturbances, exposing young to predation, and adverse weather conditions. Human disturbance can temporarily displace bald eagles, causing long-term changes in habitat use, or appear to have no impact whatsoever (summarized in Hamann et al. 1999). Responses may vary by individual depending on a number of factors such as age, sex, breeding status, weather, or topography.

Alternative 1 – No Action - Direct, Indirect, and Cumulative Effects

Taking no action would have no direct or indirect effects on bald eagles; therefore, cumulative effects are not expected.

Alternative 2 – Proposed Action - Direct, Indirect, and Cumulative Effects

There are no proposed treatment units or major haul routes located within ½ mile of the Ninemile eagle nest; therefore direct and indirect impacts to eagles during the breeding season are not anticipated. Unit 13, and a portion of Units 9 and 10 are located within the 2 ½ mile foraging zone. Units 9 and 10 would be harvested in winter months; whereas Unit 13 would be treated in the dry season; all of which is outside the nesting period. The project is not expected to impact the availability of carrion and would have no impact on riparian foraging habitat. Given direct and indirect impacts are not expected; cumulative impacts are not expected and will not be analyzed in detail.

DETERMINATION/SUMMARY OF EFFECTS – BALD EAGLE

Implementing the proposed activities would have “No Impact” on bald eagles under any alternative (Montana Bald Eagle Management Plan 1994, Programmatic Biological Assessment for Activities that are Not Likely to Adversely Affect Listed Terrestrial Species, 2010) because:

- There are no proposed treatment units or major haul routes located within ½ mile of the Ninemile eagle nest.
- To reduce the potential for disturbance during the nesting period, Units 9, 10, and 13 would be treated in the winter or during the dry season (roughly July 1 to March1) unless otherwise agreed to by the Wildlife Biologist.
- The project is not expected to impact the availability of carrion and would have no impact on riparian foraging habitat.

BLACK-BACKED WOODPECKER (SENSITIVE)

There is no recently burned habitat within the analysis area, and as such, high quality black-backed woodpecker habitat is not present. Lower quality foraging habitat does exist in bark beetle-infested ponderosa pine within the analysis area. In some areas of Montana, second-growth ponderosa pine stands have experienced between 46% and 56% average stand basal area mortality during the current outbreak (Sturdevant and Egan 2011). In untreated ponderosa pine stands in the analysis area; similar results could be expected.

Recent research suggests that black-backed woodpeckers are highly dependent on burned forests and that unburned areas infested with beetles are not high quality habitat (Caton 1996; Powell 1999; Cilimburg et al. 2006). Ongoing monitoring on the Lolo NF supports this research and is providing further indication that black-backed woodpeckers prefer recent moderate-to high-intensity burns over beetle-killed stands (D. Hutto pers. com.).

Pre-fire canopy cover (>40%) and tree diameter classes (> 5” foraging; > 9” nesting) can serve as an index to the availability of post-fire snag densities. The analysis area supports about 28,892 acres of forested habitat, 24,708 of which is on NFS lands (Table 17). Table 17 (with figures in the Vegetation Specialist’s Report) shows the above-noted conditions are abundant and widely distributed in the analysis area. About 16,524 acres (57% of available forest) could provide foraging habitat post-fire; and 11,115 (3,250 >= 15 inches and 7,865 acres 10-14.9 inches) of those acres have sufficient diameters to provide nesting habitat post fire.

ENVIRONMENTAL CONSEQUENCES - BLACK-BACKED WOODPECKER

Direct and Indirect Effects Overview

Studies on the impacts of vegetation treatments on black-backed woodpecker in unburned areas are limited. Activities that promote or create nesting/foraging trees or those that remove or suppress nesting/foraging trees can have positive or negative effects on black-backed woodpeckers (i.e., Dixon and Saab 2000). A clearcut with no reserve trees is assumed to remove all potential habitats. Other types of treatments that retain snags may reduce the available habitat and subsequently the number of nesting black-backed woodpeckers, but they would not eliminate them from the area (Hejl and McFadzen 2000 and Saab and Dudley 1998).

As described above, pre-fire canopy cover (>40%) and tree diameter classes (> 5” foraging; > 9” nesting) can serve as an index to the availability of post-fire snag densities. Goggans et al. (1987) and Bonnot (2006) recommend maintaining untreated stands of mature and over-mature forest in bark beetle-infested areas to provide nesting and foraging habitat.

Limited studies of black-backed woodpecker nest densities in burned areas that had been salvage logged compared with unlogged burned areas have shown a larger number of nests in unlogged sites (4 compared with 13 in unlogged (Saab and Dudley 1998)); 16 compared with 41 in unlogged (Forristal et al. 2005). Conversely, in mountain pine beetle-infested stands, Bonnot (2006) found that greater than 50% of the nests observed were in areas where logging had occurred within the last 5 years. Productivity appears highest in burned areas.

Analysis of effects to black-backed woodpeckers took into account the following factors:

- Changes in the amount of burned area currently available to provide high quality habitat for black-backed woodpeckers.
- Changes in the amount of beetle-killed area currently available to provide low quality habitat for black-backed woodpeckers.
- Changes in the amount of forest likely to provide good habitat if a fire or severe beetle infestation were to occur in the foreseeable future.

Alternative 1- No Action - Direct, Indirect, and Cumulative Effects - Black-backed Woodpeckers

Because this alternative would not change the existing vegetative condition in the analysis area, it would have no impact on black-backed woodpeckers. Insect-infested trees would likely continue to provide limited foraging opportunities for this species. Aggressive suppression of fires would continue, and in the absence of vegetation treatments, would limit the Forest's ability to use prescribed fire in this area. For these reasons, mature, fire-killed trees would not be recruited except in the event of an uncontrolled wildfire. Because the No Action alternative would have no measurable direct or indirect effects on black-backed woodpeckers, cumulative effects will not be analyzed.

Alternative 2 – Proposed Action - Direct and Indirect Effects

The potential for direct effects to black-backed woodpeckers from vegetation treatments is low, simply because woodpecker densities are expected to be low to nonexistent in unburned forests (see above). Removal of insect-infested trees > 5" dbh in commercial treatment units could reduce some foraging opportunities (maximum 1,823 of 24,708 (7%) forested acres thinned; 153 (< 1%) regenerated). Another 463 acres (< 2% of 24,708 acres) would be hand-thinned followed by ecosystem maintenance burning. Conversely, ecosystem maintenance burning (with no hand or mechanical thinning) would occur on 4,787 acres (19% of 24,708 forested acres) concentrated in the IRA that is expected to increase foraging opportunities by providing fire-killed trees that more than offsets impacts from any tree removal (Fire and Fuels Specialist's Report).

In the long-term, treatments in the WUI are expected to reduce the risk of stand-replacing fires that would in turn reduce the potential for creating post-burn habitat in the treated stands in the long-term. However, treatments are concentrated in areas that typically received frequent non-lethal fire events. A large amount of untreated forest that evolved in stand-replacement fire regimes would remain in the analysis area (Fire and Fuels Specialist's and Vegetation Specialist's Reports) and recent post-burn habitat is abundant in adjacent areas in the Ninemile District as well as Forest-wide (discussed above and displayed in Figures 11 & 12).

Proposed ecosystem maintenance burning outside the WUI (Units 101 and 102) would occur in stands with larger pockets of lodgepole pine trees that are infested with mountain pine beetle. Burning could directly impact foraging individuals, however, the risks of impacts are low because woodpecker densities in beetle-infested areas are also expected to be low (discussed above). Conversely, burning in the same stands would create fire-killed trees that would increase the foraging potential for approximately 2 to 8 years post-fire (see above). As discussed above, recent research suggests that black-backed woodpeckers are highly dependent on burned forests and that unburned areas infested with beetles are not high quality habitat (Caton 1996; Hutto 2005; Cilimburg et al. 2006). Ongoing monitoring on the Lolo NF support this research and are providing further indication that black-backed woodpeckers prefer recent moderate- to high-intensity burns over beetle-killed stands (D. Hutto pers. com.).

At the analysis area and Forest-wide scales, impacts from the project are minor, given the amount of untreated forest that would remain (Table 17), the increased foraging potential in EMB sites, and the abundant post-burn habitat available District- and Forest-wide (discussed above).

Cumulative Effects- Black-backed Woodpecker

Past, present and reasonably foreseeable activities that impact habitat for the black-backed woodpecker include timber harvest, prescribed fire, wildfire, and to a lesser extent, fire suppression (Table 18 and accompanying text).

Past timber harvest has occurred within the analysis area using various prescriptions and logging systems. Past harvest on NFS lands pre- and post-1980 has occurred on about 3,191 acres (13% of 25,043 acres), of which a modest 982 (4% of 25,043 acres) received regeneration harvest to create young age classes for other associated species. The remaining acres were thinned using a variety of intermediate and uneven-aged techniques that retained a significant overstory component and allowed for varying degrees of tree regeneration (Table 18). All pre-1980 and many post-1980 stands now likely provide a variety of conditions for nesting and foraging.

The fires in the early 1900s likely increased the quantity and quality of habitat for the black-backed woodpecker across a large portion of the analysis area for a 5 to 8 year period (18,932 acres; Table 18). Many of these stands are now heavily stocked with 5-to 9-inch diameters trees that would provide foraging habitat should a stand-replacing event occur. The Forest has also treated about 4,692 acres with prescribed fire in the analysis area over the last decade to maintain the ecological role of fire in drier forest types (discussed above).

The proposed EMBs in the IRA should more than offset impacts from commercial treatments; therefore when added, negative cumulative impacts from Alternative 2 are not anticipated.

For many forest types in the Northern Rockies, stand-replacement fires were the common fire regime. Historic accounts suggest that black-backed woodpeckers were relatively abundant in recently burned forests (summarized in Bonn et al. 2007). In the period between 1940 through 1987, active fire suppression coupled with wet weather reduced the number of acres that burned with stand-replacing fires. Forests that actually did burn during this period were often quickly salvaged to remove wood while it still had value. This combined effect of fire suppression and salvage harvest likely reduced the acres of standing burned trees in some areas, the preferred black-backed woodpecker habitat.

The listing of black-backed woodpeckers as a sensitive species has highlighted the importance of post-burn habitat. Several studies (Caton 1996; Hutto 1995; Saab and Dudley 1998; and discussed above) have shown the close tie between these woodpeckers and burned forest. Over the last decade, salvage of burned forest on NFS lands has been limited to a small percentage of total area burned. No salvage has occurred in post-burn habitat in roadless/wilderness including the Scapegoat which burned in 2003 and 2007 and Welcome Creek, which burned in 2007. Continued treatment of fuels in the WUI will improve the Forest’s ability to employ wildland-fire use as a management tool for sustaining black-backed woodpecker habitat in the long-term.

DETERMINATION/SUMMARY OF EFFECTS - BLACK-BACKED WOODPECKER

The potential for direct effects to black-backed woodpeckers from vegetation treatments is low, simply because woodpecker densities are expected to be low to nonexistent in unburned forests (see above).

Foraging and nesting opportunities would be reduced on the following: 1,823 (7%) acres of commercial thinning; 153 (< 1%) acres of commercial regeneration; and on 476 (2%) acres of non-commercial hand thinning followed by ecosystem maintenance burning. Ecosystem maintenance burning (with no hand or mechanical thinning) on 4,787 acres (19%) in the IRA would increase foraging opportunities by providing fire-killed trees that should more than offset any other impacts.

Implementation of Alternative 2 “May Impact Individuals or Habitat” (MIIH) of this species but would not have noteworthy impacts at the population scale. The impacts would be primarily in the form of displacement during tree removal activities and would not likely result in any individual mortality. As such, the project would not increase the potential for population declines or lead toward federal listing. For a detailed discussion on black-backed woodpecker population viability see Samson 2006.

This determination is based on the following rationale:

- This project would not result in the removal of fire-killed trees and would create some fire-killed forest patches, and foraging and nesting opportunities would be increased in EMB units.
- Black-backed woodpeckers have been shown to be strongly associated with recent burns in western Montana and were detected at very low rates in insect-infested stands during surveys conducted in the summer of 2003 (Avian Science Center data).
- Regeneration harvest would be conducted on a modest 153 acres spread across several units, so the overall forested nature of the analysis area would be retained.
- Large live trees and snags greater than 21” would be retained except in rare exceptions (see previous discussion and Vegetation Specialist’s Report).
- Post-burn habitat is abundant and well-distributed near the analysis area, Forest-wide, and Region-wide, such that population viability is not an issue.

FLAMMULATED OWL (SENSITIVE)

Surveys for flammulated owls were conducted in the analysis area in 2005, 2008, and 2010 as part of the Northern Region Landbird Program and Citizens’ Science Project (Figure 15). In 2010, additional project-related surveys were conducted along FS Road 5511 and 5515 (through proposed Units 4, 5, 8-11 and 13; and along Ellis Mountain Road 380 and Ridge Road 5471 (proposed Units 80-85, 14-22 and 103). A flammulated owl was seen in a ponderosa pine tree on the Ridge Road during surveys; no vocal responses were heard at established survey points. In 2010, Citizen’s Science also conducted surveys at established points and detected owls at the two locations displayed in Figure 15. Surveys were conducted following Cilimburg (2005). Flammulated owls have been consistently detected in the analysis area. Data from 2005 and 2008 are provided in figure 15 below. The analysis area provides the owl with 11,582 acres of warm/dry ponderosa pine/Douglas-fir forest with 4,973 of those acres that meet canopy cover and dominant tree size class requirements where breeding owls are typically detected in this part of the species’ range.

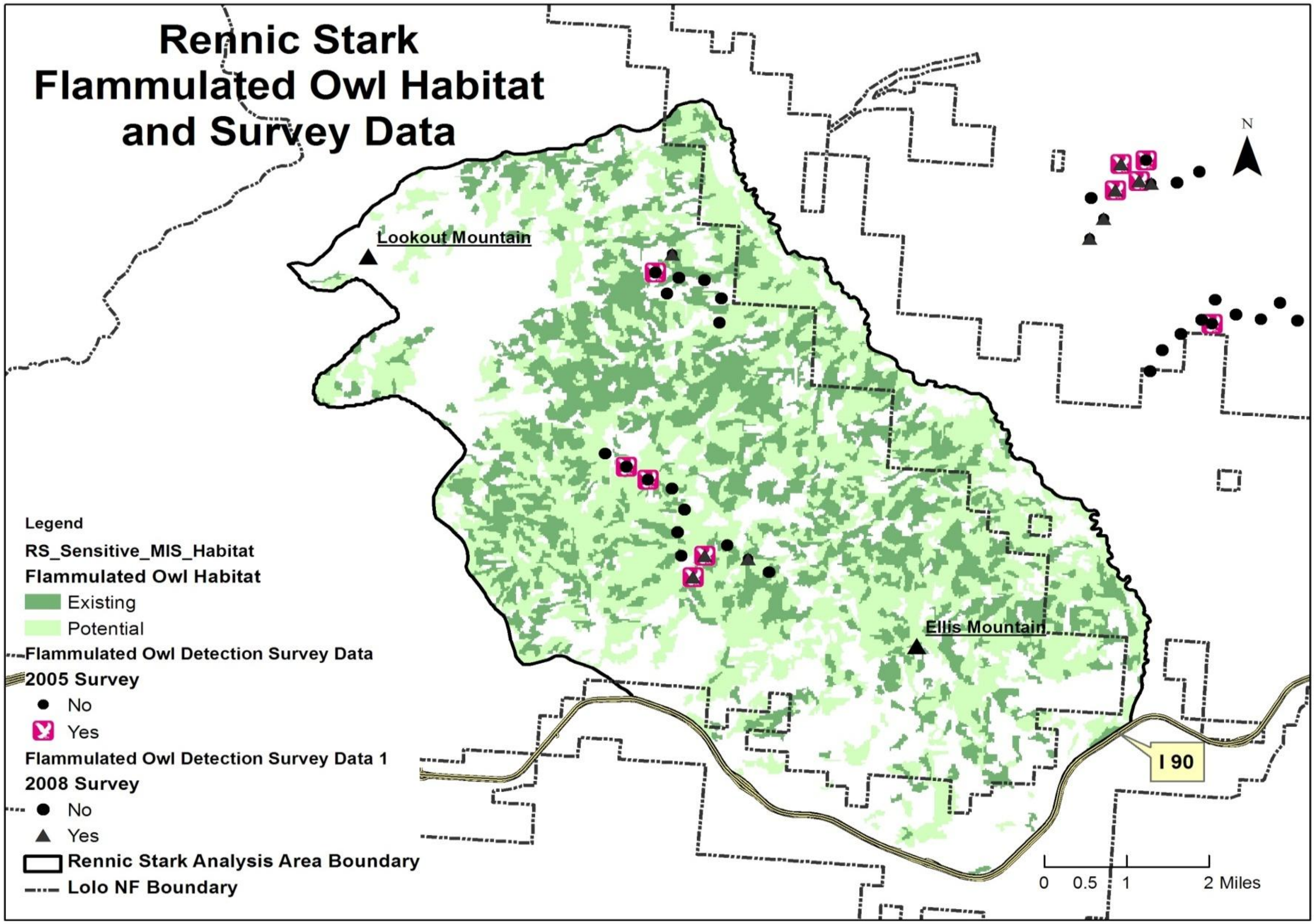


Figure 15 - Flammulated owl habitat and survey data

ENVIRONMENTAL CONSEQUENCES – FLAMMULATED OWL

Direct and Indirect Effects Overview

Conclusive studies on the direct impacts of forest management on flammulated owls are lacking. Human-related disturbances that occur during the breeding season in owl territories may disrupt courtship, thus effecting productivity (Linkhart 2001). In a number of studies of other raptor species, disturbances near occupied nests have caused adults to abandon resulting in mortality of eggs or newly-hatched young (i.e., Squires and Kennedy 2006). Flammulated owls may (or may not) be vulnerable to disturbance and displacement effects from human-related activities during the breeding season (mid-April through late July).

The effects of forest fragmentation on the owl from vegetation management are also unknown. Owls occur in association with managed and unmanaged stands throughout their range in areas that typically received frequent, low-to mid-severity fire events with naturally fragmented landscapes. It's reasonable to assume that treatments that remove suitable nesting and foraging trees resulting in stand densities and dominant tree size classes below the ranges where owls typically occurs, reduce habitat quality for the species. The effects of fire suppression or wildfire on flammulated owl are also unstudied. Given that owl productivity is higher in open forest conditions, it's reasonable to assume that an uncharacteristic increase in stand densities could also impact habitat quality (Linkhart 2001).

Alternative 1 – No Action Direct, Indirect and Cumulative Effects

Because this alternative would not change the existing vegetative condition on the project area, it would have no direct impact on flammulated owls. However, the persistence of dense understories and the continued exclusion of fires in some areas that provide flammulated owl habitat on NFS lands could reduce owl productivity over time (Linkhart 2001). Wildfire occurrence in ponderosa pine/Douglas-fir areas with extensive sapling regeneration could spread rapidly to the canopy, resulting in a crown fire that would destroy flammulated owl nesting and foraging habitat (Graham et al. 2004, and Fire and Fuels and Vegetation Specialists' Reports).

Refer to the Cumulative Effects discussion below.

Alternative 2 – Proposed Action -Direct and Indirect Effects – Flammulated Owl

Table 25 shows that proposed treatments would occur in about 1,313 of 4,973 acres (27%) of existing (nesting and foraging) flammulated owl habitat using a variety of commercial and noncommercial silviculture methods distributed across numerous units. All treatments include a form of thinning from below and/or understory burning (improvement cuts, single tree selection, commercial thin, or ecosystem maintenance burning) that are designed to reintroduce fire into the system, and promote open-forested conditions. As a result, the potential for a stand-replacing event would be reduced that would in turn aid in retaining flammulated owl habitat into the future. Treatments would remove an estimated 20 to 30% of the canopy, leaving 70 to 80% intact. All stands would retain structural components (canopy cover and large live trees and snags) consistent with where owls occur in this part of their range. Table 25 also shows treatments in potential habitat that do not currently meet the age/size class distribution, but is expected to at some time in the future. Again, treatments are designed to reintroduce fire into the system that would aid in retaining flammulated owl habitat long into the future (Vegetation and Fire and Fuels Specialist's Reports).

Table 25 Rennic Stark treatments in existing and potential flammulated owl habitat.

FLAMMULATED OWL HABITAT	TOTAL ACRES EXISTING	TREATMENT TYPE*	TOTAL ACRES (% OF available) BY TREATMENT TYPE	TOTAL TREATED ACRES (% of available)	PORTIONS OF UNIT NUMBERS AFFECTED
EXISTING	4973	COMMERCIAL TREATMENTS			
		IC	235+189		1A, 2, 5A, 5B, 6, 7, 12, 13, 14A, , 17, 18, 19, 24, 25
		STSC/LIB	10		14B
		STS	225		4, 9, 10
		STS/GS	21		11
		STSC	27		23
		STSC 2-AGE	48		1B, 8
		CT	132	887 (18%)	3, 27
NON-COMMERCIAL TREATMENTS					
		EMB	1350		101, 102
		PCT	318		80-85, 103
		PCT/EMB	57		21, 60-62
		THIN/HPB	102	426 (9%)	15, 16, 22
EXISTING TOTAL	4973			1313 (27%)	
POTENTIAL	6,609	COMMERCIAL TREATMENTS			
		IC	307		1A, 2, 5A, 5B, 6, 7, 12, 13, 14A, 17, 18, 19, 24, 25
		STSC/LIB	22		14B
		STS	201		4, 9, 10
		STS/GS	74		11
		STSC	12		23
		STSC 2-AGE	16		1B, 8
		CT	89	910 (14%)	3, 27
NON-COMMERCIAL TREATMENTS					
		EMB	1035		101, 102
		PCT	998		80-85, 103
		PCT/EMB	33		21
		THIN/HPB	221	2287 (35%)	15, 16, 22
POTENTIAL TOTAL	6,609			3197 (49%)	
TOTAL	11,582			4510 (39%)	

CT= commercial thin, EMB=ecosystem maintenance burn, HPB=handpile and burn, IC=improvement cut (commercial), PCT=precommercial thin, STSC=single tree selection (commercial)

Direct effects to flammulated owls could occur through disturbance and displacement of individuals from hand thinning and burning that may occur during the breeding season (from May 1 through August 1). The vegetation treatments, activity fuels treatments, ecosystem maintenance burning, and road work would occur over a period of 5 to 10 years so the impacts would be at a small scale disbursed over a large area at varying degrees over several breeding seasons.

Because flammulated owls are known to exhibit fidelity to nest trees, extra precautions would be taken to protect all large trees and snags (> 21 inches). Other mitigations/design standards created to protect flammulated owls and their habitat include: in commercial Units 14A, and 17 through 19 focus on retaining the largest, healthiest trees as leave trees. Any live trees >21" would be retained to the greatest extent practicable given project objectives and implementation logistics. Due to the importance of large diameter snags for flammulated owls, with the exception of snags near roads, skylines, trails, or high use recreation sites, and where public and operational safety and facility protection is necessary, all dead trees greater than or equal to 21" dbh would be retained within treatment units.

Given the resource protection measures and design standards, operations in the units where flammulated owl habitat currently exists may disturb individuals in the area and cause displacement at the beginning of courtship/mating season or post-fledging.

The removal of smaller, un-merchantable trees via hand thinning and prescribed fire, especially in units that contain large snags suitable for nesting, may alter foraging habitat for flammulated owls (Table 25). However, research suggests that dense stands likely reduce nesting and foraging potential for flammulated owls (McCallum 1994; Linkhart 2001), and thus treatments may improve or restore habitat for the owls, which evolved in areas that received frequent non-lethal fires.

Cumulative Effects – Flammulated Owl

Past, present and reasonably foreseeable activities in and adjacent to the project area that have likely reduced the quality of flammulated owl habitat are described in the text and tables in the "Analysis Area Description for Wildlife" section above, with associated data and maps in the Project File. Activities that can reduce the quality of flammulated owl habitat include timber harvest, wildfire, prescribed fire, and fire suppression.

As stated above and worth repeating here, forest fragmentation effects on flammulated owls have not been studied. While the flammulated owl is a mature and old-growth forest associate (i.e. Linkhart 2001), the drier pine forest in which it occurs is naturally open with interior edges. Timber harvest pre- and post-1980 impacted around 13% of the analysis area (Table 18). Regeneration systems occurred on a modest 982 acres that have been in various stages of re-growth for several decades and likely do not provide suitable nesting habitat. The remaining acres were thinned using a variety of intermediate and uneven-aged techniques that retained a significant overstory component and allowed for varying degrees of regeneration of trees/grasses/forbs/shrubs in the understory (Table 18). Many of these stands provide the owl with nesting and foraging opportunities today.

About 4,692 acres were prescribe burned over the last decade to maintain the ecological role of fire in drier forest types by reducing conifer encroachment, stimulating grass/forb/shrub production, and maintaining open forested conditions. Recent studies have shown positive results in restoring the vigor of older trees in dry forest types often used by flammulated owl (i.e. Sala and Calaway 2004). In fact, monitoring in the northern Rockies has consistently documented flammulated owls in selectively-logged sites (Howey and Ritcey 1987; Wright 1996; USDA-FS Dawson Ridge 2006a; and Lolo NF unpubl. data).

A large portion of the analysis area burned in the early 1990s (Table 12). Many of these stands are in various stages of regeneration, with numerous stands overstocked with small diameter trees (5 to 9" DBH). These stands may provide the owl with some roosting opportunities, but in the long-term may reduce nesting and foraging potential for the species (McCallum 1994, Linkhart 2001). Treatments in Alternative 2 would retain forested cover, while restoring some forested areas that were historically maintained by frequent, non-lethal fire events (Fire and Fuels and Vegetation Specialist's Reports).

Studies on the effects of fire and fire suppression on the species are also limited. We do know that fire suppression in drier habitats used by the owl has resulted in stand structures in some areas that are uncharacteristic of the conditions under which ponderosa pine forests evolved (i.e., Habeck 1990). Linkhart (2001) concluded the association of flammulated owl productivity to open-grown forests with larger diameter trees suggests that the species is adapted to forests that were historically maintained by fire. In Region One, Groves et al. (1997), Wright et al. (1997), Linkhart (2001) and others suggest habitat for the flammulated owl has and will decline due to fire suppression. Fire suppression permits young Douglas-fir trees to suppress the recruitment of shade-intolerant and large diameter trees important to the flammulated owl and to reduce the amount of open understory needed by the owl as foraging areas.

Projects that restore the open character of ponderosa pine and dry Douglas-fir stands will likely become more important if predictions for warmer springs and continued dry summers increase fire seasons with larger fires in the future (Running 2006; Westerling et al. 2006; Morgan et al 2008). The proposed thinning and ecosystem maintenance burning in Alternative 2 are consistent with this management approach.

A comparison of available ponderosa pine on the Lolo NF from 1938-42 to what exists today shows that ponderosa pine in all size classes has declined by about 2%, whereas Douglas-fir (a more shade-tolerant species) has increased by 12 to 14%, suggesting an overall increase in habitat for the flammulated owl (Samson 2006a). The change is attributed to the early harvest of ponderosa pine in lower elevations followed by active fire suppression (i.e., summarized in USDA-FS 2008). Despite these changes, flammulated owl habitat on the Lolo NF is relatively abundant and well distributed (discussed above and see Samson 2006a). Treatments are designed to favor ponderosa pine and would not preclude stands from developing into old growth in the future.

Determination/Summary of Effects – Flammulated Owl

Implementation of Alternative 2 "May Impact Individuals or Habitat" (MIIH) but is not likely to lead to a trend towards federal listing or loss of viability for the species. Short-term disturbance and displacement effects could occur during treatment-related activities. A modest amount of existing flammulated owl nesting/foraging habitat (8.6%) would be treated non-commercially, the majority of which would maintain owl habitat through ecosystem maintenance burning. Population level impacts are not expected due to the abundance of undisturbed habitats that would remain in the analysis area, Forest, and Region.

This determination is based on the following rationale:

- Proposed treatments include non-commercially treating a modest amount of existing flammulated owl nesting/foraging habitat (up to 8.6%), the majority of which would be maintained/restored through ecosystem maintenance burning. Treatments are designed to favor ponderosa pine and would not preclude stands from developing into old growth in the future.
- In commercial Units 14 and 17 - 19 the focus would be on retaining the largest, healthiest trees as leave trees. Any live trees >21" would be retained to extent practical given project objectives and implementation logistics. Due to the importance of large diameter snags for flammulated owls, with the exception of snags near roads, skylines, trails, or high use recreation sites, and where public and operational safety and facility protection is necessary, all dead trees greater than or equal to 21" dbh would be retained within treatment units. The project would retain stand structures in treated areas that are consistent with where breeding owls occur on the Forest.

- No even-aged regeneration harvest would occur in potential or existing flammulated owl habitat; and no old growth would be commercially treated.
- Flammulated owl habitat is abundant and widely distributed in the analysis area, Forest and Region, such that population viability is not an issue.

Boreal (Western) Toad (Sensitive)

No year-round small lakes, ponds, or standing water bodies occur within the analysis area. The nearest documented occurrence of boreal toads was in 2004, several miles north of the analysis area in suitable habitat near Sixmile Creek (http://mtnhp.org/Tracker/NHTMap.aspx, accessed December 11, 2011). Given the lack of suitable habitat and uncertainty of where seasonal pooling could occur, no surveys have been conducted in the analysis area for this species.

Environmental Consequences – Boreal Toad

Alternative 1 – No Action Direct, Indirect, and Cumulative Effects

Because this alternative would not change the existing vegetative condition in the analysis area or involve any ground-disturbing activities it would have no impact on boreal toads.

Because under the no action alternative there would be no direct or indirect effect on boreal toads, there would be no cumulative effects with this alternative.

Alternative 2 – Proposed Action – Direct, Indirect, and Cumulative Effects

Based on recent surveys conducted in Montana, it is unlikely that this species is present in the analysis area (http://mtnhp.org/Tracker/NHTMap.aspx). For this reason, the potential for impacts to individuals is not likely. In addition, following Forest Plan standards and fisheries and hydrology resource protection measures, no riparian areas or wet areas meadows would be entered with mechanized equipment, therefore this project would have no impact on reproducing boreal toads under the action alternative.

Likewise, the potential for direct impacts to toads traveling through forested habitats is also unlikely under this alternative. Given the low to no potential for direct or indirect impacts, cumulative impacts are not expected and will not be analyzed further.

Determination/Summary of Effects – Boreal Toad

Because of the lack of suitable habitat and low potential for occurrence, the project will have “No Impact” on boreal toad.

Forest Service Management Indicator Species

The Lolo NF Plan identifies the northern goshawk (mature and old growth forests), pileated woodpecker (snag/cavity habitats in mature and older forests), and elk (commonly hunted) as “Management Indicator Species” (MIS) (Forest Plan Standards #25 and 27, Lolo NF Plan, p. II-14 and Final EIS, pp. III-28 through III-29). Table 4 in the Wildlife Specialist’s Report provides a summary of management direction for MIS by Management Area. Other Forest Plan standards specific to old growth, snag/cavity, and elk habitat are detailed in each section below.

Old Growth Forest Habitat

Forest Plan Consistency for Old Growth

As discussed in the Forested Vegetation section of this EA, the Lolo NF Plan EIS established a strategy for defining and distributing old growth habitat Forest-wide (USDA-FS 1986 at II-61, IV-10). The Lolo NF was segregated into 71 drainages, and a minimum of 8% (all habitat groups combined) was allocated as old growth in most drainages where wilderness was not available. Old growth was distributed by habitat groups that range from warm dry types at lower elevations to moist types at higher elevations, recognizing the individual needs of various old growth dependent species. Management Area 21 (MA 21), representing about 2% of the Forest, was also designated in the Plan (III-104) to evenly distribute old age stands for associated wildlife Forest-wide.

Using the definition of old growth in the Lolo NF Plan (1986 at pp. VII 24-25) conservative estimates derived from FIA data collected between 1995 and 1996 show at least 14.4% of the Forest is old growth or over mature timber (Bush et al. 2003). This estimate far exceeds the 8% standard in the Lolo NF Plan. Using the Region One definition of old growth (Green et al. 1992), conservative estimates from FIA data show the Lolo NF is comprised of 9.6% old growth (90% CI 7.7 to 11.5%), slightly above the 8% standard in the Plan and far above the 2% allocated in MA21 (Bush et al. 2007).

The Lolo NF monitoring program for old growth and old growth species is detailed in the May 2008 Monitoring Paper and accompanying appendices to the paper (USDA-FS 2008b).

Alternative 2 would not commercially treat a single acre of old growth habitat as defined by Green et al. (1992) or the Lolo NF Plan (1986 at pp. VII 24-25). In addition, commercial and non-commercial treatments would not preclude stands that currently do not meet Green et al. (1992) from developing into old growth in the future (Vegetation Specialist's Report). Nesting and foraging habitat for the northern goshawk and pileated woodpecker (detailed below) would remain abundant and widespread in the analysis area, Forest- and Region.

Northern Goshawk (MIS)

Goshawk surveys were conducted in and near proposed commercial and non-commercial thinning treatment units in the summers of 2009, 2010, and 2012 using acoustical calling methods (Woodbridge and Hargis 2006) at calling stations placed every 300 meters (Project File). A silent approach by an adult goshawk occurred on two occasions near Units 8, 9, 10. Intensive nest searches in and near the units did not result in locating a nest.

Nesting habitat for goshawks was estimated using vegetation attributes collected from nest sites observed in the Northern Rocky Mountain Ecoprovince that encompasses the analysis area (Samson 2006a) using R1 VMap methods described in Brewer et al. (2007). The analysis area provides over 3,000 acres of nesting habitat for an average of 5 breeding pairs, assuming no overlap between breeding pairs and an average home range size of 5,000 acres (Reynolds et al. 1992) (Table 26, with a map display in Wildlife Specialist's Report Appendix D). Note nesting habitat far exceeds (more than triple) that recommended by Reynolds et al. (1992) who suggest maintaining180 acres per 5,000-acre home range.

Table 26 Estimated Goshawk Nesting Habitat in the Rennic Stark Analysis Area.

Total Acres FS lands only	Estimated Number of Goshawk Home Ranges *	Nesting Acres Recommended (Reynolds et al. 1992)**	Estimated Acres Existing Goshawk Nesting Habitat NFS Lands Only
25,043	5	900	3,054

*Assumes no overlap between breeding pair. 1,400 to 8,650 acres per home range reported by Reynolds et al. 1992; Hargis et al 1994; Kennedy et al. 1994; Wisdom et al. 1999; and Moser 2007. Reynold's 5,000-acre average home range size used in home range calculation.
**30 acres, 3 suitable and 3 replacement totaling 180 acres per home range from Reynolds et al.1992.

Table 27 displays the existing composition of home range foraging habitat in the analysis area by the dominant tree size class, plus herb/shrub dominant areas, sparse vegetation, and water. Wildlife Specialist's Report Appendix D provides a map display of foraging habitat with >40% canopy cover. Habitat was quantified using R1 VMap methods detailed in Brewer et al. (2007) to produce a consistently derived habitat layer with an accuracy assessment (around 70%). The table also shows Reynolds et al (1992) general recommendations for maintaining a mix of vegetation structural stages (VSS), which are analogous to dominant tree size classes. Because of the large fires of the early 1900s, the analysis area is overrepresented by trees in the 5 to 9.9" DBH size class and underrepresented by larger sized trees (see Vegetation Specialist's Report).

Table 27 Rennic Stark Analysis Area composition of home range foraging habitat all ownerships

Dominant Tree Size Class (inches dbh)	Total Acres	Percent	Acres > 5" dbh and > 40% Canopy Cover	Percent	Reynolds et al. 1992 Recommendations
>=15	4,404	12			20% (VSS 5, 6)
10 - 14.9	12,774	36			40% (VSS 4)
5 - 9.9	9,924	28			20% (VSS3)
0 - 4.9	1,790	5			10% (VSS 2)
Total Forested	28,892	81	16,524	57	50%
Acres Proposed for commercial treatments Average 30 to 60% canopy reduction			1,823	6	
Herb/Shrub	6,333	18			10% (VSS1)
SPVeg	240	<1			
Water	51	<1			
Total non-Forested	6,624	19			
Total Analysis Area	35,516				

ENVIRONMENTAL CONSEQUENCES – NORTHERN GOSHAWK

Direct and Indirect Effects Overview

The direct and indirect effects of human disturbance near nest sites, either inside or outside the breeding season, are not well-documented. At the local level, human disturbance near nests, particularly during incubation, can cause nest failure (Boal and Mannan 1994). For example, heavy equipment operation (i.e., log loading and skidding) within 330 feet of a nest has been shown to result in the adults abandoning the nest area, even with 20-day old nestlings present (Squires and Kennedy 2006). If adults abandon a nest with eggs or nestlings present, the eggs or nestlings will die from exposure, starvation, and/or predation.

In addition, recreation activities that occur near nests, such as camping, have been reported to cause nest failures (Squires and Kennedy 2006). On the other hand, Zirrer (1947 in Squires and Kennedy 2006) noted repeated re-nesting attempts by goshawks despite extreme disturbance. On the Lolo NF, a goshawk pair in the Pattee Canyon Recreation Area east of Missoula has nested adjacent to a heavily-used hiking/biking trail for the past several years. This breeding pair has attracted media attention for their repeated defensive behavior towards hikers during the nesting period, yet these birds continue to return to the area to nest year after year. In 2010 and 2012 this pairs' nest was located within the old treatment area outside of the designated buffer – they selected a nest site in the more open treatment area.

In northern Idaho, Moser and Garton (unpublished data, 2006) found timber harvest that occurred outside the breeding season in goshawk post-fledgling areas had no short-term (1 to 2 years after treatment) effects on breeding area occupancy, nest success, or productivity as long as adequate nesting habitat was available. However, because of a number of confounding factors (such as variations in weather), 1 to 2 years is not a long enough period of time to detect changes in occupancy rates relative to timber management (Reynolds et al. 2005; Woodbridge and Hargis 2006).

McGrath et al. (2003) found that goshawks in central Washington and northeastern Oregon (n = 82 nests) occurred closer to human disturbances (i.e., forest roads) compared with random sites, with productivity levels well within the ranges reported for other studies throughout the western United States. McGrath stated that human disturbance does not appear to be a factor for the northern goshawk as long as 70% of the nest area structure is maintained and timber management operations are restricted to avoid activity during breeding and fledging time periods.

Alternative 1 – No Action - Direct, Indirect, and Cumulative Effects

Because this alternative would not change the existing vegetative condition on the project area or change existing road densities it would have no impact on goshawks. It is worth mentioning that the No Action alternative would likely result in the continued aggressive suppression of fires within the project area. Further, taking no action would limit the Ninemile Ranger District's ability to use prescribed fire in this area. For these reasons, shade-tolerant species such as Douglas-fir would continue to regenerate in the forest understory. Stands would develop denser understories and shade-intolerant species would decline. In the long term, these conditions would increase the likelihood of large-scale, stand-replacing fire which would have negative impacts on goshawk habitat (see Vegetation Specialist's Report).

Alternative 2 –Proposed Action - Direct and Indirect Effects

Nesting habitat: Direct effects to goshawks could occur under this alternative through displacement of individuals during project implementation. With the exception of winter harvest proposed in Units 9 and 10, the operating period for the project is July 1 through September 10, which overlaps with the goshawk breeding season (April 15 to August 15). About 364 acres of currently unoccupied, but suitable goshawk nesting habitat bisect a portion of 22 units proposed for commercial thinning, improvement cutting, or single tree selection (Table 28).

Table 28 Rennic Stark goshawk treatments

		TREATMENT TYPE*	ACRES BY TREATMENT TYPE	TOTAL ACRES COMMERCIAL/ NON COMMERCIAL	PORTIONS OF UNIT #S AFFECTED
FORAGING	NON COMMERCIAL	PCT	19	1,401	81, 82, 83, 85
		PCT/EMB	55		21, 60-62
		THIN/HPB	75		15, 16, 22
		EMB	1,252		101, 102, 103 (high

		TREATMENT TYPE*	ACRES BY TREATMENT TYPE	TOTAL ACRES COMMERCIAL/ NON COMMERCIAL	PORTIONS OF UNIT #S AFFECTED
					beetle mortality causing loss of canopy)
	COMMERCIAL	CT	69	826	3, 27
		IC	357		1A, 2, 5A, 5B, 6, 14A, 7, 122, 13, 17-19, 24
		STS	398		1B, 4, 8-11, 23
		STSC/LIB	2		14B
NESTING AND FORAGING	NON COMMERCIAL	PCT	77	682	80, 83-85 (young stands)
		PCT/EMB	11		21, 60-62
		THIN/HPB	42		15, 16, 22
		EMB	552		101, 102, 103 (high beetle mortality)
	COMMERCIAL	CT	103	364 ACRES DISTRIBUTED ACROSS 22 UNITS	3, 27
		IC	153		1A, 2, 5A, 5B, 6, 7, 12, 13, 17, 18, 19, 24, 25
		STS	108		1B, 4, 8, 9, 10, 11, 23

CT= commercial thin, EMB=ecosystem maintenance burn, HPB=handpile and burn, IC=improvement cut (commercial), PCT=precommercial thin, STSC=single tree selection (commercial)

If an occupied nest area is located in a proposed treatment unit a minimum 40-acre no treatment buffer would be centered on the nest to completely conserve the nest area. No ground-disturbing activities would occur in a 420-acre post-fledgling area (PFA) centered on the occupied nest from April 15 (courtship and egg laying) through August 15 (30 days post-fledging when juvenile feathers become hardened and are capable of sustained flight as discussed in Brewer et al. 2007). After August 15, treatments may commence inside the PFA, but not inside the nest area.

Survey and monitoring of the area associated with the 22 proposed treatment units (Table 28) would continue in an effort to locate occupied nest sites to ensure adequate protection during project implementation. Monitoring pre- and post-harvest would follow Woodbridge and Hargis (2006).

The vegetation treatment, activity fuels treatment, ecosystem maintenance burning, and road work would occur over a period of 5 to 10 years so the impacts would be at a small scale distributed across a large area over a relatively long duration.

Indirect effects to goshawks could occur under this alternative through nesting habitat modification. Commercial thinning would occur on approximately 364 acres of estimated nesting habitat, representing a modest 12% of 3,054 acres available in the analysis area (Table 28). Canopy reductions would average from 20 to 60% (data in Project File). Stands that experience more than a 30 to 50% reduction would no longer serve as suitable nesting habitat until crowns return to pre-treatment levels, more than 10 years out (Reynolds et al. 1992; Squires and Ruggiero 1996; McGrath et al. 2003). Post-treatment 2,690 acres of nesting habitat, still nearly triple that recommended by Reynolds et al. (1997), would remain intact (Table

28). Thus impacts are minor given the abundance of nesting habitat distributed throughout the analysis area.

Foraging habitat: Table 27 above shows the composition of home range/foraging habitat in the analysis area (see Brewer et al. 2007). Commercial and non-commercial thinning and ecosystem maintenance burning would retain the upper canopy, and therefore, would not change the distribution of size classes in the analysis area, except for the regeneration harvest system proposed on a modest 153 acres. Note smaller size class stands are underrepresented in the analysis area (Table 28 above and Vegetation Specialist's Report).

Commercial treatments on 1,823 acres (from Table 28 above) are expected to cause a temporary decline in prey species abundance from the mechanical removal of trees and treatment of fuels (piling/burning/broadcast burning) until grass/forbs/shrubs/trees return to pre-treatment levels (more than 10 years out). Treatments are designed to emulate natural disturbances and effectively reintroduce fire to the landscape. As such, in the long-term goshawk foraging habitat would be maintained.

As above, these treatments would occur over a period of 5 to 10 years so the impacts would be at a small scale over a relatively long duration.

Cumulative Effects

Past activities in the project area are summarized in the "Analysis Area Description for Wildlife" section above (with detailed data and descriptions in EA, Fire and Fuels and Vegetation Specialists' Reports, and in the Project File). Activities that may impact goshawks include vegetation treatments or wildfire that remove nesting habitat or habitat for prey species.

The existing composition of nesting and foraging habitat in the analysis area (Table 27) is a product of past fire history, past timber harvest, road development (including the BPA powerline), and urban development around the periphery of the analysis area. About 982 of NFS lands were treated with a regeneration harvest (e.g., seed tree; shelterwood, or clearcut) (511 before 1980 and 471 between 1980 and 2010), representing a modest 3% of available forest (982/28,892, Tables 7 and 8). This likely resulted in removal of nesting habitat that is now in various stages of regeneration and likely provides some foraging opportunities. An additional 2,209 (8% of 28,892 forested acres) received intermediate or uneven-aged treatments that retained the canopy that are now in various stages of re-growth and continue to provide nesting and foraging opportunities. (Table 28; 828 acres + 1,381 acres).

Maintaining goshawk nesting and foraging habitat in the project area is dependent on the interaction of fire. Alternative 2 would reduce the potential for severe fire effects (Fire and Fuels Specialist's Report) that would aid in maintaining nesting and foraging habitat into the future. Proposed treatments are designed to create areas with a more vigorous, healthy, heterogeneous vegetative component adding biodiversity to the analysis area for goshawks and goshawk prey. Collectively these treatments would adjoin with previous treatments (i.e., from the Starkhorse Timber Sale) by effectively reintroducing fire into the landscape. As such the project is not expected to contribute negative cumulative impacts to goshawk, goshawk habitat, or goshawk prey.

Snag/Cavity Habitat

Forest Plan Consistency for Snag Habitat

The Forest-wide estimated average number of snags per acre with diameter at breast height (dbh) 10" and larger is 10.33 with a 90% confidence interval of 8.67 to 12.09 snags per acre (Bush et. al., 2003). Forest Plan standards call for leaving 3 to 4 snags (at least 10" dbh) per acre, depending on habitat type (1986, Appendix N).

The average number of snags per acre with dbh 20" and larger is 1.00 snags per acre with a 90% confidence interval of 0.75 to 1.27 snags per acre. Table 29 provides an estimate of snags by habitat group (with 90% confident intervals) that range in ascending order from warmer drier groups that provide habitat for flammulated owl and pileated woodpecker to cool, moist groups that provide habitat for such species as lynx and fisher. Of note Table 29 likely under-estimates snag availability given large-scale fires that have burned nearly 200,000 acres in the past 5 years (see Black-Backed Woodpecker section in Wildlife Specialist's Report).

Table 29 Forest estimates of Snags Per Acre / Diameter Group and Habitat Type Group and Associated Confidence Intervals (CI) (Bush et al. 2003).

Habitat Group	Snags Per Acre > 10"			Snags Per Acre > 20"		
	90% CI Lower Bound	Estimation of Mean	90% CI Upper Bound	90% CI Lower Bound	Estimation of Mean	90% CI Upper Bound
1	0.000	3.232	8.551	0.000	0.810	2.665
2	3.539	5.932	8.597	0.229	0.617	1.076
3	3.360	5.688	8.344	0.465	0.979	1.575
4	9.385	12.346	15.578	0.693	1.120	1.594
5	7.982	12.555	17.816	0.226	0.654	1.179
6	12.127	19.915	28.347	0.831	2.218	3.782

Alternative 2 would maintain snags (and down wood) in all commercial treatment units consistent with MA direction, Forest Plan standards, and management direction outlined in USDA-FS 2000; 2006.

Pileated Woodpecker – MIS for Snag/Cavity Habitat

Habitat conditions for pileated woodpeckers are assessed for the analysis area, which is much larger than the reported home range for the species.

Surveys for snags and pileated woodpecker use and presence were conducted during the summer/fall of 2010 (data in Project File). Individual pileated woodpecker use (i.e., large cavities, and foraging holes at the base of trees) were observed on many of the large snags in the analysis area (data and maps in Project File).

Table 30 Estimated Pileated Woodpecker Habitat in the Rennic Stark Analysis Area.

Total Acres NFS lands only	Estimated Acres Nesting and Foraging Habitat	Estimated Acres Foraging	Estimated Acres Potential (does not meet nesting/foraging habitat criteria)
25,043	3,377	9,131	6,752

Alternative 1- No Action Alternative - Direct & Indirect Effects to Pileated Woodpecker

Because this alternative would not change the existing vegetative condition on the analysis area, it would have no impact on pileated woodpeckers. However, there could be some negative indirect effects for pileated woodpeckers under this alternative. Effects would be related to the persistence of dense understories and the continued exclusion of frequent, low intensity fires in some areas. Over time, these two factors could increase the chance of a stand-replacing fire (Fire and Fuels and Vegetation Specialists' Reports) in the area which could result in the loss of old-growth habitat conditions and live and dead large diameter trees. In addition, these conditions would not allow for the regeneration of shade-intolerant species such as western larch and ponderosa pine, species highly important to the pileated woodpecker.

Cumulative Effects to Pileated Woodpecker

See discussion in Cumulative Effects section below. Also recognize that taking no action on this project and in other situations where forests have missed one or more fire return intervals due to fire suppression could be detrimental to pileated woodpeckers and other species over time.

Alternative 2 - Direct and Indirect Effects to Pileated Woodpecker

Direct effects to pileated woodpeckers could occur under this alternative through displacement of individuals during project implementation. The vegetation treatment, activity fuels treatment, ecosystem maintenance burning, and road work would occur over a period of at least 5 to 10 years so the impacts would be at a small scale over a relatively long duration. Known nesting habitat in the form of large diameter snags occurs in the analysis area so there is potential for disturbance to individuals during the nesting period.

Indirect effects to pileated woodpeckers could occur under this alternative in the form of nesting snag losses during location of skid trails and landings. This would be most pronounced on 216 acres of commercial units proposed in nesting habitat (Table 31 below). This equates to a modest 6% of 3,377 acres of suitable nesting habitat, leaving the remaining 94% intact. Conversely, prescribed burning can provide additional feeding and nesting habitat by promoting large diameter, open stands and producing new snags. During project activities, the snag management guidelines in the Forest Plan would be followed. Further, mitigation measures specify that focus would be on retaining the largest, healthiest trees as leave trees. Any live trees >21” would be retained to extent practicable given project objectives and implementation logistics. Due to the importance of large diameter snags, with the exception of snags near roads, skylines, trails, or high use recreation sites, and where public and operational safety and facility protection is necessary, all dead trees greater than or equal to 21” dbh would be retained within treatment units.

Removing commercial-sized trees that are infested with insects can also be considered an indirect impact to pileated woodpecker. However, this species is more of a generalist than other woodpeckers and does not depend heavily on bark beetles as a food source. Thus, the removal of trees infested with bark beetles should be viewed as a minor impact on pileated woodpeckers.

Table 31 Summary of proposed treatments in pileated woodpecker habitat

		TREATMENT TYPE*	ACRES BY TREATMENT TYPE	TOTAL ACRES COMMERCIAL/ NON COMMERCIAL	PORTIONS OF UNIT #S AFFECTED
NESTING AND FORAGING	NON COMMERCIAL	PCT	29	175	83-85 (young stands)
		PCT/EMB	19		21, 60-62
		THIN/HPB	30		15, 16, 22
		EMB	97		102, 103
	COMMERCIAL	CT	27	216 acres distributed across 16 units	3, 27
		IC	153		1A, 2, 5A, 5B, 6, 7, 12, 13, 17, 18, 19, 24, 25
		STS	36		1B, 4, 10, 23
FORAGING	NON COMMERCIAL	PCT	122	2,885	80-85 (young stands)
		PCT/EMB	157		21, 60-62

		TREATMENT TYPE*	ACRES BY TREATMENT TYPE	TOTAL ACRES COMMERCIAL/ NON COMMERCIAL	PORTIONS OF UNIT #S AFFECTED
		THIN/HPB	30		15, 16, 22
		EMB	2,576		101-103
	COMMERCIAL	CT	80	1,020 distributed across 25 units	3, 27
		IC	480		1A, 2, 5A, 5B, 6, 7, 14A, 12, 13, 14a, 17-19, 24, 25
		STS	423		1B, 4, 8-11, 23
		ST/LIB	37		14B
POTENTIAL	NON COMMERCIAL	PCT	67	1,340	80, 83, 84
		PCT/EMB	189		21, 60-62
		THIN/HPB	68		15, 16, 22
		EMB	1,016		101, 102, 103
	COMMERCIAL	CT	16	352 distributed across 20 units	3
		IC	117		1A, 2, 5A, 5B, 6, 14A, 7, 13, 17-18, 19, 24, 25
		STS	219		4, 8-11, 23

CT= commercial thin, EMB=ecosystem maintenance burn, HPB=handpile and burn, IC=improvement cut (commercial), PCT=precommercial thin, STSC=single tree selection (commercial)

Cumulative Effects to Pileated Woodpecker

Past, present and reasonably foreseeable activities in and adjacent to the analysis area which may impact pileated woodpecker habitat are described in the “Analysis Area Description for Wildlife” section above (with detailed data and descriptions in the EA, Fire and Fuels and Vegetation Specialists’ Reports, and in the Project File).

The existing composition of nesting and foraging habitat in the analysis area (Table 30) is a product of past fire history, past timber harvest, road development (including the BPA powerline), and urban development around the periphery of the analysis area. Prior to 1900, underburns kept most of the ponderosa pine stands in an open, park-like condition dominated by large old trees (Arno et al. 1995). Many of these stands were harvested during the early settlement because they were easily accessible at low elevations.

In total, about 982 of NFS lands in the analysis area were treated with a regeneration harvest (e.g., seed tree; shelterwood, or clearcut) (511 before 1980 and 471 between 1980 and 2010), representing a modest 3% of available forest (982/28,892, Tables 17 and 18). An additional 2,209 (8% of 28,892 forested acres) received intermediate or uneven-aged treatments (Table 18; 828 acres + 1,381 acres), and 4,692 acres have been treated with prescribed fire. These activities likely had some impacts on pileated habitat. Harvesting can remove snags, and fire suppression reduces the number of snags created across a landscape. Under current practices, habitat concerns related to pileated woodpeckers and other species are addressed well. In most cases, large high quality snags are left in units, and the prescribed burning program helps recruit new fire-scarred snags on an annual basis.

Projects that protect and recruit large diameter ponderosa pine and western larch trees/stands are beneficial for pileated woodpeckers. Alternative 2 is expected to promote long-term recruitment of mature stands with large diameter trees and snags that would benefit pileated woodpeckers. Maintaining pileated woodpecker nesting and foraging habitat in the analysis area is dependent on the interaction of fire. Alternative 2 would reduce the potential for severe fire effects (Fire and Fuels Specialist's Report) that would aid in maintaining nesting and foraging habitat into the future. Proposed treatments are designed to create areas with a more vigorous, healthy, heterogeneous vegetative component adding biodiversity to the analysis area. Collectively these treatments would adjoin with previous treatments (i.e., from the Starkhorse Timber Sale) by effectively reintroducing fire into the landscape. As such the project is not expected to contribute negative cumulative impacts to pileated woodpeckers.

ELK (MIS)

The project analysis area supports 7,555 acres of Forest Plan designated winter range, distributed across two Management Areas (MAs 18 and 23, Table 32). A map of MAs is provided in the Project File. These areas are mostly concentrated on the northern edge of the analysis area adjacent to private land. Forest Plan standards allow timber harvest as a tool to maintain and improve these winter range areas while maintaining a balance of cover and forage (50:50). Currently the analysis area offers a mosaic of conditions, with 54% of MAs 18 and 23 providing dense forested cover (> 40% to 60% canopy cover) and the remaining 46% in an open forested (25 to 40% canopy cover) or open park-like condition.

Weed infestations and treatments to reduce weeds on winter range has been ongoing in the analysis area. Spotted knapweed represents the most widespread weed in the analysis area; particularly on open south-facing slopes and along road rights-of-way (discussed above and see Weed Specialist's Report). St. Johnswort infestations occur on several road-rights-of-way and several BPA roads as well as on the south-facing slopes above the Stark Mountain Lookout Trail. Infestations of houndstongue, Canada thistle, cheatgrass, and bull thistle have also been documented along roads within the analysis area. Infestations of leafy spurge occur within the Eddy Creek Winter Range area. While most weeds that occur within the analysis area are at least somewhat responsive to herbicide treatment, there is not currently an effective herbicide or biological treatment for cheatgrass. The District has been actively treating the analysis area for weeds with special attention focused on winter range (see Recreation and Weed Specialist's Reports). Treatments include a variety of methods including application of herbicides, hand pulling, and biological control.

Table 32 Rennic Stark winter range MAs and general description with Lolo NF Plan standards and Alternative 2 treatments.

Winter Range MAs and General Description	Lolo NF Plan Standards for Wildlife	Existin g Acres	Portions of Proposed Treatment Units Affected, Alternative 2
MA 18 – below 5,000 feet, south slopes, winter range for big game, suitable for timber	Timber harvest will be employed to improve or maintain big game winter range (C.3. p. III-83). Retain as a minimum 50:50 cover:forage ratio. The majority of cover should be thermal cover, that is, trees greater than or equal to 40 feet tall with a crown density greater than or equal to 50 percent (C.7. III-84). Dead and downed trees may be salvaged as constrained by habitat needs of cavity nesting wildlife (C.21. p. III-85).	1,928	Noncommercial: 697 acres 687 EMB (Units 101-103) 10 PCT/EMB (Unit 21) Commercial: 85 47 IC (Units 18, 19,24) 38 STSC (Unit 23)
MA 23 – winter range, same as 22, except moderate visual sensitivity, suitable for timber	Timber harvest will be employed to improve or maintain big-game winter range (C.3. p. 113). Retain as a minimum a 50:50 cover:forage ratio. The majority of cover should be thermal cover, that is, trees greater than or equal to 40 feet tall with a crown density greater than or equal to 50 percent (C.6. p. 113). Dead or down trees may be salvaged as constrained by habitat needs for cavity nesting wildlife species (C.17. p. III-114).	5,645	Noncommercial: 932 acres 406 EMB (Units 101, 102) 132 PCT (Units 80, 81, 83, 84) 394 PCT/EMB (Units 60-62) Commercial: 1,449 230 CT (Units 3, 27) 470 IC (Units 1A, 2, 5A, 5B, 6, 7, 12, 13) 544 STS (Units 4, 9, 10) 98 STS/GS (Unit 11) 107 STS/2-AGE (Unit 1B, 8)
TOTAL		7,573	Noncommercial: 1,719 acres Commercial: 1,534 acres (692 acres proposed in stands with >40%cc)

CT= commercial thin, EMB=ecosystem maintenance burn, HPB=handpile and burn, IC=improvement cut (commercial), PCT=precommercial thin, STSC=single tree selection (commercial)

ELK SECURITY

Currently, the Ninemile EMU and portions of the analysis area provide elk with high security in unroaded areas, as well as in areas with seasonal and year-round road closures (Roads Analysis in Project File). MTFWP (2005) objectives for managing road densities are to maintain their current level to allow for hunter access. The main issue identified during scoping for the project was the importance of leaving forested cover adjacent to certain roads where treatments are proposed so that elk will continue to have adequate hiding cover during the hunting season. Open road densities in the analysis area during the big game rifle season are relatively low (i.e., 0.6 miles per square mile); compared with the non-hunting season when open road densities are moderate at 1.2 miles per square mile (Tables 4 & 9). Security on the north, east, and south edges of the analysis area are marginal due to private development and associated open road use, including the main Ninemile Road and the I-90 corridors that form the north, east, and south boundaries of the analysis area. The Stark Mountain IRA provides elk with large areas of unroaded summer range where forage is in decline from the absence of a large wildfire since the early 1900s, although adjacent areas north and west of the analysis area experienced large fires in 2000 (see Figure 12 in the Lynx section above).

Environmental Consequences

Direct and Indirect Effects

Winter range

In Alternative 1 (No Action) aggressive fire suppression would continue that, if effective, could continue to contribute to the downward trend in elk forage in some areas. Invasive plants would continue to be treated under the Forest weed management program (USDA-FS 2008a).

In Alternative 2 proposed ecosystem maintenance burning, precommercial, and commercial thinning; invasive plant treatments; and road decommissioning and storage are expected to maintain or improve elk forage quality and quantity on winter range in the short- and long-term (Fire and Fuels and Vegetation Specialist's Reports with internal citations omitted here). Prescribed burning on the Lolo NF in particular has been shown to increase forage production on elk winter range (Hillis and Applegate 1998).

To ensure treatments maintain a balance of elk cover and forage on winter range consistent with Forest Plan Standards, the Forest would ensure that the canopy cover post treatment will not fall below > 50% in MAs 18 and 23 in the project area which includes Units 4, 5A, 8-11, 13, 18, 23, and 24. Vegetation monitoring of canopy cover changes post-treatment would ensure treatment effectiveness.

Units 4 (281 acres), 9 (143 acres) and 10 (124 acres) contain swales with sensitive soils that need to be protected from heavy equipment; therefore, a winter harvest over frozen ground must occur (Soils Specialist's Report). Log hauling would occur via FS Roads 5511 and 5515. Some direct disturbance and displacement of individual or small groups of elk could therefore occur over one winter season. Large displacement areas with no harvest activity would be available northwest and southeast of the units and access route.

The remaining commercial treatments would occur in summer when the ground is sufficiently dry and elk have moved off of winter range areas onto steeper/higher terrain.

Active weed treatments will continue to aid in reducing/maintaining forage values.

Elk Security

The project is not expected to impact elk security in the analysis area. In Alternative 2, road decommissioning (Tables 4 & 9) would reduce walk-in hunter access; and road decommissioning and storage would limit motorized access resulting in increased security across the analysis area in the long-term. In Alternative 1 (No Action) no road treatments would occur.

In response to public and State agency comments, to provide hiding cover for elk and refugia for other wildlife, along FS Roads 5511 and 5515 and in Units 4, 5A, 8-12, 84, and 85 visual screening would be left in the form of irregular clumps of leave trees adjacent to the road or in cable corridors or thinned areas that can be seen from the road. As a general rule, to the extent practical and where it naturally occurs, visual screening on the upslope side of the road would occur in a 50-foot wide area adjacent to the road; and downslope, would occur in a 100-foot wide area. The design, amount, and composition of visual screening may vary depending on availability and topography. The Forest Biologist, Silviculturist, Fire Management Officer, and a representative from the Ninemile Working Group would be actively involved in identifying these areas.

Ground-disturbing activities would not occur during the first week of and on the weekends during the big game rifle season when public use in the area is highest, which would provide elk with displacement areas from hunter disturbance.

Cumulative Effects

Past, present and reasonably foreseeable activities in and adjacent to the analysis area which may impact elk habitat are described in the "Analysis Area Description for Wildlife" section above (with additional details in the EA, Fire and Fuels and Vegetation Specialists' Reports, and in the Project File). Activities that impact winter range and security were considered.

The existing composition of winter range and security habitat in the analysis area is a product of past fire history, past timber harvest, road development (including the BPA powerline), and urban development around the periphery of the analysis area.

Prior to 1900, underburns kept most of the winter range areas in an open, park-like condition dominated by large old trees (Arno, Scott and Hartwell 1995). Many of these stands were harvested during the early settlement because they were easily accessible at low elevations.

In total, about 982 acres of NFS lands in the analysis area were treated with a regeneration harvest (e.g., seed tree; shelterwood, or clearcut) (511 acres before 1980 and 471 between 1980 and 2010), representing a modest 3% of available forest (982/28,892 acres, Tables 7 and 8). These areas are concentrated in higher elevations that are not typically used by wintering elk. An additional 2,209 acres (8% of 28,892 forested acres) received intermediate or uneven-aged treatments (Tables 7 and 8; 828 acres + 1,381 acres) and 4,692 acres have been treated with prescribed fire. These activities likely increased forage production on winter range. The remainder of the analysis area has not received a large-scale disturbance event since the early 1900s, (although there was one small fire – 689 acres - in 2000) which has contributed to the loss of forage in some areas.

Alternative 2 would promote forage production while maintaining a proper balance of cover for elk during the winter. Proposed treatments are designed to create areas with a more vigorous, healthy, heterogeneous vegetative component adding biodiversity to the analysis area. As such this project is not expected to contribute negative cumulative impacts to wintering elk.

Existing elk security (discussed above) is expected to improve slightly, through road decommissioning and storage, with added mitigation that would provide visual screening adjacent to roads that are open during the big game hunting season. As such, the project is not expected to add negative cumulative impacts to elk security in the long-term and would improve security over time

FISHERIES

Ninemile Creek itself drains about 120,000 acres, while the Rennic Stark Analysis Area encompasses the lower half of the watershed on the west side between Fire Creek and the Clark Fork River (about 36,000 acres). A very minor amount of the proposed activities extend over the top of the divide to the headwaters of small Clark Fork River drainages – these are not discussed in detail due to their limited nature. Streamflows follow a typical snowmelt hydrograph.

Ninemile Creek is a large, low gradient tributary to the middle Clark Fork River. It is primarily a C channel type throughout its length, and therefore has a very high potential to provide spawning and rearing habitat for native fish species. Historically, Ninemile Creek was probably one of the most noteworthy recruitment sources for native salmonids to the middle Clark Fork River. Habitat degradation caused by mining, road construction, grazing, and logging, combined with introduction of non-native fish species has resulted in the stream supporting only limited populations of primarily resident westslope cutthroat trout. Most of the fluvial cutthroat appear to be hybridized. Pearlshell mussels likely existed in large quantities throughout the watershed historically. At the present time, only limited individual populations are known to occur, but sampling has been minimal. It is likely that some individuals or populations exist in the mainstem of Ninemile Creek adjacent to and downstream of proposed project activities.

Water temperatures in Ninemile Creek are relatively warm (USDA Forest Service, unpublished data). These warm temperatures, combined with habitat degradation in Ninemile Creek, likely contribute to the presence of non-native fish species. In degraded habitats, non-native fish have many competitive advantages over native species that evolved in more pristine conditions.

Most of the tributaries to Ninemile Creek within the project area are relatively small and support resident populations of westslope cutthroat trout and brook trout. Migratory westslope cutthroat spawn to varying degrees in the lower reaches of the larger streams such as Cedar, Fire, Stark, Rennic, and Cromwell Creeks. Mean elevations in the analysis area are relatively low, suggesting that summer water temperatures in tributaries may be of concern also. The baseline assessments for 6th field Hydrologic Unit Codes (HUCs) in the analysis area show all four primary habitat indicators (sediment, temperature, pools, and barriers) to be generally “Functioning at Unacceptable Risk”.

Cedar Creek is the largest and most noteworthy fisheries tributary in the analysis area. It is a moderate gradient B channel that flows through lower gradient cedar bottoms. In these reaches it naturally braids and provides diverse habitat. The stream is impacted to a minor degree by FS Road 5515, dispersed recreation, and firewood cutting. However the greatest impact is the water diversion downstream of the road which captures nearly all of the baseflow in the summer. This diversion is an impact to existing fish populations and fisheries potential in Cedar Creek and has an overall impact on its recruitment capacity to Ninemile Creek.

ENVIRONMENTAL CONSEQUENCES

Alternative 1 (No Action) - Direct, Indirect, and Cumulative Effects

No vegetation management, road work, project-associated weed spraying, or recreation facility projects would be implemented in the project area. However, ongoing projects in the Ninemile watershed, along with other Forest Service management would continue under current management direction.

The No Action alternative would miss opportunities to improve fish passage at three road crossings. These crossings are less important to native fish species compared to many areas of the Forest, but they do affect resident westslope cutthroat populations. Existing conditions for sediment, temperature, and pools would be mostly maintained since existing road systems would remain on the landscape. Periodic pulses of sediment would occur from road and crossing failures, along with chronic inputs of sediment from existing road systems. However, no additional short-term sediment impacts would occur, since no ground disturbing activities would be implemented. Firewood cutting would continue to impact localized riparian areas. Roads along streams would continue to impact stream temperatures and pool habitat. In general, there would not be a notable change over existing conditions under this alternative.

Cumulatively, Ninemile Creek would continue to support a mix of native westslope cutthroat trout and other non-native species throughout the watershed. The synergistic effects of degraded habitat within the analysis area and the remainder of the Ninemile watershed would continue to favor non-native trout in competitive interactions with cutthroat and (potentially) bull trout. Over time, it is likely that westslope cutthroat trout genetics would be further diluted through hybridization with rainbow trout in the mainstem. However, it is likely that many tributaries would continue to support genetically pure populations. The No Action alternative has little additional cumulative effect on fisheries or aquatic habitat, but the legacy of past forest management would continue to affect both. Since current road systems affect both aquatic habitat and populations, the No Action alternative would not provide improvements to meet the goals and objectives of the Forest Plan for fisheries.

Alternative 2 - Direct and Indirect Effects

Subpopulation Characteristics

Subpopulation characteristics are based on four indicators that are assessed at the Ninemile Creek watershed scale: subpopulation size, growth and survival, life history diversity and isolation, and persistence and genetic integrity. These four characteristics are largely dependent upon the cumulative influences of 19 habitat indicators grouped into the 8 categories discussed below. At the project level the most potential to positively influence fish habitat, and therefore subpopulation characteristics, is through road and barrier removals. There are roughly 29 miles of road proposed for decommissioning; all but 1.7 miles is currently grown in. Three crossings that currently affect fish movement would be replaced to provide for passage. Since these crossings are currently not complete barriers, there is no potential for loss of genetic purity by replacing them. Slight improvements to westslope cutthroat population characteristics may occur; however the magnitude of these projects is small and will not likely result in notable changes. These activities are restorative at the project and 6th field HUC scale, but in the larger context they do not warrant changing any of the four indicators.

Water Quality

Water temperature, sediment, and chemical contamination/nutrients make up the indicators for water quality. Water temperature is not expected to be impacted because of the implementation of standard RHCAs that would maintain existing stream shade. Warm summer temperatures are likely one of the main limiting factors in Ninemile Creek, and contribute to the ability of non-native trout species to out-compete native species. The main effects to water temperature are along the mainstem and in locations where past mining and roads have degraded riparian conditions. This is not a prevalent issue in the analysis area. However, irrigation withdrawal from Cedar Creek likely causes warmer than normal temperatures and this adds cumulatively to the overall problem in Ninemile Creek. From a fisheries perspective, this is one of the larger issues in the analysis area.

The hydrology assessment concludes that short-term increases in sediment from proposed road management would be approximately 6-10%, and would occur within a 5-year time frame. It also concludes that sediment reductions within the modeled 10-year time frame would be greater (up to 17%) than short-term increases and there would be more savings over time as only 2 of 11 culvert removals were accounted for as savings (i.e., longer durations equate to higher probabilities of failure and within the modeled 10 years, only 2 culverts were accounted as failing). The short-term nature of the sediment increases would not notably affect fish populations since they would not span more than one generation and they are generally of small magnitude relative to the overall sediment load. In addition, long-term reductions in sediment would allow for more natural habitat conditions to develop in streams over time, which would support native fish populations.

The final water quality indicator is chemical contamination. Weed spraying is the most likely source of contamination in the analysis area. The potential for effects from this activity would be limited since all units have standard RHCA buffers and road spraying would follow strict application procedures outlined in the Lolo NF Weed EIS (2007). In addition, the use of a low toxicity herbicide, such as Milestone, following label precautions, and following application BMPs further reduces any reason for concern.

Habitat Access

Three culverts would be replaced with structures that accommodate fish passage and 100-year flood flows. An additional 11 crossing structures would be removed – these are less important from a fish passage perspective, but would reduce risks of sediment addition and downstream habitat impacts. After the project there would still be about 75 crossings in the project area and hundreds within the cumulative effects area of the Ninemile Creek watershed. The majority of these are not notable fish connectivity issues by themselves but cumulatively they impact overall native fish populations by reducing access to habitats necessary for optimal growth and survival.

Habitat Elements

Habitat elements consist of the following six indicators: substrate embeddedness, large woody debris, pool frequency and quality, large pools, off-channel habitat, and refugia. Substrate embeddedness is a criterion similar to the sediment indicator; therefore, see the above sediment discussions.

Pool frequency and quality, large pools, and off-channel habitat are largely based on large woody debris and streambank conditions. Large woody debris would not be impacted because no harvest activities are proposed in any RHCA. Access to refugia habitats would slightly benefit from replacing three culverts to allow passage, however, refugia isn't a concern in the project area. Off-channel habitat is important in the mainstem of Ninemile Creek. The project would not affect this indicator since no activity is proposed in any RHCA.

Channel Condition and Dynamics

Wetted width/max depth ratio, streambank condition, and floodplain connectivity are three indicators that make up the channel condition and dynamics parameter. Floodplain connectivity would not be impacted because RHCAs would be implemented and no new stream or floodplain crossings are being proposed. Wetted width/max depth ratio is primarily influenced by streambank conditions. As there would be no direct disturbance to streambanks or a relevant increase in Equivalent Clearcut Areas (ECA) that would diminish bank quality, there would be no impact to channel conditions and dynamics in any of the HUCs. There would be small, site-specific benefits related to culvert upgrades and crossing removals as the new structures would meet 100-year flood requirements and streambanks would be rebuilt with the new or removed structures.

Flow/Hydrology

The flow/hydrology parameters are made up of two indicators: change in peak/base flows and drainage network increase. Changes in peak/base flows are not expected to be affected. This is due to the relatively small amount of acres that would be harvested, and ECAs would remain within the range of natural variability for the timber types. Typically, road building or road decommissioning would impact the drainage network indicator. With this project there would be a very small short-term increase in road density as temporary roads are constructed; there would be a long-term reduction in roads with road decommissioning. Neither of these are noteworthy since the amount of construction is minimal (about 1 mile) and most roads (about 94%) being decommissioned are already grown in.

Watershed Conditions

Watershed condition is made up of the following parameters: road density and location, disturbance history, riparian conservation areas, and disturbance regimes. There would be a slight change in road density, and a minor amount of decommissioning of roads along streams. However, most of these roads are already closed or grown in, so the effect – while positive – is minimal. As harvest and yarding activities are restricted to areas outside of RHCAs, there would be no impact to the other indicators.

Integration of Species and Habitat Conditions

This project would result in maintaining the four species indicators and all habitat indicators. The sediment, embeddedness, peak/base flow, drainage network, and road density and location parameter are temporarily impacted by road reconstruction and culvert removal or upgrades, but are improved by road decommissioning, installing road BMPs, road relocation, culvert removals, and culvert upgrades. See tables below for a summary of determination of effects for each specie and habitat parameter.

Cumulative Effects

Because upstream, upslope activities can affect downstream, downslope resources, the cumulative effects area for fisheries resources includes the entire Ninemile Creek watershed. Cumulative effects are made up of past, present, proposed, and reasonably foreseeable actions, regardless of landownership.

1. Natural processes and past actions account for the existing condition that we see today (see "Existing Condition", baseline discussions). Activities have varied from road building, timber harvest, weed spraying, ditch diversions, recreational fishing, ranching, farming, subdivision, and many other projects that have occurred within these drainages.

2. Present actions include road and trail maintenance, timber management, water diversions, mining, weed spraying, and recreational fishing.

3. Proposed actions are described in the direct and indirect effects section.

4. Foreseeable actions consist of continued road and trail maintenance, timber management, weed spraying, recreational fishing, and irrigation diversions.

The implementation of Alternative 2 would have no long-term (>3 year) cumulative detrimental effects to aquatic and water resources. There would be a minor improvement in habitat access and road-related cumulative effects to streams, but the magnitude of these improvements at the watershed scale would be negligible. Cumulatively, the most important issues affecting fish populations in Ninemile Creek and the Rennick Stark analysis area are poor mainstem habitat quality (lack of large complex pools), warm summer water temperatures, and non-native fish species. None of these would be addressed or affected under Alternative 2. However, slight reductions in sediment and improvements in connectivity may contribute to more favorable conditions for native westslope cutthroat and bull trout over the long-term. The improvements included in Alternative 2 when combined with past restoration activities would continue to improve watershed trends and conditions in the Ninemile Drainage.

Preliminary Biological Assessment and Evaluation Determinations

It is anticipated that this project would result in a "May Affect Not Likely to Adversely Affect" determination for bull trout consultation. Bull trout are not known to inhabit the project area, but are present in the middle Clark Fork River downstream. Due to the small scale of the proposed project, and the minor effect of the proposed activities relative to important aspects currently affecting native fish and habitat, it is unlikely that any bull trout in the middle Clark Fork would experience any change associated with proposed activities.

Table 33 USDI FWS listed species biological assessment summary of effects

Species	No Effect	May Affect, Not Likely To Adversely Affect	May Affect, Likely To Adversely Affect
1. Bull Char		X	
2. Bull Char Critical Habitat		X	

Table 34 USDI FWS jeopardy and critical habitat biological assessment summary of effects

Species	Action is Likely to Jeopardize The Continued Existence Of the Species (Y\N)	Action is Likely to Result in Destruction or Adverse Modification of Critical Habitat (Y\N)
1. Bull Char	N	N

Table 35 USFS Region 1 sensitive species biological evaluation of summary of effects

Species	No Impact	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	Will Impact Individuals or Habitat with a consequence that the Action May Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species	Beneficial Impact
1. Westslope Cutthroat Trout		X		
2. Western Pearshell Mussel		X		

HYDROLOGY

Watershed conditions vary across the project area. Some streams are in a relatively unaltered condition and are functioning at or near desired conditions. Others have dewatered sections, fragmented habitats, lack of large wood, and high road densities and roads within 100 and 300 feet of waterways leading to frequent and often undersized drainage crossings and high sediment deliveries. Ninemile, Nemote, and Cedar Creeks are listed as impaired water bodies on the State's 303(d) list. The State's Total Maximum Daily Load (TMDL) plan for Ninemile Creek was completed in 2005. All restoration work proposed in this project would help meet the TMDL plan.

Water yield is most likely near historic conditions for the streams in the analysis area and is not elevated to quantities that would negatively affect these streams.

ENVIRONMENTAL CONSEQUENCES

No Action Alternative – Direct, Indirect, and Cumulative Effects

The No Action alternative would maintain the existing condition, resulting in variable consequences to water resources dependent on the interaction of environmental factors and the current infrastructure. Fire suppression and wildfire would likely be the predominant influences. Flooding and windthrow are also possible natural influences.

Directly, indirectly, and cumulatively, the existing road system would continue in the short-term (less than 2 years) and long-term (longer than 10 years) to contribute various quantities of fine sediment to project area streams. Undersized culverts would continue to pose risks to stream stability (e.g., road fill scour, channel aggradation, and risk of failure). Tree and shrub growth would continue on infrequently used roads. Water yields in the project area would remain fairly low, unless affected by large-scale wildfire. Additional cumulative impacts are addressed in the Cumulative Effects section below.

Alternative 2 – Direct, Indirect, and Cumulative Effects

This section displays the direct, indirect, and cumulative effects related to water resource issues for the proposed actions associated with timber and fuels management as well as other opportunities for watershed improvements.

Roads

Summarizing the proposed road treatments that are most pertinent to water resources, overall road densities would be reduced, with over 30 miles of active road closure and decommissioning and about 20 miles of closure and decommissioning that do not need treatments. Consequently, this project would yield approximately 51 miles of roads that are decommissioned permanently or placed in a non-use status. Four miles have been previously decommissioned. Therefore, out of the 108 mapped NFS road miles, about 55, or 51% are taken out of service, a marked benefit to water resources.

Addressing road segments having the most impacts, 3 of 16 problematic culverts would be replaced and road decommissioning would result in approximately 11 culvert removals. For the project area (primarily Cedar Kennedy and Stark Stoney watersheds), Table 36 below reflects that about 1 mile of road that is immediately adjacent (100 feet or less) would be removed, and another ½ mile would be reduced within 300 feet.

Table 36 Proposed road changes within 100 and 300 feet of streams.

		Road miles within 100 feet of streams			Road miles within 300 feet of streams		
Watershed HUC	**Total Stream Miles**	**No Action**	**Alt 2**	**Proposed Change**	**No Action**	**Alt 2**	**Proposed Change**
Mountain Composite*	41.32	3.87	3.83	na	10.85	10.82	na
Cedar Kennedy Composite	36.78	2.56	2.51	0.1	7.39	7.03	0.4
Stark Stoney	38.74	5.56	4.69	0.9	13.55	12.46	1.1
Nemote*	62.82	7.80	7.80	na	19.98	19.98	na

* Mountain Composite and Nemote watersheds are included for cumulative effects purposes. The project area encompasses primarily the headwaters of these drainages and no road management is proposed.

SEDIMENT DELIVERY ASSESSMENT

The sediment delivery assessment involves models to generate sediment loads for relative comparisons. True sediment loads can vary substantively depending on the specific site, stream, and climate conditions. In reality, the current year's true values could be zero for dry years or much greater than average if an abnormally wet year is experienced. If culvert or road failures occur, modeled results are typically orders of magnitude less than the actual sediment delivered.

Timber and Fuels Management Operations

Results of the sediment assessment indicate that with the implementation of INFISH buffers and minimal ground disturbance from machinery sediment delivery risk from the harvest units is not a concern. Modeling results indicate that most of the proposed vegetation management activities causing ground disturbance occur at distances from water resources with little to no probability of sediment delivery. This is also supported by current research (Litschert and MacDonald 2009). Because of the low intensities, timing, and methodologies of prescribed fire operations, burning operations would also have minimal to no effect, and the risk of very high erosion and sediment delivery associated with some wildfire scenarios would be reduced. Refer to the Soils Specialist's Report for additional discussion.

Roads

Roads generate sediment from several sources: road surface, flow concentration and rilling, influences on bank erosion, and episodic failures (of stream capture, fill slope scour, or road-crossing failures). Forest rilling and bank erosion contributions are not of concern, except where noted at site-specific locations. The proposed actions would cause road surface derived sediment to temporarily increase in the short-term (i.e., 2 to 5 years depending on the activity), but the total sediment delivered decreases approximately 10% within a 10-year modeled duration (Table 37). Table 37 also displays short-term sediment deliveries from the culvert removals and replacements (5 tons each- one year) to long-term sediment delivery reductions (270 tons each at 10% probabilistic failure). Although the project and cumulative effects area has at least 90 culverts of which at least 50% are undersized, three would be replaced as part of this project. Using a 10% failure probability, Table 37 displays the risk of the 91 culverts for the No Action

Alternative. Also displayed are the "savings" of the proposed actions of removing 11 culvert crossings (included as part of the proposed road storage and decommissioning) and replacing 3 high-priority culverts, as well as the short-term sediment deliveries associated with implementation.

In addition, stream surveys indicate that sediment introductions from bank erosion occur generally only where scour and local stream incision is chronically elevating deliveries. These situations are difficult to quantify in annual delivery, but continue to chronically increase sediment deliveries. Removing and replacing culverts would remedy this situation and further decrease sediment deliveries, as well as lead to other instream, adjacent stream bank, and riparian improvements.

Table 37 Modeled 10-year sediment budget for all road-related activities (in tons).**

Alternative	All Roads (Existing Condition)	All Roads (5 years with haul and BMPs applied)	All Roads (New Construction)	All Roads (Decommissioning/ Storage – 1year)	All Roads (Post activity – 4 yrs)	Culvert Replacements/ Removals (short-term)	Total 10 Year Modeled Sediment (Road Surface)	Modeled Short-Term Increase *	<Culvert Failure Potential Sediment Savings>	Modeled Long-term Net Reductio (10 years)***
No Action	1952	-	-	-	-	-	1952	-	<2430>	-
Alt 2	-	819	<1	215	710	<70>	1744	6-10%	<540>	11-17%

*Short-term annual impacts vary by activity, but include activities for the first six years (5 years haul and BMPs; one year road decommissioning; 4 years post project activity).
**Road surface only, except where noted with "<x>" for culvert activities
***Modeled sediment for potential culvert replacements and failure are not absolutely comparable to road surface values. Ranges account for differences in models and uncertainty and sediment contributions from road surface erosion, crossing failures, and bank erosion. The first value in the range represents the modeled values for road surface erosion. The higher value reflects the probabilistic savings from culvert replacements and removals.

In summary, short-term sediment from proposed road management would increase by approximately 6-10% of existing values, but would occur within a 5-year timeframe. Sediment reductions within the modeled 10-year timeframe would be greater (up to 17%) than short-term increases and there would be more savings over time as only 2 of 11 culvert removals were accounted for as savings (i.e., longer durations equate to higher probabilities of failure and within the modeled 10 years, only 2 culverts were accounted as failing).

Water Yield Assessment

Proposed road, timber harvest, and fuel treatment activities are not expected to have detrimental effects on water yields in the analysis area. Using a midpoint of the range of historic open area conditions, up to about 30% of the analysis area may have very likely existed as an Equivalent Clearcut Area (ECA) as defined in this assessment. Total projected ECA values are well within the range of historic stand values.

Table 38 Total Project ECA Values – Alternative 2

Watershed	Existing ECA	Change From Existing	Total
Mountain Composite	2.8	16.2	19.0
Stark-Stony Composite	5.5	4.9	10.4
Cedar – Kennedy Composite	2.9	3.9	6.8
Nemote	10.4	0	10.4

Stream stability issues observed in the project area were primarily related to road, crossing, and diversion influences and channel alteration from water yields is not expected. Alternative 2 would meet Forest Plan standards and regulatory requirements because all the ECA levels are well within historic averages and references for water yield concerns.

Directly, indirectly, and cumulatively, Alternative 2 involves short-term sediment delivery from road work, including BMP upgrades, haul, construction, road decommissioning, and culvert removals/replacements; however, long-term benefits to soil productivity, vegetation growth, and stream functions would substantively outweigh short-term effects.

Stream Habitat

Stream reconnaissance efforts generally found stream habitat in good condition, except at specific locations, stream segments, or tributaries with road, ditch, or historic timber harvest in the stream bottoms.   For values on these indicators, please reference the Fisheries Specialist's Report.

Cumulative Effects

Cumulative impacts result when the effects of proposed actions are added to or interact with other effects from past, present, or reasonably foreseeable actions in a watershed. Cumulative effects are considered for the project tributaries and are addressed relative to effects to Ninemile Creek or the Clark Fork River as appropriate. Effects to Ninemile Creek and the Clark Fork River are best accounted qualitatively in assessing trends. Accurate quantifications of impacts are not realistic because of numerous factors contributing to mainstem conditions and the relative size differences between mainstem and tributary systems.

Table 39 Cumulative Effects Summary Table.

Action	Contribution and Possible Trend
Wildfire	Wildfire will continue to influence the landscape and stream conditions. The 2000 wildfire complex largely did not influence this area. Water yields are currently less than historic averages. Future wildfire may occur and impact the drainages to varying degrees. Although some conditions may lead to short-term increases in sediment delivery and water yields, wildfire is generally a desired event that positively influences water resources.
Flooding	Flooding is common to natural stream systems and can vary in degree of magnitude based on natural variations in climatic and terrestrial processes. Flooding impacts are more apparent with larger road systems, especially where road-stream crossings are undersized or where roads closely parallel stream segments. This project incrementally improves conditions, but more improvements are necessary to further minimize risks from infrastructure.
Climate Change and Warming Trends	Changes in hydrologic processes of precipitation quantities and timing are expected as a result of noted warming trends. The most favorable project actions are those that work towards allowing natural processes to occur with limited influence by human infrastructure. Proposed actions would not lead to any negative influences and positive influences are expected, although difficult to quantify. Culvert removals and replacements, reducing sediment deliveries, and improving stream habitat all work towards improving watershed resiliency, which are improvements relative to reducing the impacts of global and regional climate changes.
Wildland Fire Suppression	Wildland fire suppression has likely affected water resources by decreasing natural water yields. However, this is not currently negatively affecting water resources. Continued suppression could result in higher intensity wildfire, although most wildfires burn in a combination of low to high burn severities and as such provide long-term positive benefits to water resources. Proposed vegetation treatments should reduce the wildfire intensity in treatment areas and offset the effects of past suppression to some extent.
Timber Harvest	Past harvest has most likely influenced water yield, but streams do not indicate impacts. Water yield effects from the proposed project are within natural ranges. Additional timber harvest could be proposed in the future with little to no impacts on water yields. Tree recruitment to streams has been reduced in areas with existing close-proximity roads. Except for illegal firewood cutting within 150 feet of streams, future Forest trends are for increased tree recruitment as natural recovery and tree growth occurs in previously disturbed riparian areas. INFISH buffers ensure that riparian habitat conservation areas will be protected during future Forest management activities.
Precommercial Thinning	Precommercial thinning has occurred in the analysis area in the past as well as currently. This activity only benefits watershed conditions as stands are managed closer to natural historic averages.
Prescribed Burning	Prescribed burning has occurred in the analysis area and is proposed. By potentially reducing the wildfire intensity in treatment areas, the effects to water resources could be potential reductions in sediment loading. This is a desired activity.
Road Construction, Maintenance, and Improvements	In the past, road construction has influenced water resources, as described previously. Positive effects, primarily reductions in sediment loading, to water resources are anticipated from proposed activities because road maintenance routes runoff off of roads and away from water resources. Long-term improvements would continue to occur as road improvements, such as BMPs, culvert upgrades, storage, and/or decommissioning are implemented in the project area.
Dispersed Recreation	There are a few dispersed camp sites within the analysis area. These areas see localized removal of trees and road sediment introductions, but effects are negligible. This use will continue and likely increase in the future and may require active management to protect forest resources.
Firewood/Misc. Product Gathering	Firewood gathering has occurred and will continue to occur in the future. Effects are minor and localized.
Mining	Although mining has occurred frequently in the Ninemile basin with substantive negative influences on the stream system, mining activity is not common in these watersheds, as the sought after minerals are not prevalent.

Soils

Existing Condition - Summary of Project Area Current Soil Conditions and Limitations

Legacy soil disturbance, disturbance that occurred as a result of past activities and natural disturbance, forms the foundation of the soil conditions on the landscape today. All proposed activity areas (units) currently meet the R1 Soil Quality Standards. Project area land and soil types are suited to the proposed actions.

Six activity units, or portions of units, have been identified as having potential biological, chemical, or physical soil limitations related to existing conditions and the proposed actions: Units 4, 5b, 9, 10, 15, and 16. Review of all other activity units has found few harvest and fuel related soil resource limitations. Soil limitations and recommendations have been taken into account and where needed site-specific resource protection measures would be implemented. All limitations and soil recommendations have been discussed with the project silviculturist, logging system specialist, and fuels planner. In addition a Soils Rehabilitation Plan has been prepared and is included as Appendix G of this EA.

Environmental Consequences

Alternative 1 - Summary of Effects

Alternative 1 meets the Lolo NF Forest Plan, the R1 Soil Quality Standards, and the National Forest Management Act for the management of soil resources. No soil disturbance would occur because of land management actions. Soil productivity would be unchanged.

Alternative 1 would not add direct, indirect, or cumulative soil effects. No additional detrimental soil effects would be realized since ground-based harvest and fuel treatments would not occur. However the benefits of re-introducing landscape level ecosystem management burns and decommissioning roads would be forgone. See Appendix F for existing soil conditions by treatment unit.

Alternative 2 - Summary of Effects

Field review was conducted to identify sensitive soils. Site-specific resource protection measures have been applied to these sites and the Forest Soil Scientist has been and would continue to be involved with layout, contract preparation, and project implementation.

Lolo NF monitoring as well as monitoring conducted on other national forests in western Montana indicates that soil disturbance from vegetation management activities is not irreversible; there is improvement of soil function over time.

Alternative 2 includes resource protection measures that would allow for soil development, forest floor rebuilding, and increasing soil organic matter over time. This alternative would meet the Lolo NF Forest Plan, the R1 Soil Quality Standards, and the National Forest Management Act for the management of soil resources. These findings are based on the assessment of the activities using the R1 Soil Quality Standards and consideration of soil functional attributes including forest floor depth and groundcover, coarse wood, and soil potential for recovery. The analysis uses the best available science to support findings for soil functional attributes. Soil disturbance would occur however soil resiliency and soil recovery would be present in the units and across the landscape.

Implementation of this alternative would result in direct, indirect, and cumulative soil resource effects; proposed disturbance would overlap in time and space with the existing soil conditions. Detrimental Soil Disturbance is expected at landings, on primary skid trails near the landings, at trail or skyline corridor convergence points, and along temporary roads. Adaptive management is included in Alternative 2 to assure maintenance of soil resources. See Appendix F for existing and expected post-implementation soil conditions by treatment unit.

Limited and localized soil productivity changes would be expected because of equipment disturbance to the forest floor. This disturbance is expected to be limited to main skid trails adjacent to landings, skyline corridors, large landings, and temporary roads. The activity areas would be expected to maintain forest floor across greater than 85% of the area.

Erosion would be negligible and site-specific mitigations would be implemented to limit the equipment footprint. Soil, forest floor, and groundcover disturbance, especially detrimental soil disturbance would be limited to less than 15% of the activity area. No landslide or mass wasting is expected.

Large wood, a combination of standing and down, would remain on site at levels specified in the Lolo NF Coarse Woody Guideline and Graham et al. (1994).

The benefit of mixed severity landscape level fire is provided. Prescribed fire and wildfire potential appears to be the most likely on-going and reasonably foreseeable actions that would overlap in time and space and produce additional cumulative effects on the soil resources.

Opportunities to close or decommission roads as well as perform rehabilitation work associated with old landings and at recreation sites are included in Alternative 2.

Noxious Weeds

Spotted Knapweed is the most widespread weed within the analysis area, particularly on open south-facing slopes and along road right-of-ways. St. Johnswort infestations occur on several road right-of-ways including Ellis Road (#380), Road 5510 and several Bonneville Power Administration (BPA) roads. St. Johnswort also occurs on the south-facing slopes above the Stark Mountain Lookout Trail and has likely spread to other open areas. Infestations of Houndstongue, Canada Thistle, Cheatgrass and Bull Thistle have also been documented along roads within the analysis area. Infestations of leafy spurge occur within the Eddy Creek Winter Range area. The BPA power line runs through the analysis area and several BPA roads access the towers. The power line right-of-way and access roads are infested with Spotted Knapweed and St. Johnswort and act as vectors for weed spread. In addition, there are permitted special-use sites such as electronic sites within the analysis area and roads that access those sites. Spotted Knapweed is prevalent at those sites and along the access roads. An isolated infestation of Diffuse Knapweed was treated at one site.

Direct and Indirect Effects Common to Both Alternatives

Established weed populations along right-of-ways and on NFS lands may provide a source of seeds for infestation. Effects associated with weed population enlargement may include declines in the palatability or abundance of wildlife and forage (Rice et al., 1997), declines in native plant diversity (Forcella and Harvey, 1983; Tyser and Key, 1988), reductions in the aesthetic value of the landscape, encroachment upon rare plant populations and their habitats, potential reductions in soil stability and subsequent increases in erosion (Lacey et. al, 1989), and an overall decline of ecosystem health. The potential for the spread of existing noxious weeds and the introduction of new species exists for both alternatives. The potential for weed spread would be less with the No Action Alternative than for Alternative 2, but existing populations may continue to spread due to seed transport by vehicular traffic, wildlife, and other natural dispersal methods.

Alternative 1 - No Action - Direct and Indirect Effects

Under this alternative on-going noxious weed management activities would continue as funding allowed, but no additional weed management activities would occur. The possibility of new weed species becoming established, and expansion of existing infestations, would remain at its current level since there would be no additional ground disturbance or canopy opening associated with road construction or decommissioning, timber harvest, or prescribed burning. The District would continue with its current weed treatment schedule.

Lack of additional weed control in the no action alternative in those areas not already covered by existing analyses could allow weeds to spread within the analysis area and to adjacent land ownerships. This alternative would result in negative impacts to native plant populations, recreation, soil and water, and other forest resources. However, these impacts would be less than under Alternative 2 due to the absence of canopy opening, ground disturbance, introduction of logging equipment, and prescribed burning. While the short-term impacts of Alternative 2 might be greater than taking no action, because the disturbed areas would be treated, there should be fewer weeds in the long term.

Cumulative Effects

Past activities such as timber harvest, road and trail construction, and recreational use likely resulted in the introduction of weeds into the area. Current and reasonably foreseeable activities within the project area include firewood collection, recreational use of roads and trails, road maintenance, and fire suppression. These activities could result in creating new disturbed sites available for colonization by weeds, and they do offer the possibility of introduction of new weed species.

If vegetation treatments are not completed and, as a result, more large-scale and severe wildfires cause an overall increase in ground disturbance, increased light through reduced canopy, and use of heavy equipment in firefighting, weed infestations would expand and new invaders may be more likely to become established.

Alternative 2 - Direct and Indirect Effects

In general, reducing canopy cover would result in loss of shade to the forest floor and would likely increase dry habitat more suitable for weeds leading to expansion of weed infestations. Vegetative treatments that increase openings, especially along roads, may increase the likelihood of unauthorized ATV access. These unauthorized routes act as vectors for weed spread and may increase the likelihood of new invaders becoming established.

Using heavy equipment for vegetative treatments, trailhead reconstruction, and road reconstruction and decommissioning would increase the likelihood that weed seed would be introduced into the project area. Ground disturbance caused by heavy equipment creates conditions susceptible to weed invasion and could result in expansion of existing infestations and introduction of new invaders. Road decommissioning may also inhibit access for future weed treatments. However, road decommissioning would reduce motorized travel along those routes and would likely reduce weed spread.

While Alternative 2 would tend to result in conditions conducive to expansion of weed infestations and introduction of new invaders, proposed herbicide treatments would control or contain existing noxious weed infestations and prevent establishment of new weeds in the short term. Existing weed management tools (e.g., educational practices, biological control agents, and mechanical control) would also be used to reduce the likelihood of new weed species becoming established and expansion of existing noxious weed populations especially in high priority areas.

Cumulative Effects

Current infestations of noxious weeds are a result of past (before weed control efforts were in place) and current activities in this area. In addition to the proposed activities, ongoing and future activities such as firewood collection, recreation, road maintenance, and fire suppression would occur in the project area. Any ground disturbance associated with these activities may result in the creation of new habitat for noxious weeds. These activities could result in increases of disturbed sites available for colonization by weeds, and new species of weeds could be introduced to the area. While resource protection measures would limit the spread of weed seed and establishment of new populations, they are not expected to entirely halt such spread.

If an overall reduction in canopy cover is maintained over time, weed infestations would likely increase throughout openings especially in areas that are not identified as high priorities for treatment in Forest Plan Amendment 11 and that are not cleared for treatment through this analysis.

However, Alternative 2 would expand the area and roads where we are currently cleared to treat weeds with herbicide. This would give us greater flexibility in the future to respond to new weed species that may become established and to contain existing weed populations within those areas. This would reduce the possibility of spread within the project area and onto adjacent lands.

If treatments create a mosaic pattern across the landscape with varying degrees of canopy cover, the probability of severe wildfires would be reduced. This would check the spread of weed infestations in comparison with the disturbance caused by a large-scale severe wildfire which would likely cause a large-scale weed infestation across the burned area.

HERITAGE

ENVIRONMENTAL CONSEQUENCES

Effects Common to All Alternatives

The Ninemile historic mining district covers most of the analysis area; however there are no mining related sites within the Rennic Stark boundary. There are no historic properties whatsoever located within the analysis area boundary.

Direct and Indirect Effects: There would be no direct effects to cultural resources or historic properties. Indirect effects, although not expected, could be caused due to increased accessibility to the area. Sites 24MO0047, 24MO0048, 24MO0049, 24MO0108 are not located in project units, however the Lolo NF Heritage Program would continue to inspect the sites as per Section 110 of the National Historic Preservation Act and agency policy (FSM 2364.31) and would provide site locations to Forest Service project managers so that inadvertent disturbance does not occur. Avoidance measures would be in place for 24MO0276, the culturally modified tree (CMT) located along the Ninemile Divide, within EMB Unit 102.

Cumulative Effects: There are no foreseeable projects as a result of the Rennic Stark project that could cause cumulative effects to cultural resources or historic properties in the project area.

RECREATION

The analysis area is located along the Ninemile Divide close to populated areas in the Ninemile and Sixmile Valleys as well as Alberton and populated areas of Petty Creek. Three non-motorized system trails are either completely or partially within analysis area: Stark Mountain Trail (#58), a portion of the Ninemile Divide Trail (#51), and the West Mountain Creek Trail (#50.) The Cedar Creek Trailhead is located within the analysis area and allows recreationists to access the analysis area from the northeast via the Stark Mountain Trail. Capacity at the trailhead is currently about 3-5 vehicles and there is parking for one truck and trailer. From Rennick-Cedar Creek Road (#5515), the trail climbs 4.5 miles to the Stark Mountain Lookout. The trailhead currently has a trail sign and several pullouts for parking. The Ninemile Divide Trail (#51) runs along the divide between the Ninemile and Clark Fork valleys and provides spectacular views of the surrounding mountains. This trail receives limited use by hunters. The West Mountain Creek Trail (#50) is classified as an “historic” trail and is not maintained although it is retained on the system. This trail receives limited use from people visiting Stark Mountain Lookout and from hunters.

Visitor information data was collected on the Lolo NF through the National Visitor Use Monitoring (NVUM) program during 2006. Forest-wide results indicate that the Lolo NF received over 1.4 million National Forest visits. Main activities were primarily focused on dispersed recreation including hiking/walking (45% participation), relaxing (7.1%), hunting (6.4%), snowmobiling (5.5%) and viewing natural features (5.2%). Most surveyed visitors were from Missoula County (84%) and lived 25 miles or less from the Forest. Most visits to the Lolo NF were of short duration lasting only two hours.

Within the analysis area, Forest Service system roads and trails provide access for dispersed recreation activities which primarily include hiking, hunting, horseback riding, driving for pleasure, and viewing natural features. The main roads used by recreationists include West Rennick Creek Road (#5511), Rennick Cedar Creek Road (#5515) and Ellis Mountain Road (#380). The Stark Mountain Lookout, which is staffed during the summer months, is a popular destination for Forest visitors driving up from the east side of the Ninemile Divide. The area is also used by the public for firewood cutting. There is little snowmobile use in the analysis area.

Law enforcement issues in the area include a history of individuals breaking open gates and breaking locks in order to access closed roads. Unauthorized off-highway vehicle (OHV) use has also been an historic problem resulting in resource damage as well as conflicts between Forest users. Conflicts between private land owners bordering the NF and NF users who may be trespassing or impacting private landowners has also been an issue in the analysis area.

Environmental Consequences

Alternative 1 – No Action

Table 40 Alternative 1 Environmental Consequences

Recreation Activity or Facility	Direct and Indirect Impacts	Cumulative Effects
Hiking/walking	No effects	If no treatment results in larger wildfires across the analysis area, trails and scenic values could be negatively impacted in the short term.
Hunting	No effects	Hunting opportunity may decrease as the forest canopy closes in the short term. However, wildfire and beetle kill may eventually provide openings that could improve hunting opportunities.
Horseback riding	No effects	If no treatment results in larger wildfires across the analysis area, trails and scenic values could be negatively impacted in the short term.
Driving for Pleasure	No effects	If no treatment results in larger wildfires across the analysis area, scenic values could be negatively impacted in the short term.
Viewing Natural Features	No effects	If no treatment results in larger wildfires across the analysis area, scenic values could be negatively impacted at least in the short term. If severe wildfires burn through ponderosa pine and ponderosa pine and Douglas-fir communities where fire has been excluded, these communities could be replaced decreasing scenic diversity in the area.
Visitor Management/Law Enforcement	No effects	No effects

Table 41 Alternative 2 Environmental Consequences

Recreation Activity or Facility	Direct and Indirect Impacts	Cumulative Effects
Hiking/walking	Contract operations and related road closures may negatively impact hiking opportunities in the short term due to noise and inconvenience. Re-graveling and reconstructing the Cedar Creek Trailhead would improve the recreational experience of hikers by giving them a level place to park and turn around. Trailhead improvements would not increase capacity but would improve drainage and condition of the trailhead.	Treatments resulting in a more varied landscape could enhance recreation by allowing visitors to experience a variety of vegetative communities and a diversity of wildlife. Treatments that reduce the threat of severe wildfire in a vegetative community adapted to frequent fires (e.g., ponderosa pine) would enhance recreational experiences by preserving areas that many visitors value. Road decommissioning may negatively impact access for hiking although it would be implemented such that it would not preclude foot and stock travel on several roads that were identified during

Recreation Activity or Facility	Direct and Indirect Impacts	Cumulative Effects
		scoping as being frequently used for recreation.
Hunting	Disturbance to wildlife from contract operations may negatively impact hunting opportunities in the short term. The proposed treatments would improve hunting opportunities by reducing tree density and improving sight distance in some areas. Long-term benefits would include improved wildlife habitat and forage production as a result of reducing canopy cover and creating openings. Re-graveling and reconstructing the Cedar Creek Trailhead would improve the recreational experience of hunters by giving them a level place to park and turn around. Trailhead improvements would not increase capacity but would improve drainage and the condition of the trailhead.	Treatments that result in more varied vegetative communities may improve habitat for game species and increase hunting opportunities in the long term. Road decommissioning may negatively impact motorized access for hunting; however, it would be implemented on several roads such that it would not preclude foot and stock travel. It may have a positive impact on game populations.
Horseback riding	Contract operations and related road closures may negatively impact riding opportunities in the short term due to noise and inconvenience. Re-graveling and reconstructing the Cedar Creek Trailhead would improve the recreational experience of horseback riders by giving them a level place to park and turn trailers around. Trailhead improvements would not increase capacity but would improve drainage and the condition of the trailhead.	Treatments resulting in a more varied landscape could enhance recreation by allowing visitors to experience a variety of vegetative communities and a diversity of wildlife. Treatments that reduce the threat of severe wildfire in a vegetative community adapted to frequent fires (e.g., ponderosa pine) would enhance recreational experiences by preserving areas that many visitors value. Road decommissioning may negatively impact access for horseback riding although it would be implemented such that it would not preclude foot and stock travel on several roads that were identified during scoping as being frequently used for recreation.
Driving for Pleasure	Contract operations and related road closures may negatively impact driving opportunities in the short term.	Treatments resulting in a more varied landscape could enhance recreation by allowing visitors to experience a variety of vegetative communities and a diversity of wildlife. Treatments that reduce the threat of severe wildfire in a vegetative community adapted to frequent fires (e.g., ponderosa pine) would enhance recreational experiences by preserving areas that many visitors value.
Viewing Natural Features	Contract operations and related road closures may have a negative impact on viewing natural features in the short term.	Treatments resulting in a more varied landscape could enhance recreation by allowing visitors to experience a variety of vegetative communities and a diversity of wildlife. Treatments that reduce the threat of severe wildfire in a vegetative community adapted to frequent fires (e.g., ponderosa pine) would enhance recreational experiences by preserving areas that many visitors value. Treatments that reduce density of vegetation would open up some vistas for viewing scenery.

Recreation Activity or Facility	Direct and Indirect Impacts	Cumulative Effects
Firewood cutting	Contract operations and related road closures may negatively impact access for firewood cutting in the short term. Available firewood may be reduced due to vegetative treatment in units but the impact would be minimal overall.	No effects
Visitor Management/Law Enforcement	Openings created by treatments, especially along roads, would increase access for unauthorized OHV use.	Soils could be negatively impacted if unauthorized routes become established. These routes also become vectors for expansion of weed infestations.

ROADLESS ANALYSIS

The Stark Mountain Inventoried Roadless Area (IRA) is located on the Ninemile Divide between Ninemile Creek and the Clark Fork River. Several roads lead toward the IRA from the west and south including roads along Bear, Sheridan, and West Mountain Creeks. Nemote Creek Road (#454) extends into the area and provides access to the Stark Mountain Lookout which is also within the IRA. The topography to the east, toward the Ninemile Valley, is characterized by narrow steep drainages. To the west, the topography varies from rolling to steep and includes rocky ridges.

Approximately 587 acres (4 percent) of the Stark Mountain IRA have been developed since 1983. The development includes long-term specified road construction and timber harvest. These management activities occurred within areas where the Forest Plan allowed them. These developed areas currently do not meet the criteria for placement on the potential wilderness inventory as described in Forest Service Handbook (FSH) 1909.12, sections 71.1 and 71.11 because they contain forest roads and past harvest, which are visually evident on the landscape. These developed areas also do not meet all the criteria of wilderness as defined in Section 2(c) of the 1964 Wilderness Act.

The Stark Mountain IRA contains approximately 13,553 acres of NFS land. Approximately 6,180 acres (46 percent) of this IRA lie within the Rennic Stark analysis area. Wilderness attributes within the Stark Mountain IRA were analyzed in the Lolo National Forest Plan FEIS (1986). Attributes of the Stark Mountain IRA that fall within the Rennic Stark analysis area are discussed below.

NATURAL AND UNDEVELOPED CHARACTERISTICS

Noxious weed infestations along the Nemote Creek Road (#454) right-of-way approaching the Stark Mountain Lookout and along a burned section of the West Mountain Trail (#50) have disrupted ecological processes within some areas of the IRA. It is likely that there are other infestations within the IRA as well. Due to the lack of roads, however, weeds are not as widespread within the IRA as they are across the rest of the Rennic Stark analysis area. Development within the IRA including the Stark Mountain Lookout, the toilet associated with the lookout, and Nemote Creek Road (#454) decreases the naturalness of part of the IRA.

Solitude and Primitive Recreation

Because of the location on Ninemile Divide, it is difficult for recreationists in the Rennic Stark portion of the Stark Mountain IRA to escape the sights and sounds of off-site human development including Interstate 90, Montana Rail-link, and views of ranches and subdivisions. The IRA is also located below the flight path of aircraft approaching and taking off from Missoula County Airport. There are few opportunities for solitude on Nemote Creek Road (#454) and at Stark Lookout which is a popular tourist and local visitor destination in summer.

The three non-motorized system trails that traverse the IRA (Stark Mountain Trail (#58), the Ninemile Divide Trail (#51) and the West Mountain Creek Trail (#50)) are not heavily used and do provide recreationists with some degree of solitude. In addition, visitors and hunters who travel off-trail have opportunities to experience a sense of solitude especially in places where there is topographic or vegetative screening. Opportunities for challenge and adventure are moderate due to the steepness of the terrain. There are no lakes or large streams within the area. The size and terrain of the area does not require the visitor to have primitive skills. The core area is generally less than 2 miles from the boundary and existing roads and trails provide easy access.

Special Features and Values

The IRA within the Rennic Stark analysis area is not recognized as containing any particularly unique values or unusual or scarce ecosystem representatives not existing in currently designated wilderness areas.

Manageability

Most of the boundary for the Stark Mountain IRA does not follow easily recognizable features, except for the portions along property boundaries and section lines. For the most part, the boundary would be difficult to locate on the ground. Developed areas within and outside the IRA reduce the manageability of this area as wilderness. However, the exclusion of these developed areas would improve the desirability of the rest of the IRA for wilderness management. A few boundary adjustments would enhance the management opportunities for wilderness and for adjacent lands.

ENVIRONMENTAL CONSEQUENCES

Alternative 1 – No Action - Direct, Indirect, and Cumulative Effects

Current management would continue within the Stark Mountain IRA – no new activities would take place. In the short term, the portions of the IRA located within the Rennic Stark project area would remain in their current physical condition. Over time, exclusion of natural fire and ecosystem maintenance burning could disrupt natural processes and result in stands that are less resistant to wildfire than they were under historic fire regimes. The undeveloped characteristics would remain the same. Developed areas would remain in their current condition. Because no activities would occur within the IRA, the ability to find solitude would remain as it currently exists.

Alternative 2 - Direct and Indirect Effects

Prescribed Burning

Two large Ecosystem Maintenance Burning units are proposed within the Stark Mountain IRA (Unit 101 and a portion of 102 – a total of approximately 2,813 acres). The burning treatments are expected to be low-to mixed-severity. The purpose of the low-severity prescribed burning treatments is to reduce forest fuels and enhance winter range for big game species, including elk and deer. The purpose of the mixed-severity prescribed burning is to reduce existing surface fuel accumulations with an emphasis on targeting concentrations of large, dead and down fuels. Fire is the primary natural disturbance process that historically occurred on the landscape in this area. Following burning, red needles on some trees resulting from tree scorch and black char on the ground and tree boles could be noticeable in the short-term (1-2 years). However since fire was historically a natural disturbance on these landscapes, these short-term visual changes would not be outside of what is expected to occur naturally. Thus, this activity would have no effect on the natural or undeveloped characteristics of the IRA.

The feeling of solitude could temporarily be reduced during project implementation due to the sights and sounds of operations. However, this disturbance would likely occur for only several days a year until the activity was complete. Timing would depend on weather, smoke dispersion conditions, and funding. Prescribed burning would have no effect to the other wilderness attributes of special features and manageability.

Recreation Activities

The proposed re-graveling and reconstruction at the Cedar Creek Trailhead would not increase capacity at the trailhead but would improve parking. This improvement could slightly increase visitor use of the trail into the IRA but it is likely that any increase would be minor and thus would have no effect on wilderness or roadless characteristics.

Activities proposed outside of and in close proximity to the IRA would occur within areas already developed on NFS lands. Thus, activities proposed outside of and in close proximity to the IRA would have no effect on the wilderness or roadless characteristics of the IRA itself.

Cumulative Effects

While ecosystem maintenance burning could temporarily reduce the feeling of solitude during the time of implementation, there would be no long-term effects to the roadless characteristics of the IRA. Ecosystem maintenance burning may increase naturalness by re-creating a historic fire regime. Cumulatively, the current roadless characteristics and wilderness suitability of the Stark Mountain IRA would remain similar to what they currently are because: 1) prescribed burning mimics a natural disturbance process under controlled circumstances; and 2) activities proposed outside and adjacent to this roadless area would occur within areas that have been previously developed on NFS lands. Alternative 2 would not reduce the existing capability of this IRA to be suitable for wilderness recommendation.

VISUAL QUALITY

The visual landscape is represented by the area's basic vegetative patterns, landforms, rock formations, and water forms which are in view. The mountains are generally rounded and subdued where they have been severely glaciated. Vegetation in the project area varies with denser vegetation on the north slopes and more sparse vegetation on the south slopes. The overall impression of the project area when viewed from the Ninemile Valley is a predominantly forested, natural-appearing landscape. There are numerous openings and various textures throughout the landscape.

From Interstate-90 near Huson, the power line with its cleared corridor is visible as a notch on the ridgeline. From Interstate-90 at West Mountain Creek, little of the project area is visible because of the viewing angle, but several power poles are visible and dominant. From Stark Mountain Lookout, the view is varied with distant natural views on the skyline that draw the viewer's eye out to the horizon.

ENVIRONMENTAL CONSEQUENCES

Alternative 1 - No Action - Direct and Indirect Effects

The risk of stand-replacement fires in forested stands with dense understories, such as the Rennic Stark project area, is of concern. Higher intensity burns, such as stand-replacing fires, have potential visual effects that could dramatically change the view from the Ninemile Valley, Stark Mountain and Interstate-90.

Implementing the No Action alternative would result in continued natural changes to the landscape. The appearance of the landscape from the 3 viewpoints established for this analysis (Ninemile Valley, Interstate-90, and Stark Mountain Lookout) would continue to change over time with tree mortality from bark beetles and wildfires. This could range from small pockets of dead trees, to reduced densities causing color and texture changes, to large stand-replacing fires. Although the appearance of dead and dying trees is not considered scenic by most people, they are often acceptable as natural processes. We tend to accept the products of natural consequence more readily than we do the objects of artificial consequence (USDA, Region 1).

Cumulative Effects

A variety of resource activities have occurred in the past and are expected to continue in the project area. These include: wildland fire, fire suppression, hunting, trapping, cutting and gathering of firewood and other forest products, trail maintenance and use, driving on open roads, road maintenance and BMPs application, use and maintenance of power line corridors, and noxious weed control.

No additional timber or prescribed fires are proposed in the analysis area in the foreseeable future.

Alternative 2 – Proposed Action - Direct and Indirect Effects

Forest visitors who travel the road systems within the project area would notice changes to the landscape in the foreground and middleground views. These views are managed for a Visual Quality Objective (VQO) of Modification from open roads in the project areas. Visible change would include more open stands and greater visibility into the stands. According to Ryan (2005), thinning small trees can have a positive impact on scenic beauty as visibility into the forest is increased. It has been found that thinning 25-30% of basal area may enhance visual quality, and thinning up to 40-50% of basal area may be acceptable if the large trees are retained. Many of the stands proposed for thinning would be within that range.

Forest visitors may also observe slash piles, burn piles, road maintenance activities, logging landings, or tree paint during the 5-to 10-year period needed to implement the project.

The installation of a new culvert at Cedar Creek next to the trailhead at low travel speeds would be obvious in the short-term until grass on the road shoulders was reestablished. Involving the Forest Landscape Architect in project design and following the Resource Protection Measures described in Chapter 2 would reduce color contrast and meet VQOs.

The reconstruction of the trailhead may cause short-term visual effects. The District Recreation Program Manager would work with Engineers and the Forest Landscape Architect to develop the design for this project.

Cumulative Effects

No other major projects are planned in the project area. Past timber harvest projects ranging from shelterwood, single tree selection, sanitation cuts, clearcutting, commercial thinning, group selection, and seed tree cuts have been implemented throughout the project area since 1950. These treatments totaled 4,042 acres. Additionally 6,240 acres of site preparation and tree planning (since 1970), 19,620 acres of wildfires (since 1910), and 22,636 acres of bug kill (since 1980) have occurred.

A variety of additional resource activities have occurred in the past and are expected to continue in the project area. These include: fire suppression, hunting, trapping, cutting and gathering of firewood and other forest products, trail maintenance and use, driving on open roads, road maintenance and BMP application, use and maintenance of power line corridors, and noxious weed control. No additional timber or prescribed fires are proposed in the analysis area in the foreseeable future.

The overall effect of past, proposed, and ongoing activities are within the scale of the characteristic landscape and do not dominate the form, line, color and texture. The landscape would continue to meet VQOs as described in the Lolo Forest Plan.

Economics

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

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

Environmental Consequences

The economic measures used for this analysis are project feasibility, financial efficiency, and economic impacts as discussed below.

Project Feasibility

Project feasibility is used to determine if a project is feasible, that is, will it sell, 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 predicted stumpage value from this analysis is compared to the base rate (revenues considered essential to cover regeneration plus minimum return to the Federal treasury). The project is considered to be feasible if the stumpage value exceeds the base rates. If the feasibility analysis indicates that the project is not feasible (stumpage value is less than the base rates), the project may need to be modified. For example, forest products (e.g., sawlogs, pulp) could be packaged in separate contracts and offered at different times depending on market conditions. This could increase the attractiveness of the project to potential bidders resulting in making it more feasible to implement.

The estimation of project feasibility was based on the Region 1 sale feasibility model, which is a residual value timber appraisal approach that takes into account logging system, timber species and quality, volume removed per acre, lumber market trends, costs for slash treatment, and the cost of specified roads, temporary roads, and road maintenance. The predicted stumpage rate from the feasibility analysis was compared to the base rate (revenues considered essential to cover regeneration plus minimum return to the federal treasury). The stumpage rate and base rate are displayed in Table 42. The base rate, including essential regeneration costs, is $38.90 per CCF (hundred cubic feet). The appraised stumpage rate is $0.28 per CCF, which is much lower than the base rate, indicating that this alternative is infeasible and unlikely to attract bids without modification. However, two caveats are important when assessing the feasibility of this project. The feasibility analysis was based upon Alternative 2 that includes several biomass units. These units account for approximately 2,500 CCFs of the total volume of 10,704 CCFs. These units would likely not be treated initially because of the uncertain market for this material but would be offered at a later date if a market for this material became available. If this material were removed from the feasibility analysis, the stumpage rate would increase, making the project more feasible. Additionally, the base rate of $38.90 is substantially above the minimum rate of $3.00 per CCF due to the essential regeneration costs. If regeneration costs for the 649 acres of uneven-aged management (single tree selection/group selection) were not included, the base rate would decrease to $20.90 and the appraised stumpage rate would increase to $9.22/CCF, increasing the likelihood of attracting bids, although the project would still be infeasible.

Table 42 Project feasibility and financial efficiency summary (2010 dollars)

Category	Measure	No Action Alternative	Alternative 2
Timber Harvest Information	Acres Harvested (All)	0	1,976
	Volume Harvested (CCF)	0	10,704
	Base Rate ($/CCF)	0	$38.90
	Appraised Stumpage Rate	0	$0.28
	Predicted High Bid ($/CCF)	0	$19.49
	Total Revenue (Thousands of dollars)	0	$416
Timber Harvest and Required Design Criteria	Present Net Value (Thousands of dollars)	0	-$170
Timber Harvest and All Other Planned Activities	Present Net Value (Thousands of dollars)	0	-$2,250

Financial Efficiency

Financial efficiency provides information relevant to the future financial position of the program if the project is implemented. Financial efficiency considers anticipated costs and revenues that are part of Forest Service monetary transactions. Present net value (PNV) is used as an indicator of financial efficiency and presents one tool to be used in conjunction with many other factors in the decision-making process. PNV combines benefits and costs that occur at different times and discounts them into an amount that is equivalent to all economic activity in a single year. A positive PNV indicates that the alternative is financially efficient.

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 not described in financial or economic terms, but rather are discussed in the various resource sections of this report. For instance, changes in fire risk are described in terms of changes in fire behavior, while wildlife resource changes are described in terms of changes to habitat conditions.

The financial efficiency analysis is specific to the timber harvest and ecosystem management activities associated with the project (as directed in Forest Service Manual 2400–Timber Management and guidance found in the Forest Service Handbook 2409.18). Costs for sale preparation, sale administration, regeneration, and ecosystem restoration are included. All costs, timing, and amounts were developed by the specialists on the project's interdisciplinary team. The expected revenue is the corresponding predicted high bid, $28.53 per 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 if the project attracts bids. The actual timber value would depend on the market when the timber is sold and may be higher or lower than the predicted high bid. For more information on the values or costs, see the Project File.

Table 42 summarizes the project feasibility and financial efficiency, including the base rate, stumpage rate, predicted high bid, total revenue, and PNV calculations. One PNV indicates the financial efficiency of the timber sale, including all costs and revenues associated with the timber harvest and required design criteria. A second PNV includes all costs for Alternative 2, including other restoration activities. A 4-percent discount rate was used over a period of 10 years (2013–2022), the estimated time required for full implementation of the project.

Table 42 indicates that Alternative 2 is financially inefficient for the timber harvest and required design criteria, as well as for all activities, as indicated by the negative PNV. The PNV for Alternative 2 is -$170 thousand for the timber harvest and required design criteria and -$2.3 million for all planned activities.

When evaluating trade-offs, the use of efficiency measures is one tool used by the decision maker in making the decision. Many things cannot be quantified, such as effects on wildlife, impacts on local economies, and restoration of watersheds and vegetation. The decision maker takes many factors into account in making the decision.

Table 43 lists the costs included in the PNV analyses, which includes all estimated project costs except for those already included in the timber appraisal. Planning costs (e.g., performing the analysis and producing the EA) were not included since they are sunk costs at the point of alternative selection. Sale preparation costs of $13.50/CCF and sale administration costs of $4.50/CCF were included.

Table 43 Activity Expenditures by Alternative (those not included in appraisal)

Activity	Alternative 1	Alternative 2
Sale preparation	$0	$144,504
Sale administration	$0	$48,168
Road decommissioning and road storage (non-haul)*	$0	$70,971
Road upgrades and maintenance (non-haul)*	$0	$395,705
Excavator piling of slash*	$0	$8,800
Planting	$0	$76,500
Silvicultural exams	$0	$48,120
Precommercial thinning*	$0	$141,400
Noncommercial thinning/slashing*	$0	$471,300
Understory slashing or thinning*	$0	$138,900
Hand piling and burning of nonactivity fuels	$0	$256,950
Fire line (hand)	$0	$39,000
Fire line (excavator)*	$0	$80,000
Prescribed burning	$0	$1,114,300
Animal damage control	$0	$9,600

*Contracted activities

Economic Impact Effects (Jobs and Labor Income)

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 one to examine the effect of a change in one or several economic activities on an entire economy, all else constant. This examination is called impact analysis. IMPLAN, an input-output modeling system (MIG 2003), was used to estimate effects on employment and labor income within the impact area. It 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) the processing of the timber volume from the project, and (2) the dollars resulting from any restoration activities of the project into the local economy affected by the treatments proposed. The direct employment and labor income benefit employees and their families and, therefore, directly affect the local economy. Additional indirect and induced multiplier effects (ripple effects) are generated by the direct activities. Together the direct and multiplier effects comprise the total economic impacts to the local economy.

The analysis calculated the jobs and labor income associated with timber harvest, reforestation, and restoration activities. In order to estimate jobs and labor income associated with timber harvest, the timber harvest levels were proportionally broken out by product type (see Table 44). In order to estimate jobs and labor income associated with reforestation and restoration activities, expenditures for these activities were developed by the resource specialists. Only contracted activities are included in the impact analysis.

Table 44 Proportion of timber harvest by product type

Product Type	Alternative 2
Sawmills	80%
Log Homes	0
Post & Poles	0
Pulp	20%

Table 45 displays both direct and total estimates for employment (part-and full-time) and labor income that may be attributed to Alternative 2. Since the expenditures occur over a multi-year period, the estimated impacts of jobs and labor income would be spread out over the life of the project. Most of the timber harvest and wood processing jobs would occur over a four-year period. These are not new jobs or income but rather jobs and income that can be attributed to this project.

Estimates in Table 45 indicate that Alternative 2 would maintain approximately 45 direct jobs spread over the life of the project, or 9 direct jobs annually. These direct jobs would lead to an additional 39 indirect and induced jobs spread over the life of the project or roughly 9 jobs annually. All together, these jobs would provide roughly $2.4 million of direct labor income and $3.8 million in total labor income over the life of the project. Timber harvest would be responsible for the majority of the total jobs and the total labor income.

Table 45 Total employment and income (2010 dollars) over the life of the project and annually.

Non-timber Activities	Alt. 2		No Action
	Total	Annual	
Part and Full Time Jobs Contributed			
Direct	14	1	$0
Indirect and Induced	7	1	$0
Total	21	2	$0
Labor Income Contributed ($M2010)			
Direct	$834	$83	$0
Indirect and Induced	$238	$24	$0
Total	$1,073	$107	$0
Timber Harvest	Alt. 2		No Action
	Total	Annual	
Part and Full Time Jobs Contributed			
Direct	30	8	$0
Indirect and Induced	32	8	$0
Total	62	15	$0
Labor Income Contributed ($M2010)			
Direct	$1,576	$394	$0
Indirect and Induced	$1,174	$293	$0
Total	$2,749	$687	$0

All Activities	Alt. 2		No Action
	Total	Annual	
Part and Full Time Jobs Contributed			
Direct	45	9	$0
Indirect and Induced	39	9	$0
Total	83	18	$0
Labor Income Contributed ($M2010)			
Direct	$2,410	$477	$0
Indirect and Induced	$1,412	$317	$0
Total	$3,822	$795	$0

Definitions:
1. Employment: The total full-and part-time wage, salaried, and self-employed jobs in the region.
2. Labor income: Includes the wages, salaries, and benefits of workers who are paid by employers and income paid to proprietors.

Cumulative Effects

The financial efficiency of the project would not be affected by the past, present, or reasonable foreseeable future actions in the project area. Other projects occurring in the economic impact area will have cumulative economic impacts. Many activities listed in Appendix D of the Rennic Stark EA have the potential to contribute cumulatively to jobs and labor income provided by implementing this project.

List of Rennic Stark Appendices

Appendix A – Consultation and Coordination

Appendix B – References

Appendix C – Comment Tracking and Issue Analysis

Appendix D – Past, Present, Future Actions

Appendix E – Summary of Wildlife Species Considered

Appendix F – Soil Disturbance

Appendix G – Soil Rehabilitation Plans to meet R1 SQS

Appendix H – Travel Analysis Process