United States
Department of
Agriculture

Forest
Service
Northern
Region

January 2009

DRAFT ENVIRONMENTAL IMPACT STATEMENT

LAKEVIEW-REEDER FUELS REDUCTION PROJECT
Under Authority of the Healthy Forest Restoration Act

Priest Lake Ranger District, Idaho Panhandle National Forest
Bonner County, Idaho

One of the public field trips that was held within the project area as part of the collaborative efforts.
August 2006.

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DRAFT ENVIRONMENTAL IMPACT STATEMENT
Idaho Panhandle National Forests
Priest Lake Ranger District

Bonner County, Idaho

January 2009

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Abstract

The Lakeview-Reeder Fuel Reduction project proposes fuels reduction and road treatment activities on National Forest System lands in the vicinity of the community of Nordman, Idaho, and near the Granite Creek, Kalispell Creek, Reeder Creek and Reeder Bay residential areas along the west side of Priest Lake. The goals of the project are to reduce hazardous forest fuels within the project area to decrease the risk of a wildfire negatively impacting the communities, and to improve forest health and reduce the threats from stand replacing wildfires and insect and disease infestations. Alternative 2, which is the proposed action as well as the preferred alternative, would treat fuels on approximately 3,864 acres within the project area. To access the fuel treatment areas, road maintenance activities would occur on approximately 17 miles of road, reconstruction activities would occur on 5 miles of road, and approximately 3 miles of road would be constructed. In addition, other road related activities would occur for the purposes of either mitigating the effects of the project on aquatic and wildlife resources, or to meet Forest Plan standards.

Copies of this DEIS are available on compact disc (CD) from the Priest Lake Ranger District; and the DEIS is posted on the Idaho Panhandle National Forests internet site at www.fs.fed.us/ipnf/eco/manage/nepa/index.html. A limited number of printed copies may also be available.

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Chapter 1 - Purpose and Need

1.1 Introduction

The Lakeview-Reeder Fuels Reduction Project is located on National Forest System (NFS) lands centered around the community of Nordman, Idaho, and encompasses the Granite Creek, Kalispell Creek, Reeder Creek and Reeder Bay residential areas along the west side of Priest Lake (Figure 1-1).

The general project area extends from Kalispell Bay, Hanna Flats and Bismark Mountain in the south to Indian Mountain, Granite Mountain and Copper Bay to the north. In addition, the project area occurs on the west side of Bonner County, Idaho and the east side of Pend Oreille County, Washington. The legal land description of the project area includes the following areas in Bonner County, Idaho: sections 25-26 and 33-36 of Township 62 North, Range 5 West of the Boise Meridian; sections 1-29 and sections 32-36 of Township 61 North, Range 5 West of the Boise Meridian; sections 1-4 and 10-12 of Township 60 North, Range 5 West of the Boise Meridian; sections 30-31 of Township 62 North, Range 4 West of the Boise Meridian; sections 4-9, 16-20 and 29-32 of Township 61 North, Range 4 West of the Boise Meridian; and sections 5-7 of Township 60 North, Range 4 West of the Boise Meridian in Bonner County, Idaho. In Pend Oreille County, Washington, the project area includes section 36 of Township 37 North, Range 45 East of the Willamette Meridian; sections 1 of Township 36 North, Range 45 East of the Willamette Meridian; and sections 6-7 of Township 36 North, Range 45 East of the Willamette Meridian; and sections 6-7 of Township 36 North, Range 46 East of the Willamette Meridian.

This area is a mixture of both National Forest System lands and private property and is one of the most populated areas within the greater Priest Lake area. Residential homes, subdivisions, businesses and popular recreational sites are abundant. The Lakeview-Reeder project area encompasses approximately 29,380 acres. Over 5,800 privately-owned acres, amounting to nearly 20% of the land base are scattered within that area and several dozen miles of boundary exist between private and National Forest ownership. There are approximately 736 residences within and immediately adjacent to the Lakeview-Reeder project area and the people living and recreating within the area would have to travel through it to evacuate in the event of a severe fire (PF-SCOPE-1). The remaining 80% of the project area is National Forest.

Since the late 1800s, settlement, certain timber harvesting practices, tree disease introductions and fire suppression efforts have altered the forest composition and structure within the Lakeview-Reeder area. The forests have shifted towards more uniform, dense stands containing large quantities of hazardous forest fuels. These conditions can predispose stands to undesirable stand replacing fire events and insect and disease epidemics (Graham et al., 2004).

The Forest Service has prepared this Draft Environmental Impact Statement (DEIS) in compliance with the National Environmental Policy Act (NEPA), the Healthy Forests Restoration Act (HFRA), and other relevant federal and state laws and regulations. This DEIS discloses the environmental impacts that would result from the proposed action and the no-action alternative.

In addition to the information presented in this DEIS, additional documentation, including supporting analyses of project-area resources, may be found in the project planning record located at the Priest Lake Ranger District office. Some of these documents are referenced throughout the DEIS by record name. As an example, after a sentence in this document you may see “(PF-SOILS-13)”; this is a reference to a specific document in the soils section of the project file.

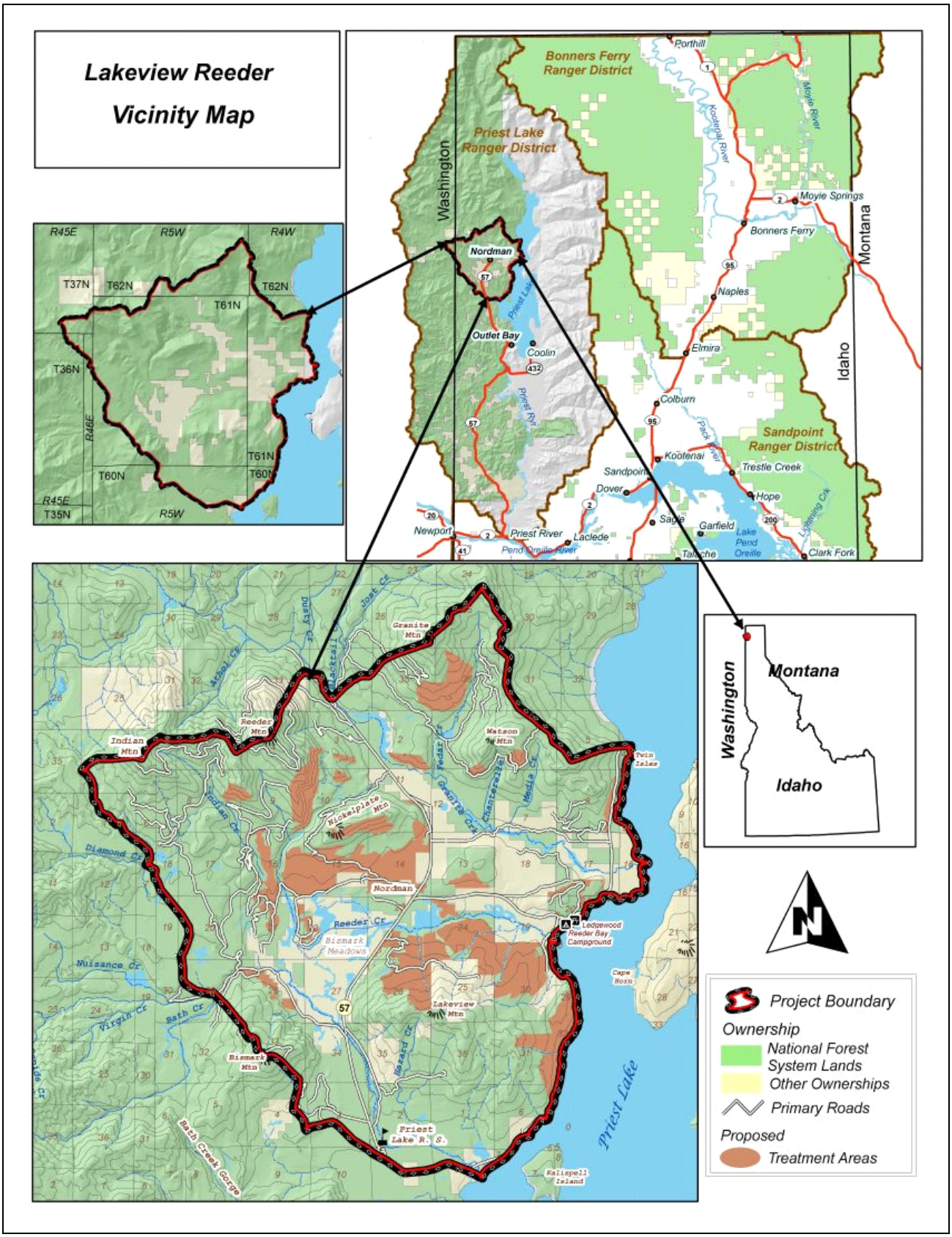


Figure 1-1. Project vicinity map

1.2 Purpose and Need for Action

The Lakeview-Reeder Fuels Reduction Project was proposed to respond to goals and objectives of the National Fire Plan, the Healthy Forests Restoration Act, the Bonner County Wildland Urban Interface Fire Mitigation Plan, the Pend Oreille County Community Wildfire Protection Plan and the Idaho Panhandle National Forests Land and Resource Management Plan. Lastly, the proposal was designed to be responsive to ecological findings from large and mid-scale ecosystem assessments.

The following discussion provides a summary of relevant direction from the plans and assessments that were mentioned above, as well as discloses why there is a need to modify the current forest conditions and transportation system in order to meet that direction.

National Direction

National Fire Plan

During the last several decades, wildfires have increased in size and intensity within the United States. In 2000, in response to a request from President Clinton, the Secretaries of Agriculture and Interior developed an interagency approach to respond to severe wildland fires, reduce their impacts on rural communities, and assure sufficient firefighting capacity in the future (USDA and USDI, 2000). This report, known as the National Fire Plan, outlined a strategy to reduce wildland fire threats and restore forest ecosystem health in the interior West. In 2001, Congress funded the National Fire Plan to reduce hazardous forest fuels and restore forests and rangelands. In response, the Secretaries of Agriculture and Interior, along with the Western Governors and other interested parties, developed a 10-year strategy and implementation plan for protecting communities and the environment (USDA and USDI, 2001). This plan, coupled with the Federal Wildland Fire Management Policy (NIFC, 2001), forms a framework of federal agencies, states, tribes, local governments, and communities to work together to reduce the threat of fire, improve the condition of the land, restore forest and rangeland health, and reduce wildland fire risk to communities.

The National Fire Plan identified the area around Nordman, Idaho as an “At-Risk Community” because homes and structures are directly adjacent to wildland fuels at risk of a large-scale wildland fire disturbance.

Healthy Forest Initiative and Healthy Forests Restoration Act

In 2002, the Bush Administration launched the Healthy Forest Initiative (HFI) to reduce barriers to the timely removal of hazardous forest fuels. The HFI expedites administrative procedures for hazardous forest fuel reduction and ecosystem restoration projects on federal land.

The Healthy Forests Restoration Act (HFRA) was passed in December 2003 (P.L. 108-148) to reduce delays and remove statutory barriers for projects on federal land that reduce hazardous forest fuels and improve forest health and vigor. The act provides expedited environmental analysis of hazardous fuel reduction projects and provides administrative review through an Objection process before decisions are issued (USDA, 2004). The act also helps rural communities, states, tribes, and landowners restore healthy forest and rangeland conditions on state, tribal, and private lands.

The purposes of this act are:

- to reduce wildfire risk to communities, municipal water supplies, and other at-risk Federal land through a collaborative process of planning, prioritizing, and implementing hazardous fuel reduction projects;

- to authorize grant programs to improve the commercial value of forest biomass (that otherwise contributes to the risk of catastrophic fire or insect or disease infestation) for producing electric energy, useful heat, transportation fuel, and petroleum based product substitutes, and for other commercial purposes;
- to enhance efforts to protect watersheds and address threats to forest and rangeland health, including catastrophic wildfire, across the landscape;
- to promote systematic gathering of information to address the impact of insect and disease infestations and other damaging agents on forest and rangeland health;
- to improve the capacity to detect insect and disease infestations at an early stage, particularly with respect to hardwood forests; and
- to protect, restore, and enhance forest ecosystem components to promote the recovery of threatened and endangered species, improve biological diversity, and enhance productivity and carbon sequestration.

Criteria for projects to be authorized under this act include fuel condition class, adjacency to communities at risk (Federal Register, January 4, 2001, Vol. 66, No. 3, p. 751-777), and collaboration. The Lakeview-Reeder Fuels Reduction Project is authorized under HFRA to reduce hazardous forest fuels within the established wildland urban interface (WUI) designated by a "Community Wildfire Protection Plan". The following explains how this proposed project meets the intention and criteria of HFRA. The Act, in Section 102, defines the following criteria met by this proposal:

- The project area exists on "Federal land in wildland-urban interface areas" (HFRA 2003, sec. 102(a)(1)). The Bonner County WUI Fire Mitigation Plan (2004) identifies the project area as wildland urban interface, and further identifies the Nordman area as a high priority area for hazardous forest fuel reduction treatments.
- The project would focus "…largely on small-diameter trees, thinning, strategic fuel breaks and prescribed burns to modify fire behavior, as measured by the projected reduction of uncharacteristically severe wildfire effects…" (HFRA 2003, sec. 102(f)(1)(A)) This project's treatments would mainly harvest smaller, weaker or diseased trees (see the description of Alternative 2 within Chapter 2 for more detail).
- The project would "…maximize the retention of large trees, as appropriate for the forest type, to the extent that the trees promote fire-resilient stands." (HFRA 2003 sec. 102 (f)(1)(B).) Large, fire-resistant, fire adapted and site-appropriate trees such as western larch and western white pine dominated the pre-settlement forest of this area. The project would retain those relics that survived the last, large fires in the area and promotes restoration of historic forest conditions by planting those same species in appropriate harvest units (see the description of Alternative 2 within Chapter 2 for more detail).

County Direction

Bonner County Wildland Urban Interface Fire Mitigation Plan

In 2004, the Bonner County Wildland Urban Interface Fire Mitigation Plan was developed as Bonner County's contribution to the Idaho Statewide Implementation Strategy for the National Fire Plan and in compliance with the Disaster Mitigation Act (2000). This effort was led by the Bonner County Wildland Urban Interface Fire Mitigation Committee, which includes the Idaho Department of Lands, the USDA Forest Service, local fire departments, private landowners and other interested stakeholders.

The plan defines the county's wildland urban interface (WUI) areas, assesses general wildland fire risk and outlines a strategic plan for wildfire preparedness and protection. Within the plan, the committee identified different areas (across ownerships) that require fuel reduction treatments and then prioritized those areas based on the fuel hazard, topography, vegetation, fire history and frequency, as well as the values at risk (like housing density, infrastructure or natural resources.). The areas near Nordman and Reeder Bay were identified as a priority for hazardous fuel reduction treatments.

Bonner County defined the WUI as the area or zone where structures and other human development meet or intermingle with undeveloped wildland fuels, including all wildland within 2 miles of structures or development. The Lakeview-Reeder Fuel Reduction Project area lies within this "Community Wildfire Protection Plan"-defined WUI (PF-FUELS-1). In this plan, hazardous fuels treatments were identified as needed activities to create defensible space and fuel breaks around and near homes and businesses. The objective of this work is to reduce risk to life and property, increase firefighter and public safety, as well as to reduce fire suppression costs. The implementation strategy includes reducing the physical threat of wildfire by implementing hazardous fuels treatment projects.

Pend Oreille County Community Wildfire Protection Plan

Concurrently, Pend Oreille County, Washington also developed a "Community Wildfire Protection Plan" which includes significant discussions and assessments about wildland fire hazards across ownerships in the county, as well as detailed definitions of wildland urban interface and critical infrastructure. The plan outlined many of the areas within the Lakeview-Reeder project area as a moderate to high risk with critical public infrastructure.

Local Direction

Priest Lake Ranger District Fuels Strategy

In 2005, staff at the Priest Lake Ranger completed a district wide planning effort to prioritize areas that were most in need of fuel treatments (PF-FUELS-2). The Lakeview-Reeder project area was identified as one of the highest priority areas for treatment.

The IPNF Forest Plan

In 1987, The Idaho Panhandle National Forests adopted a Land and Resource Management Plan (Forest Plan) that provides direction for all resource management programs and activities on the IPNF. The Forest Plan consists of Forest-wide goals, objectives and standards that provide for land uses and resource outputs. The Forest Plan embodies the provisions of the National Forest Management Act (NFMA) of 1976 and its implementation regulations, as well as those of other guiding documents. Although the Forest Plan is currently being revised through a joint effort with the Kootenai National Forest, the 1987 Forest Plan is still the overall guiding management document for the IPNF. Each resource section in Chapter 3 contains more detailed information about project consistency with Forest Plan direction.

The specific Forest Plan goals and objectives (USDA 1987, p. II-1 to II-11) that guided the development of the Purpose and Need and proposed activities are:

- Provide efficient fire protection and fire use to help accomplish land management objectives. Efficient fire protection and use programs will be implemented based on management objectives, site specific conditions, and expected fire occurrence and behavior.
- Manage the forest resources to protect against insect and disease damage. Timber management activities will be the primary process used to minimize the hazards of insects and diseases and will be accomplished primarily by maintaining stand vigor and diversity of plant communities and tree

species. Regenerating to species combinations that are the least susceptible to root rot diseases is the primary protection objective for the root rot diseases. Regeneration and culture of multi-species stands will be used to reduce the threat of epidemic outbreaks of harmful insects.

- Manage vertebrate wildlife habitat to maintain viable populations of all species. Manage the habitat of animal and plant species listed under the Endangered Species Act to provide for recovery as outlined in the species recovery or management plans. Grizzly bear management will emphasize maintenance of adequate security in conjunction with providing the seasonal vegetative habitat components. Road management and scheduling of Forest activities will be the primary management scheme. Manage habitat to maintain populations of identified sensitive species of animals and plants to prevent the need for federal listing.
- Manage resource development to protect the integrity of the stream channel system. Maintain high quality water to protect fisheries habitat, water based recreation, public water supplies, and be within state water quality standards. Water quality that is below Forest standards will be improved through restoration projects and through the scheduling of timber harvest and road building activities where appropriate. The application of appropriate conservation practices will ensure that the quality of individual water bodies will not be significantly affected by sediment production. Fishery and timber riparian management activities will be coordinated in order to maximize the contribution of riparian vegetation to aquatic habitats.
- Roads will be developed and managed to the minimum standards and miles necessary to meet the objectives of the management areas. Transportation facilities will be constructed, managed and maintained to meet the management area goals in a cost effective way while meeting safety, user and resource needs. Best Management Practices for road construction will be utilized during construction and maintenance of transportation facilities.
- Manage the soil resource to maintain long-term productivity.

Many Forest Plan Standards are applicable to the general project design. Specific Forest Plan Standards (USDA 1987, pp. II-24 to II-39) that guided the development of the project activities are:

- Human life and property will be protected. Activity fuels will be treated to reduce their potential rate of spread and fire intensity so the planned initial attack organization can meet initial attack objectives.
- Reforestation will normally feature seral tree species, with a mixture of species usually present. Silvicultural practices will promote stand structure and species mix which reduce susceptibility to insect and disease damage. Project design will provide for site preparation and slash hazard reduction practices that meet reforestation needs of the area. Encourage utilization of forest products to reduce biomass, which must be disposed of otherwise. Timber harvest schedules and access will be coordinated with intermingled landowners where applicable. Openings created by even-aged silviculture will be shaped and blended to forms of the natural terrain to the extent practicable; in most situations they will be limited to 40 acres. Creation of larger openings must conform to current Regional guidelines regarding public notification, environmental analysis and approval. An area of National Forest land will no longer be considered an opening when vegetation meets management goals established for the management area in accordance with the Regional Guide. Lands in other ownership within or adjacent to National Forest land will be included in the analysis when planning openings. The silvicultural prescription for each stand will establish the level of management intensity compatible with the management area goals. Preferred species management as identified in the silvicultural prescription will consider both biological and economic criteria.
- Management of habitat and security needs for threatened and endangered (T & E) species will be given priority in identified habitat. Results of research regarding habitat of T & E species will be incorporated into management direction as it becomes available. Current direction for management of

T & E species will be amended or revised to ensure conformance with Species Recovery Plans. Manage grizzly bear habitat according to the Interagency Grizzly Bear Guidelines. Implement the Cumulative Effects Model as the method for evaluating activities within identified habitat. Strive for at least 70 square miles of security or established threshold level for each grizzly bear management unit in accordance with Identified Ecosystems. Maintain at least minimum viable populations of management indicator species distributed throughout the Forest. Maintain habitat for cavity nesting species and foraging substrates by implementation of the IPNF Snag and Woody Down Timber Guidelines.

- Management activities on Forest lands will not significantly impair the long-term productivity of the water resource and ensure that state water quality standards will be met or exceeded. Maintain concentrations of total sediment or chemical constituents within State standards. Implement project level standards and guidelines for water quality contained in the Best Management Practices, including those defined by State regulation or agreement between the State and Forest Service. Provide fish passage to suitable habitat areas, by designing road crossings of streams to allow fish passage or removing in-stream migration barriers. Pursue fish habitat improvement projects to improve habitat carrying capacities on selected streams. Coordinate management activities with water resource concerns as described in MA 16. Activities within non-fishery drainages, including first and second order streams, will be planned and executed to maintain existing biota. Maintenance of existing biota will be defined as maintaining the physical integrity of these streams. Models will be used as a tool to approximate the effects of National Forest activities on water quality values. The models will be used in conjunction with field data, monitoring results, continuing research and professional judgment, to further refine estimated effects and to make recommendations.
- Provide and maintain public road and trail access to National Forest lands. Manage roads for public use consistent with management area goals and needs for protection of facilities. Road construction and reconstruction will be the minimum necessary to efficiently meet safety, user and resource needs. Unless a road is determined to be part of the permanent transportation system, the entire roadway will be revegetated and stream crossings removed when management needs are met.
- Soil disturbing management practices will strive to maintain at least 80 percent of the activity area in a condition of acceptable productivity potential for trees and other managed vegetation. Unacceptable productivity potential exists when soil has been detrimentally compacted, displaced, puddled, or severely burned as determined in the project analysis. Projects should strive to maintain sufficient large woody debris to maintain site productivity. Large woody debris is essential for maintenance of sufficient microorganism populations.

In addition to the overall goals, objectives and standards discussed above, the Forest Plan designated Management Areas (MA) to provide more site specific guidance. Each MA provides for a combination of activities, practices and uses appropriate to the management goals and objectives of that specific management area. The Lakeview-Reeder Fuel Reduction project area is comprised of lands in five different MAs. Most of the land within this project area is either in MA 1 or MA 4. Lesser amounts of MA 9, 14 and 16 are also present. A short summary of the management area goals for these different MAs is presented below. MAs and their associated goals are described in greater detail in the IPNF Forest Plan on pages III-1 through III-87.

- Management Area 1- Management Area 1 consists of lands designated for timber production. Management goals are to manage suitable timber production lands for long-term growth and production of commercially valuable wood products. Within this project area, these MA-1 lands are concentrated in the vicinity of Hanna Flats, as well as Lakeview, Nickleplate, Reeder and Indian Mountains.

- Management Area 4 - Management Area 4 consists of lands designated for timber production within big game winter range. Achieving the MA 4 goal requires providing sufficient forage to support big game habitat needs through scheduled timber harvest and permanent forage areas. Within this project area, these MA-4 areas are mostly located along the shoreline of Priest Lake between Kalispell Bay and Reeder Bay and towards Watson and Granite Mountains.
- Management Area 9- Management Area 9 consists of areas of non-forest lands, lands not capable of producing industrial products, lands physically unsuited for timber production and lands capable of timber production but isolated by the above type lands or nonpublic ownership. Management goals are to maintain and protect existing improvements, resource productive potential and meet visual quality objectives. Within this project area, these MA-9 lands are located towards the top of Bismark Mountain and in Bismark Meadows.
- Management Area 14- Management Area 14 consists of areas to be utilized for scientific research and includes the existing and candidate Research Natural Areas (RNA's). Within the project area, these lands occur in the Potholes Research Natural Area located in the Kalispell drainage along the western edge of the project area.
- Management Area 16- This management area consists of floodplains, wetlands, streams and other riparian areas. These MA-16 lands are scattered over the project area. In 1995, the Inland Native Fish Strategy (INFS) replaced the previous Forest Plan direction for the management of these riparian areas. INFS identified these areas as Riparian Habitat Conservation Areas (RHCAs) and developed Riparian Management Objectives (RMOs) to provide the management direction for these areas.

Scientific Findings from Larger Scale Ecosystem Assessments

This section provides a summary of findings that relate to forest vegetation that were made from three large to mid-scale ecosystem assessments. These assessments provide a perspective on forest vegetative conditions and trends over larger areas, which helped to identify the needs for proposing this project. Conditions within the analysis area were compared to findings at the larger scales and this process helped to develop the general desired conditions and the management activities that could be used to trend the vegetation towards those conditions.

Interior Columbia Basin Ecosystem Management Project (ICBEMP)

The ICBEMP Scientific Assessment (Quigley and Arbelbide, 1997) evaluated all public lands administered by the USDA Forest Service and USDI Bureau of Land Management within Eastern Oregon, Eastern Washington, most of Idaho, and the western-most section of Montana. The Lakeview-Reeder project area lies within lands classified as "Forest Cluster 4" in the Scientific Assessment. The forests within this area are heavily roaded, moist forest types with moderate to high hydrologic integrity and low forest, aquatic and composite integrity. The ICBEMP assessment findings show that the primary risks to ecological integrity in these areas are:

- Loss of late and old forest structures in managed areas,
- Forest compositions that are susceptible to insects, disease and fire, and
- Risk to hydrologic and aquatic systems from fire potential.

Opportunities to address these risks were identified as treatment of forested areas to reduce fire, insect, and disease susceptibility, and restoration of late and old forest structure in managed areas (Quigley, Haynes and Graham, 1996).

Northern Region Overview

The Northern Region Overview (USDA, 1998) considered and incorporated findings from the ICBEMP and the Northern Great Plains Assessments and focused on priorities for restoring ecosystem health and availability of recreation opportunities. Some of the findings of the overview pertinent to vegetative conditions in the project area are:

- Due to interaction of agents such as blister rust and mountain pine beetle, followed by salvage harvests since the 1930s, over 95 percent of the white pine type has changed to grand fir, Douglas-fir, and western red cedar/western hemlock cover types with an associated change to a largely mid-seral stage structure. Without an effective restoration effort using genetically improved/resistant western white pine stock, paired with an aggressive planting program, further interactions with agents of change will effectively eliminate white pine as a cover type.
- The risk regionally is high for a continued loss of western larch cover type and emergent structure due to the lack of low intensity, periodic disturbance, and the shift toward stand-replacing fire.
- Current structures are typified by mid- to mature age/size classes with relatively few areas in the seedling and sapling structural stage. In northern Idaho, the typical stand structure and composition is multi-layered; comprised primarily of Douglas-fir and grand fir. This is a result of a combination of fire exclusion, selective harvest of large early-seral species, and especially the loss of western white pine. An increase in root disease has correspondingly reduced the productivity and health of forests in northern Idaho in this type as a higher percentage of the most susceptible host species (Douglas-fir and grand fir) exist today.

The Overview findings conclude that there are multiple areas of concern in the Northwest Zone of the Region (which includes the Idaho Panhandle National Forests), but that “this sub region holds the greatest opportunity for vegetation treatments and restoration with timber sales”. The Overview goes on to state, “The timber management (timber harvest) tool best fits with the forest types in northern Idaho and is essential, for example, to achieve the openings needed to restore white pine and larch…”

North Zone Geographic Assessment

Because of the local variation in landscape change throughout the Columbia Basin, the Idaho Panhandle National Forests (IPNF) began a process to conduct an ecosystem assessment for the northern zone of the IPNF (USDA Forest Service, unpublished report). The assessment covers three subbasins; Priest River, Pend Oreille, and Kootenai and is called the north zone geographic assessment (GA). The purpose for developing the GA was to develop a scientifically based understanding of the processes and interactions occurring in the subbasins so that activities can be developed to promote healthy and resilient ecosystems. The GA identifies ecosystem trends and changes in vegetation over the last 100-200 years and findings are similar to those of the Northern Region and Interior Columbia Basin Assessments.

In addition to analyzing the vegetative conditions across an entire subbasin, the GA also considered conditions within smaller geographic areas- typically one or more watersheds. The Lakeview-Reeder project area occurs within portions of two of these watershed areas- the Kalispell-Reeder and the Lower Granite areas. Findings conclude that majority of the terrestrial landscape within these areas are low integrity and high risk. These areas are the most heavily altered from historic conditions and contain the greatest need and opportunity for large-scale vegetation restoration. These types of landscapes have the following characteristics:

- Current forests are dominated by shade-tolerant, drought-and fire-intolerant species (grand fir, western redcedar, and western hemlock), and short-lived seral species (lodgepole pine and Douglas-fir).

- There is a loss of long-lived seral species such as western larch, western white pine, and ponderosa pine.
- There is a lack of wildfire as a natural disturbance factor.
- These landscapes contain large areas of forest types with high probability of major successional change in the next few decades.
- There is an increased risk of fire as a result of fuel accumulations from the changes in forest conditions.
- The forest types are susceptible to heavy mortality from insects and disease.

The GA also identified management strategies that could be used for restoration within these low integrity/high risk landscapes. The following is a list of the management objectives that are most relevant to this project area:

- Use both regeneration harvest and prescribed fire to create openings where potentially long-lived seral tree species (ponderosa pine, white pine, and larch) are lacking and implement appropriate silvicultural practices to assure regeneration of these species – including blister rust resistant white pine;
- Lower the risk of large, severe disturbances by:
    - Restoring potentially long-lived early seral trees species (ponderosa pine, western larch, and blister rust-resistant white pine) on appropriate sites;
    - Reducing the extent of drought and fire intolerant forest types (grand fir, western hemlock, western redcedar) on sites where they are not well adapted, and are likely to be drought stressed (south aspects, shallow soils, some upland sites);
    - Reducing the extent of short-lived early seral forest types (Douglas-fir and lodgepole pine) that are at or near pathological rotation age;
- Use commercial thinning, thinning from below, shelterwoods with reserves, and prescribed fire to sustain and favor larch and ponderosa pine where they are present, and regenerate them where appropriate;
- Use weather, insect, and pathogen disturbances as opportunities to begin regeneration of potentially long-lived early seral tree species (ponderosa pine, western larch, and blister rust-resistant white pine);
- In existing young stands, favor potentially long-lived early seral tree species, manage density, and manage blister rust through pre-commercial thinning, pruning, and other appropriate stand tending activities;
- Restore large-scale diversity in landscape pattern by increasing patch size of both early and late successional patches; while providing for a large variety of patch sizes.

Current Project Area Conditions

A large portion of the project area consists of forest stands that regenerated densely following the last large-scale ecological disturbances which occurred over 80 years ago. In 1926, a large intense wildfire burned over a large percentage of the project area. Many environmental factors, which interact with and sometimes exacerbate one another, have resulted in significant tree mortality within those stands. Factors which have been affecting tree mortality in the project area include drought conditions, high tree densities, competition (for light, water and nutrients), insect and disease pathogens, as well as windthrow and breakage. As some trees die excessive ground fuels often accumulate, and subsequent flushes of tree

regeneration can result, leading to dense, live ladder fuels in the understory (Figure 1-2). Many of the forest stands in this condition occur over large, continuous expanses, often in proximity to private developments, public infrastructure or other resource values. In addition to those environmental stressors listed, human activities including the introduction of white pine blister rust disease, successful fire suppression efforts and certain logging practices that occurred historically have changed the species diversity, composition, landscape ecology, disturbance regimes and nutrient cycle of forest stands in the project area over the last century.

Figure 1-2. This particular stand, located near the west side of Bismark Meadows, contains large quantities of ground fuels, ladder fuels, and has a dense overstory component

These conditions increase the risk from severe fire events which threaten community and natural resources values. Through our collaborative efforts, the interdisciplinary team identified the following community-based values at risk:

- Public and Resident Health and Safety
- Public Confidence, Support and Peace of Mind – Successful fuel treatments can reinstate these attitudes
- Firefighter Safety - A Wildland Firefighter Safety Awareness Study (BLM ,1997) documented that of the 114 recommendations to improve wildland firefighter safety, the solution with the highest score for positive impact was to “Implement a large-scale, long-range fuel management program.”
- Financial Resources

- Homes, Cabins and Businesses
- Critical Public Infrastructure Including Roads and Power Lines
- Recreational, Historic and Archaeological Sites

The following ecosystem components and natural resources were also identified:

- Wildlife and Fish Habitat
- Clean Air and Water
- Forest Composition, Structure and Function
- Sensitive Plants
- Timber, Grazing and Agriculture Land

Because of the risk of losing these values, it is socially unacceptable to allow fire to resume its historic role as a landscape, stand-replacing ecological disturbance within the wildland urban interface. Therefore, fire suppression will continue in this area. However, in the event of a wildfire in the project area, the topography and current fuel conditions could result in severe fire behavior, with flame lengths, spread rates and fire intensities greater than firefighters could safely and effectively suppress. Moreover, in many of these dense forest stands that contain significant ladder fuels a fire could easily move into the crowns of the trees (Alexander, 1987), further impeding suppression efforts. Flame lengths must be less than 4 feet to be safely attacked directly by hand crews. Currently, 55% of the project area is in a condition that would support flame lengths greater than 4 feet and because of the amount of ladder fuels within the project area that same percentage would support an active crown fire (see fire section in chapter 3 for more details). A rate of spread (ROS) of less than 5 chains per hour would have a higher likelihood of containment than faster moving fires based on the suppression resources capability and availability. Fire predictions demonstrate fires that are moving greater than 5 chains per hour would escape initial attack after one hour. Currently, 56% of the project area is in a condition that would support a ROS greater than 5 chains per hour.

As with most areas in the Priest Lake basin, this project area has had a significant history of both natural and human-caused wildfires. In the late 1800's and again in 1926, a large percentage of this project area burned over in hot, fast moving fires that eventually became tens of thousands of acres in size. The 1926 wildfire reached approximately 100,000 acres in size. Since 1926, the project area has not experienced any large fires. Rather, fire suppression efforts have successfully kept fires relatively small. Since the 1950's (when good fire record keeping began) dozens of natural and human-caused fires have occurred within the project area. By putting these small fires out, forest fuels have continued to accumulate in many forest stands in the area and are now at high levels (Figure 1-3). As fuels continue to accumulate, the probability of successfully suppressing future fires is decreasing. In addition, more development and public use is taking place in the project area than ever before. Therefore, the number of human-caused wildfires will likely increase in coming years.

Historically, in areas that evolved under a mixed-severity fire regime, even in a moist ecosystem, many of the forest stands would have incurred low-intensity fires (which creep around in the duff) at least once to twice during the stand's life. Those low-intensity fires often killed groups of seedlings/saplings and the occasional mature tree, as well as reduced accumulations of duff and ground fuels. As a result, thick-barked, long-lived, fire-resistant species, such as western larch, ponderosa pine and Douglas-fir would have been favored, and occasional fires would have helped limit the number of trees per acres. Additionally, stands in similar areas with low- and mixed-intensity fire regimes usually had not only

fewer trees per acre, especially in the understory, but also had much larger trees in the overstory than the forest stands that dominate the landscape today. These more open, mature forest structures have declined in the sub-basin and have been replaced by dense stands of immature/medium size trees.

Figure 1-3. The photo above shows heavy fuel accumulations northwest of Bismark Meadows

Other environmental and human-caused factors have also impacted the forests during the last century. The introduced disease, white pine blister rust, has significantly reduced western white pine within the project area and this is one of the most important fire adapted species in Northern Idaho. In addition, after decades of successful fire suppression, fires' role of regenerating forest stands through the creation of both small and large openings has declined. Due to these factors, the only tree species successfully regenerating within many of these stands in recent years are the shade-tolerant species, such as grand fir, subalpine fir, hemlock and cedar. These species are not only fire-intolerant, but the true firs and hemlock are also susceptible to many of our endemic root rot diseases and insects. These factors have influenced the increase in ground fuel accumulations within the stands. In addition, these tree species can grow in higher densities due to their shade tolerance and have denser crowns and lower canopy base heights that increase the live, ladder fuel component of the stand. Live, ladder fuels have exponentially increased the fuel continuity from the ground up through the entire tree canopy, increasing the likelihood of high-severity, stand-replacing crown fire events in the future (which kill even fire-resistant species). All of these factors are contributing not only to increased competition, mortality and hazardous fuel conditions, but also to potential decrease in the stand's survivability and resilience to future fires.

Project Goals, Objectives and Desired Conditions

The Lakeview-Reeder project is proposed to respond to goals and objectives set forth in the above direction. Under guidance from this direction, the Lakeview-Reeder project would achieve the following specific goals and objectives through vegetative treatments and prescribed fire:

Table 1-1. Goals and objectives for the project.

GOAL	Reduce hazardous forest fuels within the project area to decrease the risk of a wildfire negatively impacting the communities in the project area, public and firefighter safety, public infrastructure, private and National Forest System lands and resource values.		
OBJECTIVES	Decrease risk to values	Reduce potential fire behavior near and immediately adjacent to private boundaries by reducing surface fuels and providing canopy breaks to reduce crown fire potential while increasing firefighter and public safety.	
	Decrease fire hazard	Alter fire behavior	Reduce crown fire risk.
			Lower potential flame lengths and Rate of Spread.
			Break up continuity of hazardous fuels.
		Provide for firefighter safety.	
		Maintain adequate suppression access.	
GOAL	Restore, enhance and protect forest ecosystem components to improve forest health, increase biological diversity, as well as reduce threats from stand replacing wildfires and insect and disease infestations.		
OBJECTIVE	Reduce risk of loss of key ecosystem components	Trend landscape towards Condition Class 1.	
		Modify the tree composition, structure and pattern in the forests to be more resistant and resilient to disturbances.	

Because protection of the community and natural resources values in the project area is important and successful fire suppression efforts in this area could be difficult or impossible under certain weather conditions, there is a clear need to reduce fuels within the project area to alter potential fire behavior. A synthesis of 153 peer-reviewed articles concluded that treatments to reduce fuels can significantly modify fire behavior and severity and reduce environmental damage caused by fire (Graham et. al., 2004). Fuel reduction activities would reduce the negative impacts of a severe wildfire to the values described, create safer conditions for both the public and firefighters and provide for more effective fire suppression. Fuel treatments are not intended to guarantee benign fire behavior but can reduce the probability that extreme fire behavior will occur. Weather and terrain greatly influence fire behavior and are factors that humans can't influence.

Fuel reduction immediately adjacent to private land and developments would provide a defensible space where firefighters could safely suppress smaller fires spreading from private land onto NFS lands or spreading from NFS lands to private lands. However, limiting fuel reduction to areas adjacent to private land alone would neither protect other resource values nor provide adequate protection from a larger, fast-

moving fire event. The best approach for reducing the risk from severe fire is to manage tree density and species composition with well-designed silvicultural systems at a landscape scale. (Graham et. al., 2004; Graham et al., 1999). Fuel reduction efforts in key locations throughout the project area would disrupt both fuel quantity and continuity and would create strategic fuel breaks that greatly modify the behavior of potential wildfires, as well as diminish the risk from a large fire. Potential spread rates and fire intensities would be lowered, improving the ability to successfully suppress fires and effectively reduce risks to life, property, natural resources and other values.

Restoration, enhancement, and protection of forest ecosystem components is complementary to, if not necessary, to achieving our first goal—hazardous fuel reductions. In order to achieve a long-term, landscape fuel condition that would result in lower intensity or mixed severity, mosaic fire events, the restoration of species adapted to low- to mixed-severity fire regimes must occur. To achieve both fuel reduction and forest restoration objectives, fuel treatments can be designed to restore forest conditions including forest cover, species composition and structure across the landscape to a more resilient and resistant condition (Graham et al., 2004).

The forest stands' current species composition, densities and forest structure in the project area is less resistant to natural disturbances and environmental stressors than those that occurred historically. By restoring fire- and drought-resistant tree species to the composition levels that occurred historically, long-term forest health would be improved and the risk of insect and disease outbreaks, as well as large, severe wildfires would be reduced. Additionally, habitat for those wildlife species associated with low- and mixed-severity fire regimes would also be increased over current conditions.

1.3 Scope of the Analysis

The analysis of effects disclosed in this document includes those occurring from the entire "scope" of the decision. Scope is defined in 40 CFR 1508.25 as the range of actions, alternatives, and impacts to be considered in an EIS. This analysis discloses the environmental effects of the Proposed Action (Alternative 2) and No Action (Alternative 1), within the project area and surrounding landscape. The scope of the proposed action is limited to the specific fuel treatments and mitigations proposed on National Forest land in the Lakeview-Reeder area. The geographic extent of some areas used to analyze different components (watershed and wildlife home ranges) may extend beyond the project area.

This analysis is the site-specific documentation for Forest Plan implementation. The Proposed Action provides the basis of a management strategy for the project area based upon the specific Forest-wide goals, objectives, and standards of the Forest Plan; interdisciplinary team discussions, public involvement, legal framework and agency policies and regulations.

Types of Actions Analyzed

Connected Actions

Connected actions are those actions which are closely related and therefore should be discussed in the same environmental impact statement. Actions are connected if they:

- automatically trigger other actions which may require environmental analysis,
- cannot or will not proceed unless other actions are taken previously or simultaneously, or
- are independent parts of a larger action and depend on the larger actions for their justification.

The proposed action includes those activities necessary to fulfill the identified purpose and need.

Cumulative Actions

Cumulative actions, which when viewed with other proposed actions have cumulatively significant impacts and should therefore be discussed in the same impact statement.

Similar Actions

Similar actions are actions that have enough similarity in timing or geography to the proposed action that the effects of these similar actions should be considered in the same environmental analysis as the proposed action and its alternatives. This proposed action does not have any similar actions.

Types of Impacts Analyzed

The scope of the analysis includes consideration of three types of effects: direct, indirect, and cumulative; which are disclosed in Chapter 3 by affected resource. The definitions of these impacts or effects are (40 CFR 1508.7 and 8):

- Direct effects, which are caused by the action and occur at the same time and place.
- Indirect effects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable.
- Cumulative impact is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

  Past, ongoing, and reasonably foreseeable activities that have occurred (or will in the future) in the various resource analysis areas are presented in Appendix B. These activities have been broadly categorized into those that could affect the various resources and those that would not. Past, ongoing and reasonably foreseeable activities that could affect the resources and could potential add to the effects from the proposed action, are briefly discussed in Appendix B and then analyzed in more detail for each of the relevant resources in Chapter 3. Activities that would not have effects are briefly discussed in Appendix B and then eliminated from further analysis. Each resource in Chapter 3 analyzes only those actions that fall within the cumulative effects analysis area described for that resource and that have the potential to affect the resource. This analysis does not include potential future activities in which the timing and conditions are highly uncertain. For example, it was decided that any future actions designed to facilitate or maintain the desired stand conditions defined in this document would be analyzed separately at a later date when any such proposal would be “ripe” for a decision by the Responsible Official.

1.4 Regulatory Framework

Laws and regulations provide direction for land management activities and protection of individual resources on federal lands. In part, this regulatory framework defines the scope of analysis and methodology (what needs to be analyzed and how) for individual resources. Shown below is a partial list of federal laws and executive orders pertaining to project-specific planning and environmental analysis on National Forest System Lands. Policies, direction and laws that relate to specific resources, such as the Clean Water Act, are discussed in greater detail in the various resource sections of this document, i.e. Water/Hydrology, and include pertinent disclosures and findings.

Federal Laws

- National Environmental Policy Act (NEPA) of 1969
- Clean Water Act (CWA) of 1948 and amendments (1977)
- Clean Air Act of 1955 and amendments (1970)
- National Forest Management Act (NFMA) of 1976 as amended
- Forest and Rangeland Renewable Resources Planning Act of 1974
- Multiple-Use Sustained Yield Act (MUSY) of 1960
- Endangered Species Act (ESA) of 1973 as amended
- National Historic Preservation Act of 1966 as amended
- Archeological Resource Protection Act of 1980
- American Indian Religious Freedom Act of 1978

Executive Orders

- Executive Order 11593 (protection and enhancement of the cultural environment)
- Executive Order 11988 (floodplains)
- Executive Order 11990 (wetlands)
- Executive Order 12898 (environmental justice)
- Executive Order 12962 (aquatic systems and recreational fisheries)
- Executive Order 13186 (Migratory Bird Treaty Act)

Final Rule – Administration of the Forest Development Transportation System

In January 2001, the Forest Service Manual (FSM), which governs regulations concerning the management, use and maintenance of the National Forest Transportation (Road) System, (Chapter 7700) was revised with a "Final Rule". The Final Rule de-emphasized the development of forest road systems and added a requirement for science-based roads analysis. The intent of the revision is "to help ensure that additions to the National Forest network of roads are those deemed essential for resource management and use; that, construction, reconstruction, and maintenance of roads minimize adverse environmental impacts; and finally, that unneeded roads are decommissioned and restoration of ecological processes are initiated," (36 CFR Part 212).

The Final Rule set forth that if a Forest level roads analysis has not been completed, the Responsible Official determines whether a roads analysis is needed at the project scale, and if so, what level of analysis is necessary to support a project-level decision. The Idaho Panhandle National Forests has not completed a forest-level roads analysis. The Roads Analysis conducted for the project area is included in the project file (PF-RDS-1).

1.5 Decision to be Made

This environmental impact statement (EIS) is not a decision document. The EIS discloses the environmental consequences of proceeding with the proposed action or any of the alternatives. The Responsible Official (Forest Supervisor) will select an alternative based on the information in this

document, on public comments, on financial considerations, and on how well the preferred alternative meets the purpose and need of the project and complies with applicable state and federal laws, agency policy and Forest Plan direction.

The decision to be made involves the selection of an alternative. If an action alternative is chosen, the decision will include:

- When proposed activities could begin and whether there are any timing restrictions.
- What type of fuels treatment would occur and where.
- Which elements of the Transportation Plan, including road improvements, would be implemented, and any timing requirements.
- What associated activities would take place, such as monitoring and mitigation measures and how such features would be applied.

Chapter 2 – Collaboration and Alternatives

2.1 Introduction

The Lakeview-Reeder Fuel Reduction Project is an authorized project under the HFRA. In that act, it is recognized that collaboration is the key to the successful development of a fuel reduction project, and therefore HFRA encourages meaningful public participation early in project development through collaboration with State and local government agencies and interested persons. This chapter begins by describing the collaboration that occurred during the planning stages of this project and how the Forest Service used that process to develop the final proposed action. After the collaboration process is discussed, the details of the proposed action and alternatives are presented. In addition, the monitoring associated with this proposal is presented in this chapter. Lastly, a summary of the environmental effects that the alternatives would have is presented.

2.2 Public Collaboration and Involvement

HFRA requires hazardous fuel reduction projects to be developed in a manner consistent with "A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment 10-Year Comprehensive Strategy Implementation Plan" (HFRA 2003 sec. 104(f)). One of the action items in this implementation plan addresses local level collaboration and recommends coordinating with Federal and State agencies, local governments, landowners and other stakeholders, and community-based groups. The National Fire Plan also directs local level collaboration, involving participants with direct responsibility for management decisions affecting public and/or private land and resources, fire protection responsibilities, or good working knowledge and interest in local resources.

The collaboration efforts that took place for this project were substantial and occurred in two general stages. First, a series of collaborative activities occurred to develop an initial proposal and identify tentative resource issues to be included in the environmental analysis. After this initial proposed action was developed and released to the public, a second phase of collaborative efforts took place to refine the proposal in order to better integrate other resource issues into the design of the project.

Various methods were used to facilitate a collaborative process. Notices were sent out to interested publics at various stages of the planning process, field trips to the project area were conducted and numerous indoor meetings were held. A summary of those efforts is presented below. The public involvement plan, scoping letters, public responses and content analyses can all be found in the project file and/or on the IPNF website (http://www.fs.fed.us/ipnf/eco/manage/nepa/index.html).

Development of the Proposed Action

Spring 2004 to February 2005

The Priest Lake Ranger District (PLRD) Fire & Fuels staff initially met with the Bonner County Wildland Urban Interface Fire Mitigation Planning Committee, which is comprised of county administrators, private landowners, representatives from local emergency services, fire districts, as well as state and federal land management agencies. That planning committee was assembled to define the wildland urban interface for Bonner County, develop a fire mitigation plan for that WUI, and identify areas within Bonner County which were priorities for hazardous fuel reduction treatments. Factors used to identify priority areas included: density of private property values, proximity to infrastructure (highways/county roads, utilities, etc.), as well as risk factors (e.g. increased ignitions, high forest fuel accumulations, topographic barriers, etc.). The Bonner County WUI Fire Mitigation Plan was published in May 2004. Within that plan, the WUI around Reeder Bay and the community of Nordman was identified as a priority

for hazardous fuel reduction treatments, due to the densities of private land/structures, infrastructure, natural resource values, as well as the high concentrations of not only residents but also those who recreate in the area.

Concurrently, Pend Oreille County, Washington also developed a "Community Wildfire Protection Plan" which includes significant discussions and assessments about wildland fire hazards across ownerships in the county, as well as detailed definitions of wildland urban interface and critical infrastructure. The plan identified many of the areas within the Lakeview-Reeder project area as a moderate to high risk.

Shortly after both Bonner County, Idaho and Pend Oreille County, Washington protection plans identified areas within the project area as high-risk and/or critical to public infrastructure, the Priest Lake Ranger District began considering National Forest System (NFS) lands in the area for fuel reduction treatments. During the fall of 2004 and spring and summer of 2005, foresters and fuel specialists began surveying forest stands in the area, evaluating the stands in terms of their fire hazard potential (which relates to vegetation types and quantity, canopy base height, canopy density, ground fuels and historic forest composition and ecology), adjacency to existing fuel breaks, topography, prevailing winds, as well as proximity to potential ignition sources, private property, homes and egress routes.

After a cursory fuel hazard assessment was completed, the Lakeview-Reeder Fuel Reduction Project planning process began. On February 2, 2005, Priest Lake Ranger District staff participated in a meeting hosted by BONFire, which is a funding off-shoot of the Bonner County WUI Fire Mitigation Planning Committee to help private landowners complete fuel reduction work on their own property. The meeting was held at the Priest Lake Elementary School specifically for private landowners and residents in the vicinity of Nordman, Reeder Bay, Lamb Creek, Outlet Bay, Kalispell Creek, and Gleason-McAbee Road. Over 1000 invitations were sent out; 49 individuals (in addition to BONFire, federal and state representatives) attended. At that meeting, Forest Service staff discussed many planned and ongoing fuel reduction projects across the District, including the area around Nordman and Reeder Bay. Those interested in the Lakeview-Reeder project were invited to attend a preliminary planning session on February 17, 2005.

At the February 17 meeting, Priest Lake Ranger District staff gave an overview of the potential Lakeview-Reeder project area (extent was identified primarily by watershed boundaries in the area), described some of the initial determinations of hazardous fuel conditions and discussed possible management strategies. At that meeting, some of the public raised questions about potential issues including access, wildlife corridors, grizzly bear habitat, water quality, recreation and visual considerations (PF-SCOPE-2).

October 2005 to Summer 2006

On October 28, 2005, nearly 800 informal scoping letters were mailed to private landowners in and near the project area, as well as other individuals, agencies, community organizations and interest groups to solicit feedback about potential concerns within the project area (PF-SCOPE-03). A press release was also sent to local newspapers and radio stations (PF-SCOPE-03). In addition, the scoping letter was placed on the Idaho Panhandle National Forests (IPNF) website. The letter identified specific areas with hazardous fuel concerns, detailed existing fuel conditions, and described appropriate management options. Priest Lake Ranger District received nearly 90 responses as a result of this scoping effort. Most responses echoed similar potential issues to those discussed at the first public meeting and at interdisciplinary team meetings including fire hazard, public access, grizzly bear habitat, and water quality, soil productivity and visual considerations.

On April 4, 2006, another scoping notice was sent to those who had indicated continued interest in the project (PF-SCOPE-3). This second notice provided more discussions of the fire risk in the area and of

the potential environmental effects and trade-offs of various treatment types and levels. Three different potential treatment levels were presented in this notice in order to determine how the public wanted the Forest Service to balance wildfire risks in the WUI with private and natural resource values. In other words, how much hazard should be mitigated, what level of wildfire risk is the public comfortable living with and to what degree should the Forest Service be responsible for reducing that risk. The treatment levels were based on proximity to private land boundaries and infrastructure, risk assessment (based on fuel conditions, proximity to ignition sources, topography, etc.), and strategic locations for landscape fire behavior modification. Each of these levels prescribed differing amounts of fuel treatments and each lessen the fire risk to different degrees. Level 1 showed treatment of the fewest acres, and level 3 showed treatment of the greatest number of acres. Level 2 fell between the two. Forty-six individuals or groups responded in writing to that second, informal scoping. Although differing responses were received, it became evident that most of the stakeholders wanted the Forest Service to take an aggressive approach to mitigating the wildfire risk in the project area (PF-SCOPE-4).

In addition to the scoping letters and responses, foresters and fuel specialists visited with individuals who, during scoping efforts, expressed interest in specific forest stands or areas. Many of these people are adjacent landowners who would be directly affected by whatever actions may be undertaken. Many visits involved walking through the stands to observe actual conditions, as well as discussions about ecological processes, feasible site-specific fuel reduction treatment activities and possible environmental effects. Some of these areas included treatments at the base of Nickelplate Mountain, Vimmy Ridge, areas above Reeder Bay Campground and treatments along the Kalispell Creek road.

Treatment areas at the base of Nickelplate Mountain and Vimmy Ridge were modified or dropped altogether because of landowner concerns for primary wildlife travel corridors and potential increased Off-Highway Vehicle use (OHV). Treatments above Reeder Bay Campground were scaled back due to concern for white-tailed deer winter range. Treatments were modified along the Kalispell Creek road because of landowner concerns for perennial springs near the property line.

In addition to the scoping notices that were sent out, District staff presented the same information at seven local community group meetings – Priest Lake Chamber of Commerce, Priest Lake/Kaniksu Lions' Club, West Priest Lake Volunteer Fire Department, Priest Lake Trails & Snowmobile Club, Lakeface Lamb Stewardship Monitoring Committee, Priest Community Forest Connection and Selkirk Conservation Alliance.

The purpose was to encourage group-specific feedback as to which option or combination of options is most important to balance wildfire risks with values, both private and natural resource. Written responses were requested from individuals as well as a consensus of each group to provide as much detail as possible about which option(s) they support, as well as supporting reasons and why the other options were not selected (PF-SCOPE-3).

On August 3 and 5, 2006, the Priest Lake Ranger District hosted Lakeview-Reeder Fuel Reduction Project field trips, at which 26 individuals and 5 Forest Service employees discussed the project, stopped to look at stands with hazardous fuel conditions, looked at similar stands post-treatment in the Lakeface Lamb project area and considered potential effects of the project (Figure 4). Many project-related issues were discussed at length, including possible impacts to soils; water quality; threatened, endangered and sensitive plant and animal species; grizzly bears and Bear Management Unit (BMU) core habitat; visuals/scenic qualities; recreation; future access; and the potential for increased resource damage caused by ATV or off-road recreation. Other factors such as wildland fire preparedness, landscape fire potential and risk, as well as personal responsibility were debated. Possible design criteria and mitigation measures, which could either negate or minimize potential detrimental impacts to resources, were also discussed during the field trip (PF-SCOPE-3).

Figure 2-1. Attendees of the August 3rd field trip comparing an untreated stand with a commercially thinned stand as part of the Lakeface-Lamb Fuel Reduction Project at Priest Lake.

Some treatment areas were modified as a result of these meetings including some treatments along the Kalispell Creek road. One participant, an adjacent landowner, asked if some forest stands could be thinned instead of regenerated. Foresters evaluated the stands more thoroughly and concluded, based on the specific site conditions, that thinning was a viable option in the stands the adjacent landowner was most concerned with.

One of the field trip stops included a stand recently treated by BONFire on private property within the project area (Figure 5). During the planning of this project, BONFire had been working with interested landowners within the project area to treat fuels on their property. Generally, treatments consisted of removing the surface and ladder fuels and pre-commercially thinning the remaining overstory trees. Fuels were disposed of by piling and burning. A total of 43.5 acres on 28 parcels have been treated on private lands as a result of these efforts (Appendix B).

In addition, the project planners periodically attended BONFire planning meetings to provide updates on the progress of the Lakeview-Reeder project.

Figure 2-2. Stand on private property treated with assistance from BONFire.

Proposed Action Scoping– Fall of 2006

On November 14, 2006, the formal proposed action scoping notice that included a "Request for Comments" letter was mailed to members of the public, including those who had indicated an interest in the project, adjacent landowners, potentially affected organizations, and other public agencies (PF-SCOPE-03). At this same time, a Notice of Intent to prepare an Environmental Impact Statement was published in the Federal Register on November 28, 2006.

The letter that was sent to the public provided a review of the collaborative efforts, described the project purpose and need, detailed the proposed activities, and disclosed the issues that would be addressed. In response to this letter, comments were received from Idaho Department of Parks and Recreation, Environmental Protection Agency, Idaho Conservation League, Kootenai Environmental Alliance (comments submitted on behalf of The Lands Council and WildWest Institute), Priest Community Forest Connection, Priest Lake Volunteer Fire Department, and several adjacent landowners.

The proposed action was developed through a culmination of the public involvement activities to date. Through this process, the proposed action was designed after a treatment level similar to the level 3 presented in the last informal scoping notice (some changes to a small percentage of proposed treatment areas were made based on public input and additional field work). Of the three levels presented, this level would take a more aggressive approach to reducing the current wildfire hazard in the area. While some respondents wanted an even more aggressive approach than level 3 in reducing hazardous fuels, it was determined that level 3 would lower the wildfire risk effectively, while still maintaining all of the other project area resources in an acceptable condition. This initial proposed action is summarized below. A complete description is found in the project file (PF-SCOPE-7). However, as discussed in the next section

of this chapter, this initial proposal was later refined. The initial proposal consisted of the following activities. Fuel treatments were proposed on approximately 8,375 acres including:

- 2,816 acres of commercial thinning
- 4,177 acres of regeneration cutting
- 1,279 acres of burn only
- 103 acres of piling and burning

In order to adequately access the fuel reduction and forest restoration treatment areas, some road maintenance, reconstruction and construction activities was proposed. Furthermore, while conducting the road work necessary to access the treatment areas, additional measures were proposed to improve the condition of some of the existing roads, in an effort to reduce the potential for sediment delivery to nearby streams. The road work included:

- Construction of approximately 5 miles of new permanent road and one mile of temporary road;
- Reconstruction of eight miles of existing roads; and,
- Maintenance on approximately 36.5 miles of existing road.

Additional activities were identified within the project area by resource specialists. At the time this initial proposed action was developed, these activities were included in order to improve resources, mitigate the effects of the fuel treatment activities, and/or for the purpose of being consistent with forest plan direction. These projects included:

- Road #308 relocation
- Stream restructuring within Kalispell Creek
- Constructing fish habitat structures
- Eliminate fish barriers
- Improving Grizzly Bear Security
- Scenery Restoration

Refinement of the Proposed Action

Spring-Summer '07

On February 28, 2007, an informal collaborative group sent a letter to the Forest Supervisor expressing interest in providing additional input into the design of the Lakeview-Reeder Fuel Reduction Project and scope of the environmental document (PF-SCOPE-3). The group consisted of representatives of the Idaho Conservation League, Kootenai Environmental Alliance, Selkirk Conservation Alliance, The Lands Council, Priest Community Forest Connection, BONFire, Vaagen Bros. Lumber Company, Rocky Mountain Elk Foundation and a few interested landowners. This group requested that the public be given additional time to respond to the proposed action. In response, the Forest Supervisor extended the comment period from December 15, 2006 to February 2, 2007 (PF-SCOPE-5).

The participants in this informal collaborative group developed a list of concerns which were discussed further during a subsequent meeting with the Forest Service. Some remedies were suggested at that meeting, which included some additional mitigation measures and analysis issues. Fire management specialists described how treatments were strategically located based on physical site factors (fuels, topography, proximity to private property and values at risk) and predicted fire behavior using local fire

history and historical weather patterns, to develop a proposal that was most effective at disrupting the fuel continuity and affecting landscape fire behavior. In response to requests from this group, the Forest Service also developed and prioritized a comprehensive list of water quality, fish habitat, and grizzly bear habitat improvement and/or mitigation activities that could be included in the Lakeview-Reeder project. In addition, on April 30, 2007, the group issued another letter to the Forest Supervisor encouraging the Forest Service to establish another action alternative or modify the proposed action to incorporate the groups' input regarding fuels reduction practices; road construction, reconstruction, decommissioning and relocation; wildlife habitat and water quality protection activities. The group suggested an alternative that would eliminate a portion of the proposed fuel treatment areas that involved harvesting trees and were located in areas that were not as high of a priority to treat as other areas. In addition, the group requested that the Forest Service consider ways to reduce the new road construction, and lastly, to conduct as much of the mitigation and/or improvement work on the roads in the area to help aquatic resources and grizzly bear habitat. (PF-SCOPE-6).

During the summer of 2007 the Forest Service conducted some additional field work, as well as ran fire behavior simulations, in order to respond to requests from the informal collaborative group and determine which treatment areas provided more benefits than others. As a result of these efforts, in the early fall of 2007 the Forest Service developed a new alternative to address the comments from the informal collaborative group. Relative to the original proposal, the changes that were made included:

- A reduction in harvest acres from 8,375 to 3,864.
- A reduction in new road construction from 6 to 4.5 miles.
- Incorporation of 24.5 miles of road obliteration.
- Removing all harvesting in grizzly bear core habitat.
- Integration of additional mitigation measures and activities designed to meet Forest Plan standards regarding aquatic resources and grizzly bear habitat.

After weighing the degree to which both the original proposed action and this "new" alternative, would reduce fuels, and considering the efficiencies allowed under the HFRA authority to minimize alternatives that had to be analyzed in detail, the Forest Service decided to drop the original proposed action and instead, adopt the new alternative as the proposed action (see alternative 2 for details). The Forest Service determined that the new alternative would reduce fuels adequately enough to address the majority of fuel concerns. However, it was recognized that additional projects may have to be planned in the future to fully address the hazardous fuel reduction needs within the project area.

2.3 Issues

An issue, as it relates to the NEPA process, is a discussion, debate, or dispute with the proposed action based on some anticipated effect. Issues were identified by the interdisciplinary team using current knowledge of conditions and concerns and through collaboration and scoping described above. These issues reflect both agency and public concerns. After consideration, these issues were sorted into three categories: key issues, analysis issues, and issues eliminated from detailed analysis.

The following information is provided for both Key Issues and Analysis Issues:

- A brief description of the issue.
- The issue indicators that are used to measure predicted changes and determine differences between alternatives and effectiveness of the alternatives in addressing the issue and the purpose and need.
- The measurements used for the individual indicators.

Key Issues

Certain issues emerged during scoping efforts and were identified as being the most important public concerns. These issues became the "key issues" or those issues that were within the scope of the project and of sufficient concern to drive the development of and/or refinement of the proposed action and therefore, require more time and effort in the analysis. Key issues are used to develop and focus the specific activities of the action alternatives, sharply define effects and help define the scope of the environmental analyses and documentation. Key issues are specific to this geographic area and proposal and provide a good comparison between alternatives during analysis. The following Key Issues, indicators and measurements were used to track the issues through the discussions of the existing conditions and the effects analysis in Chapter 3, as well as in comparing the Proposed Action (Alternative 2) and the No Action (Alternative 1).

Wildfire Hazard

Reducing wildfire hazard and the risk to the values within this WUI are two of the objectives of this project. However, during the scoping and collaborative efforts that occurred for this project, it became apparent that there were disagreements and differences of opinions between some of the people involved on how much and where the treatments should occur in the project area, as well as how effective the treatments would be in reducing the wildfire hazard. Therefore, the issue indicators and measurements listed in Table 2 were chosen to help display how well the proposed action would meet the objectives for the project and reduce the hazard.

Table 2-1. Wildfire hazard issue indicators and measures

Issue	*Indicators*	*Measurements*
Effects of the project on wildfire hazard	**Potential Fire Behavior** – Fire behavior is measured by: potential flame length (which is related to fuel loading and fuel arrangement) to determine the surface fire behavior potential; rate of spread and the minimum travel time to determine how fast a fire would be moving across the landscape; amount of potential crown fire and crowning and torching index to determine potential crown fire activity.	• Flame Length in feet • Rate of Spread in chains per hour and the change to the minimum travel time • Crown Fire Activity in acres as well as the torching and crowning index
	Fire Regime Condition Class – Fire Regime Condition Class is a methodology which analyzes historic fire regimes with current fire conditions. The result is a value which determines if the current potential fire behavior and effects are within historic variation. Three Condition Classes are used to describe if the landscape is: within historic regimes (Condition Class 1), moderately departed from the historic regimes (Condition Class 2), or having a high departure from historic regimes (Condition Class 3).	• Condition Class Level

Forest Health

Restoration and protection of forest ecosystem components is the second of the two main goals of this project (see Chapter 1). These forest ecosystem components include forest composition and structure and landscape pattern. During scoping efforts the Forest Service received comments that questioned how the project would affect the health of the forests in the project area. The indicators and measurements were selected to respond to these comments as well as show how well the proposed action would meet the goals for the project.

Table 2-2. Forest health indicators and measures

Issue	*Indicators*	*Measurements*
Effects of the proposal on forest health.	**Forest Composition** – The most common tree species in the project area tend to be those that are shorter lived, more susceptible to insects and diseases, and less resistant to fire and drought. In general, this has increased dead fuels in the forest and has created a situation that could jeopardize the long-term health, function and resilience of the forest ecosystem.	• Forest composition in acres and percent of each tree species
	Forest Structure – A large amount of the forest is dominated by either very young or fairly old trees. By contrast, a much larger percentage of the forest is dominated by medium-sized trees. Unmanaged stands dominated by medium-sized trees often have more hazardous fuel conditions due to large quantities of surface, ladder and crown fuels.	• Forest structure in acres and percent in each structural stage.
	Landscape Pattern – These forests are moderately fragmented. Smaller patches of similar forest structures are dispersed across the landscape. This has affected the habitat for some wildlife species.	• Forest patch sizes

Grizzly Bear Habitat

The project area occurs within the designated Selkirk Grizzly Bear Recovery Zone, which was established by the US Fish and Wildlife Service (USFWS). Grizzly bears are known to use portions of the project area. The USFWS established two different grizzly bear management units that overlap portions of the project area – the Kalispell-Granite and Lakeshore units. Within each of these bear management units (BMU), the USFWS has established standards that limit the amount of open and total road density allowed in these areas. In addition, core habitat standards (areas without any open roads) were established for both BMU's.

During the development of the action alternative, this was the principle reason for:

- removing all vegetation treatments in grizzly bear core habitat;
- reducing road densities further, to create new grizzly bear core habitat; and
- applying mitigation measures to limit the disturbance to grizzly bears.

During the public scoping done for this project, there were comments submitted that questioned what the impacts would be to grizzly bears as a result of the proposed activities. As a result of this as well as the need to demonstrate how well the alternatives would respond to the bear standards, the following indicators and measurements were identified.

Table 2-3. Grizzly bear habitat indicators and measures

Issue	*Indicators*	*Measurements*
The effect of the proposal on grizzly bears and their habitat	**Total Motorized Route Density** – Calculations include open roads, restricted roads, roads not meeting all restricted or obliterated criteria, and all motorized trails.	• Total Road Density in percent of BMU with >2mi/sqmi • Open Road Density in percent of BMU with >1mi/sqmi
	Open Motorized Route Density – Calculations include open roads, roads not meeting all restricted or obliterated criteria, and open motorized trails.	
	Core Habitat – Core areas are those areas that are free of motorized access during the core security period and once established would remain in place for 10 years. Core is calculated by applying a 500 meter buffer to all open, restricted, and high use or motorized trails.	• Core Habitat in acres and percent of total BMU area
	Amount, Duration and Intensity of Disturbance – Amount of habitat that is affected by disturbances and length and severity of disturbances.	• Type, duration, intensity, and amount of disturbance.

Water Quality

The primary streams within the project area are Granite Creek, Reeder Creek, Indian Creek and Kalispell Creek. The current status and/or anticipated status of these streams are as follows:

- Idaho Department of Environmental Quality (IDEQ) has recommended that Granite Creek be listed as a water quality limited stream (WQLS) because of temperature concerns.
- Reeder Creek is currently listed as a WQLS because of sediment concerns, and IDEQ recommended it be listed for temperature concerns as well.
- Because Indian Creek is a tributary to Reeder Creek, the same IDEQ guidance will be followed.
- Lastly, Kalispell Creek is a WQLS for sediment and is recommended for listing for temperature as well.

Because of these listings by IDEQ and the Environmental Protection Agency (EPA), activities we propose must be designed so that they do not result in net increases in sediment or stream temperature to those listed streams. In addition, some domestic water sources are present in the project area and need to be protected.

The fuels reduction and vegetation treatments, road construction and improvement, road decommissioning, and temporary re-opening of the #311 road were designed to address this concern. Critical management issues for water quality include water yield, sediment yield, hydrologic function, riparian function, stream temperature and watershed condition class. The following table describes each of these critical issues and identifies the issue indicators and the measurements used for the analysis and documentation of effects. During public scoping, some comments were received that questioned what the effects would be of the proposed action on these water quality aspects. Therefore, to respond to those comments and determine whether or not the proposal would be consistent with all the laws and

regulations associated with water quality, the following indicators and measurements were selected for analysis.

Various computer models were used to estimate effects and to compare the relative differences between alternatives. The analysis methods and the models are discussed in more detail in Chapter 3.

Table 2-4. Water quality issues, indicators and measures

Issue	*Indicators*	*Measurements*
Water Yield – Activities such as those that are proposed could increase the water yield in streams and/or change the timing of flow from the steams. This in turn could detrimentally affect the stream channels and water quality attributes.	**Equivalent Clearcut Areas (or Acres) (ECA)** – ECAs are used as an indicator for water yield. The ECA is calculated from the total amount of tree crown removal in forest stands that has resulted from timber harvesting, road construction, fire, and other activities.	• ECA in acres • Increased risk for rain-on-snow events • Road density in miles per square mile.
	Risk for Rain-on-Snow Events – Canopy openings in the critical zone can increase sensitivity to and risk for rain-on-snow events due to decreased evapotranspiration, and increased snow accumulation, ablation, and melt. The result of creating the openings in the critical zone, is an altered hydrograph with higher peak flows due to a "flashier" response to climatic events, reduced base flows, and overall increased water yield.	• Sediment Yield in tons per acre • Road density on sensitive land types in miles per square mile
Sediment Yield – Sediment yield was assessed as a measure of the potential level of disturbance under any alternative. All stream systems process sediment, but not all streams are equally able to process. The WATSED model was used to estimate the sediments, of existing and potential sediment yields. Using the WATSED model outcomes, the hydrologist used professional judgement and field data to project possible effects from any action alternative	**Increases in Sediment Delivery-** Streams evolved with a balance of sediment and water yield. However when sediment delivery to the streams exceeds the capacity of the stream to transport and/or store the sediment than stream function suffers. The WATSED model provides a relative comparison of the potential increase in sediment yield under specific management actions. Additionally, the road density value lends itself to evaluating the risk of increased sediment delivery to the streams.	• Percent increase in sediment yield • Change in road density on sensitive land types in miles per square mile
Hydrologic Function – Hydrologic function addresses the ability of drainage to balance water and sediment yields. More specifically, it defines how movement of water through the landscape as precipitation passes through the forest canopy, over and through the soil, and through streams, rivers, and lakes on its way to the ocean.	**Road Density** – Roads contribute to increases in peak stream flows by increasing drainage efficiency as roads intercept and concentrate runoff from hill-slopes. Changes that may result from increased peak flows include alteration of stream geomorphology and ecology, more rapid turnover of riparian zone vegetation, and increased transport of woody debris and	• Ability of a channel to balance water and sediment yields

Issue	*Indicators*	*Measurements*
	sediment (Jones and Grant 1996).	
Riparian Function – Many aquatic and terrestrial wildlife species are dependent on riparian (i.e., streamside) habitat. Forested riparian areas provide the large woody debris (i.e., fallen trees in streams) that creates scour pools, dissipates erosive energy, controls bedload movement, stabilizes stream channels, and provides cover and food supplies for fish and other aquatic life. Live and fallen vegetation in riparian areas filters sediment from overland flow before it reaches stream channels. Riparian vegetation also provides shade to moderate stream temperatures and protects cold-water fisheries.	**Sediment Yield** –activities such as those that are proposed, have the potential to cause sediment to reach stream streams.	• ECA in acres within RHCAs • Road density in riparian areas in miles per square mile
Stream Temperature – The single most important variable which controls direct solar radiation and thus heat influx in small forest streams is shade (Cobb 1988). Variables other than vegetation, which influence the amount of solar radiation reaching the stream, include stream width, orientation, solar angles and surrounding topography. With the proposed activities, the only variable that could possibly increase the amount of solar radiation to reach the stream would be timber harvesting.	**Road Density** – Roads directly contribute to the increased sediment delivery by intercepting and concentrating runoff from hill-slopes. The degree of sediment delivery is related to the road density on sensitive land types where the potential for mass failure, sediment delivery and soil erosion are high.	• ECA in acres within RHCAs • Road density in riparian areas in miles per square mile
Watershed Condition Class – Data on the physical condition and biological variables of each watershed and subwatershed are compiled and analyzed in assessing the perceived water quality and watershed integrity relative to undisturbed conditions. This condition class is a measure of cumulative hydrologic effects from past watershed activities.	**Ability of a channel to balance water and sediment yields** – A generalized relationship indicating the "stable channel balance" is described in Rosgen (1996) as proportionality between sediment discharge, stream discharge, particle size and slope. A change in any one of these variables initiates adjustments in the other variables, thus resulting is a change to the channel.	• Condition Class rating of NPF, FAR or PFC.

Analysis Issues

Analysis issues are concerns about specific effects of proposed activities on the environment and therefore, become part of the effects analysis. The implementation of an action alternative is not expected to have significant impacts on these issues in the Lakeview-Reeder Analysis Area because the effects are limited in intensity and context. For some of theses issues, potential impacts are partially or fully remedied by refining the design of a project or by applying mitigation measures. Analysis issues did not rise to the level of key issues and are not used to develop alternatives, but are carried forward in the

analysis in order to provide additional comparison of the alternatives, measure the effects of each alternative on different forest resources and design specific protective measures. Each resource analysis in Chapter 3 provides details on the issues relevant to that resource and the potential effects of the alternatives; however analysis may not be as in-depth as for key issues.

Analysis issues include:

- Scenery – Portions of this project area can be seen from Priest Lake, as well as from popular travel ways like Highway 57 and various county roads. In addition, the area can be seen from popular recreational areas and hiking trails. The current IPNF Forest Plan identifies these areas as areas where the quality of the scenery would need to be maintained.
- Other Wildlife Species – A small portion of this project area contains habitat for threatened Canada lynx. Other species on the regional sensitive species list or identified within the Forest Plan as management indicator species have habitat in the analysis area. These include species such as flammulated owls, pygmy nuthatch, pileated woodpecker, black-backed woodpecker, goshawk, boreal toad, Townsend bat, fringed myotis bat, fisher, marten and wolverine. Lastly, a portion of the project area was designated in the Forest Plan as an area in which to emphasize the production of winter forage for big game species. Elk, moose, as well as both whitetail and mule deer exist in the project area, providing abundant hunting and viewing opportunities. Elk and moose commonly use habitat on Watson, Nickelplate, Reeder and Granite Mountains, while the lakeshore is important for whitetail deer. The analysis conducted for this project considers how the proposed activities may affect these species.
- Soil Productivity – Intense wildfires can decrease the productivity of soils by creating hydrophobic conditions, increasing erosion, through the volatilization of nutrients and loss of large woody debris. Some fuel treatment activities can also potentially negatively affect soil productivity, usually through soil compaction, loss of large woody debris or nutrient removal.
- Rare Plants – Treatment activities should not significantly affect federally-listed threatened, endangered or sensitive plant species. Analysis includes botanical surveys for federally-listed species within proposed treatment areas, as well as mitigation measures and design criteria that could reduce adverse effects to federally-listed plant species.
- Recreation – Within the project area, there are several developed campgrounds and picnic areas on NFS land. The Kalispell and Ledgewood Day-Use areas are used for picnicking and swimming, and the Reeder Bay Campground accommodates overnight campers. Within the project area there are also several hiking trails. Fuel treatments could affect recreation via noise, smoke, changes to scenery, or changes to road or trail access to NFS lands. In addition, project activities may influence the level of off-road motorized use.
- Air Quality – Some of the activities proposed for this project will likely generate short-term smoke during certain times of the year. Prescribed burning of forest fuels can be an effective means to reduce hazardous fuels. However, smoke caused from prescribed burning can affect people by reducing visibility and in extreme cases, even posing a health concern for sensitive individuals.
- Noxious Weeds – The project area contains different species of noxious weeds. The potential effects that project activities would have on the spread of noxious weeds are considered in this analysis.
- Fisheries – Granite Creek contains habitat for bull trout, a federally-listed species, and several streams in the project area produce westslope cutthroat trout, which is on the regional sensitive species list. Therefore, this analysis considers how project activities could affect the habitat for these, and other fish species.

- Old Growth – This analysis documents the maintenance of adequate old growth stands on the District to meet Forest Plan standards.
- Finances and Economics – This analysis describes project financial feasibility and economic efficiency.

Issues Not Considered in Detail

Issues that were identified as 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence were eliminated from detailed analysis. The Council on Environmental Quality (CEQ) NEPA regulations require this delineation in Sec. 1501.7, "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…" Based on the assessment of potential effects and on public and agency comments, it was determined that several issues would not be analyzed in detail in Chapter 3. A list of these issues and reasons for their elimination from detailed analysis are summarized below.

Effects of Proposed Activities on Special Resource Areas

The project area does not contain any research natural areas, wilderness areas, roadless areas or range allotments, therefore, potential issues associated with these resources will not be addressed in the DEIS.

Home Ignitability in the Home Ignition Zone

This issue was raised through scoping. The Lakeview-Reeder Fuel Reduction Project Environmental Impact Statement's purpose is to analyze impacts of Federal actions on National Forest. The Home Ignition Zone, a term described by one researcher as the home and its immediate surrounding (Cohen, 2003), in the Lakeview-Reeder project area is substantially on private land. Improving the protection of homes and fire-wise education is being accomplished by other programs. The Bonner County WUI Fire Mitigation Plan has a specific action item for assessing and addressing the "ignitability of structures" in Bonner County. Implementation of this action item and identified tasks is ongoing. State and local agencies, the Forest Service, the communities and interested members of the public have been collaboratively working to implement these tasks. Though the Forest Service is actively participating in the Bonner County WUI Fire Mitigation Plan implementation and agrees this is an important issue in that context, it is outside the scope of this project to propose actions on private land and, therefore, the issue was eliminated from further analysis. The effects of the ongoing activities on private land as they relate to fire hazard reduction are considered in the cumulative effects in the analysis of Fire and Fuels in Chapter 3.

Effects of Proposed Activities on Archaeological Sites

Cultural resource surveys of the project area have been completed as directed by the Cultural Resources Management Practices (Forest Plan, Appendix FF). The cultural resource inventories are on file for selective review at the Sandpoint Ranger Station. Numerous sites have been recorded, and a determination made to the extent of protection required. These sites would be protected under all alternatives. Any future discovery of cultural resource sites would be inventoried and protected if found to be of cultural significance. A decision would be made to avoid, protect, or mitigate the impact to these sites in accordance with the National Historic Preservation Act of 1966. Currently, there are no known districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places that would be affected by the proposed actions. As such, the actions should not cause the loss or destruction of significant scientific, cultural, or historic resources.

2.4 Alternative Descriptions

This section describes Alternative 1 (No Action) and Alternative 2 (Proposed Action).

Alternative 1 – No Action

Section 104(d)(2) of HFRA does not require the development or study of any alternative to the proposed action for those hazardous fuel reduction projects that are proposed in the wildland-urban interface and located no further than 1.5 miles from the boundary of an at-risk community. Because the proposed action for this project meets those criteria, it was not mandatory to include an analysis of the No Action alternative. However, the No Action alternative can provide resource specialists a means to evaluate the current ecosystem conditions as a baseline and can also be used to compare the projected effects of each management alternative. The decision-maker and members of the public can use No Action to look at the differences that would take place under other alternatives, as well as the consequences of not conducting treatments at this time if this alternative is selected. For these reasons, a No Action alternative was developed and studied for this project.

In this impact statement, the No Action alternative would mean that the proposed activity would not take place, and the effects of the No Action alternative would be those impacts that would occur as a result of not implementing the proposed action.

Although the selection of this alternative would defer all proposed treatment activities, it is important to keep in mind that "No Action" does not mean there would be no further management within the project area. The current level of management would continue. Activities such as fire suppression, projects analyzed in earlier environmental analysis and decisions, and routine road and trail maintenance would continue. The reasonably foreseeable activities (Appendix B), which would not be affected by this project, are included, as appropriate, in the resource discussions in Chapter 3.

The No Action alternative does not actively address reducing risk from severe fire. None of the proposed silvicultural and hazardous fuel treatments, prescribed burning, road improvement or aquatic and grizzly bear habitat mitigation measures would occur.

Alternative 2 – Proposed Action

This Proposed Action was developed through the collaborative efforts described earlier in this chapter. It was designed to meet the goals and objectives established for the project while meeting as many of the other resource needs as possible.

Activities that are included in this proposed action are discussed below and they are divided into three categories based on their primary purpose. First, the various types of fuel reduction treatments and associated road access activities are described. These activities are those that are specifically needed to implement the fuel reduction work. This is followed by a description of the primary "Project Mitigation Activities" that are included in order to help mitigate the potential negative effects that the fuel treatments (and associated road access activities) would otherwise have had upon the aquatic resources and grizzly bear habitat. Lastly, in order to conduct this fuel reduction project and at the same time, be consistent with all the Forest Plan standards and other legal direction regarding water quality, fisheries and grizzly bear management, additional "Forest Plan Consistency Activities" are included.

After these three categories of activities are discussed, the required design features and additional mitigation measures are presented.

Fuel Reduction Treatments and Road Access Activities

There are approximately 29,380 acres within the project area, and we are proposing to conduct treatments on approximately 3,864 acres or 13% of that area. As discussed in more detail below, we are proposing to treat the hazardous fuels using eight different methods, depending upon the site-specific conditions that occur in each of the forest stands. Mechanical harvest treatments would utilize either ground-based machines (2,311 acres) or cable yarding (20 acres). The map in figure 6 illustrates where these fuel treatments would occur in the project area. Figure 7 shows where all of the proposed road work is located. A discussion of the treatment types is provided below to help you understand what they would entail and why they are being proposed. In addition, the forest vegetation section of this DEIS provides details on how the different treatment types would affect the fuel hazard.

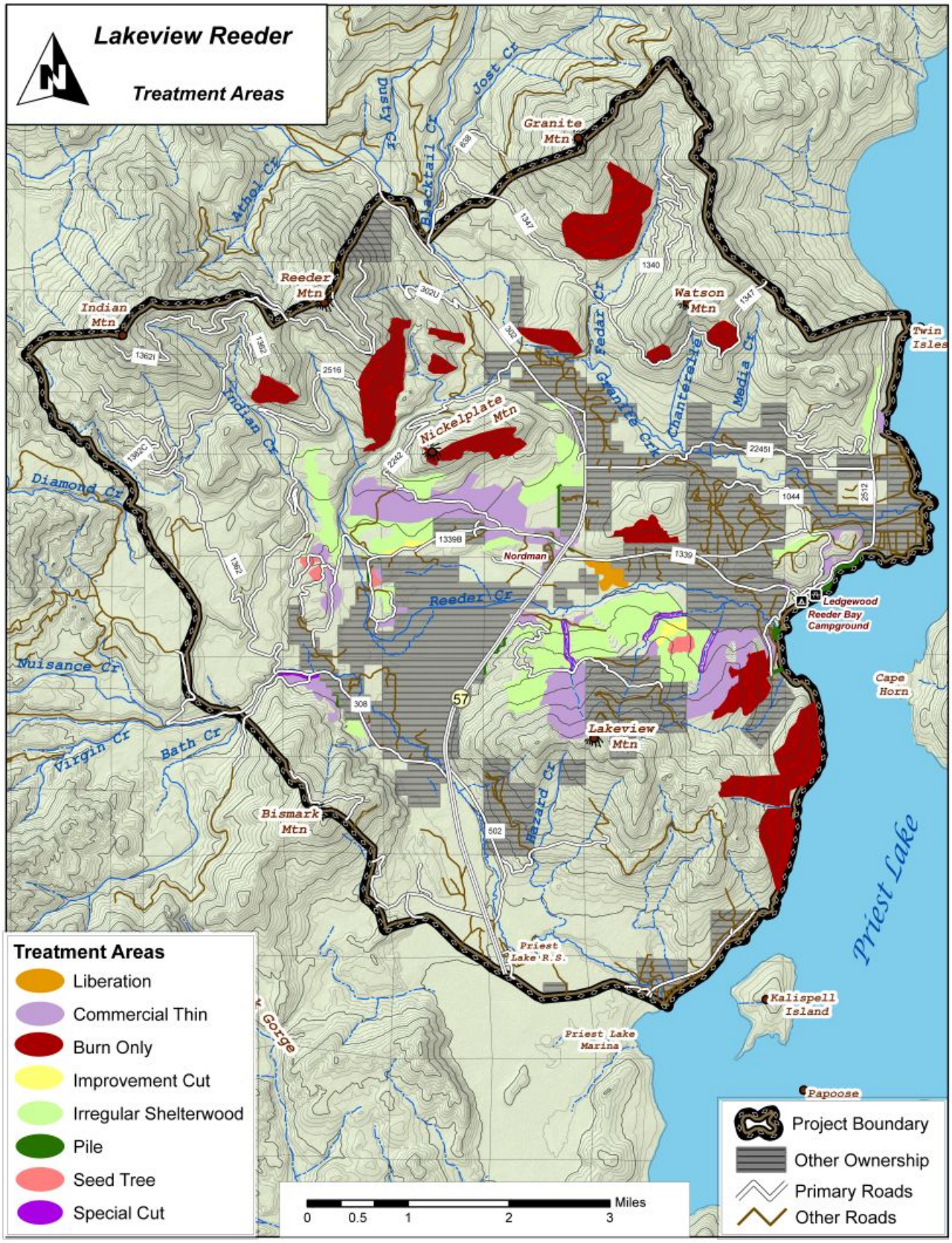


Figure 2-3. Map of proposed fuel treatments

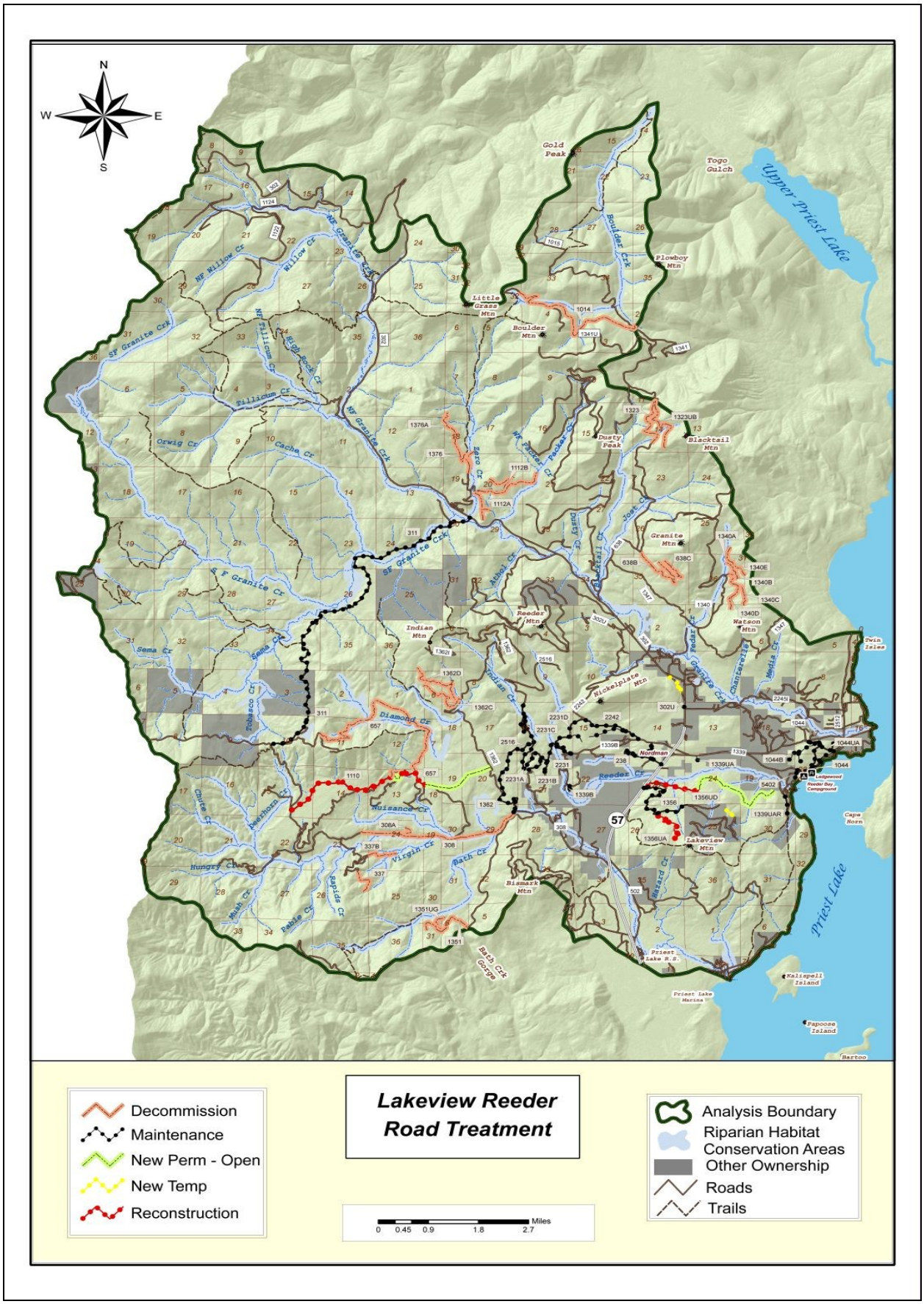


Figure 2-4. Map of proposed road work

Commercial Thinning with Mechanical Fuel Piling and Burning – (1,030 acres, 27 percent of the total treatment acreage)

This type of stand treatment generally involves cutting and removing the smaller trees, the tree species that are less desirable, and/or the poor quality trees that are being affected by forest insects, diseases or other factors. This treatment reduces the density of trees in the stand and provides the trees that remain more growing space and soil nutrients. This treatment would result in a moderate reduction of the upper canopy fuels and a substantial reduction of the ladder and surface fuels (Figure 2-5).

Figure 2-5. A commercially thinned stand in the 57 Bear Paws Fuel Reduction Project

After the merchantable trees that have been designated for cutting are removed, most of these areas will contain numerous very small, unmerchantable trees remaining in the "understory". Because these small trees often represent a fuel hazard concern because they can form "ladder" fuels, most of these small unmerchantable trees would be cut via a "hand slashing" activity. The fuels that result from both the cutting of the merchantable and unmerchantable trees, would be grapple piled in the stand by a track-mounted excavator type machine and the piles would subsequently be burned[1].

On average, the stands that are proposed for this type of treatment have an existing canopy cover of 77 percent and following the treatment, it is predicted that the average residual canopy cover would be 52 percent. Thus, approximately one-third of the existing tree canopy would be removed during this treatment. In general, the stands proposed for this treatment type tend to be 60-80 years old, with a smaller number as old as 100-120 years. In regard to trees densities, these stands may average approximately 300 trees per acre now and after treatment, an average of approximately 100 to 120 trees per acre would remain[2]. Currently the stands proposed for this commercial thinning treatment are generally dominated by western hemlock, grand fir and western redcedar trees (Figure 2-6). Many of these areas also have a moderate amount of western larch, lodgepole pine, and Douglas-fir present. Many

[1] In some stands where fuel, topography, vegetation conditions are conducive, fuels that would normally be grapple piled may be collected and transported out of the unit and processed for biomass utilization. The effects of these activities would be similar to grapple piling in that the same coarse wood and fuel reduction objectives would be met and machines would operate on a slash mat, however, pile burning would not occur.

[2] These estimates are for the trees that are larger than 5" in diameter. In many instances there are also a substantial number of trees present that are smaller than this size.

areas have a more minor amount of subalpine fir, Englemann spruce, western white pine and hardwoods present. Compared to the pre-treatment stand condition, the stands after the treatment would generally contain a higher percentage of larch, cedar and white pine, and a lower percentage of subalpine fir, lodgepole pine, grand fir and hemlock. After the stands are treated, residual trees would be distributed across the stand and any canopy openings would be very small.

Figure 2-6. Stand proposed for commercial thinning in the Lakeview-Reeder Project

In general, this type of treatment was proposed for those stands that contained enough healthy trees of a desirable species and condition that when those trees are left, the area would not contain any sizable canopy openings and no trees would need to be planted in these areas. This type of treatment was only selected where it was predicted that the majority of the trees that were left would remain healthy for a substantial amount of time into the future. This was a very important consideration because of the need to design the fuel treatment to be effective for a considerable amount of time. This could not be achieved if trees were left that had a fairly high likelihood of being susceptible to insect and disease mortality, storm damage or other factors that would kill or damage the trees and lead to increasing hazardous fuels.

Improvement Cutting with Mechanical Fuel Piling and Burning – (39 acres, 1 percent of the total treatment acreage)

This stand treatment is essentially the same as the commercial thinning treatment described above. The differences are rather subtle and from a practical standpoint, a thorough discussion of the differences is not necessary[3].

[3] Formal definitions for many of these treatment types are presented in Helms (1998).

The stands proposed for this treatment tend to be dominated by western larch trees. The larch form the overstory canopy layer and shade tolerant species such as grand fir, hemlock and cedar generally form the understory canopy layers. The treatment would involve thinning the upper canopy to give the larch more growing room and removing the understory canopy layer to substantially reduce the ladder fuels. Because western larch is the most shade intolerant tree species in the region, it requires more growing space to remain healthy than the other species do. Therefore, the estimated post treatment stand density would generally be less than described above for the commercial thinning treatment. Currently these areas have an average canopy cover of 59 percent and the predicted post treatment canopy closure is 45 percent. Therefore, about a quarter of the existing canopy cover would be removed with this treatment.

All of the other discussion items presented above for the commercial thinning treatment apply to this improvement cutting treatment and therefore they are not repeated here.

Liberation Cut with Mechanical Fuel Piling and Burning – (45 acres, 1 percent of the total treatment acreage)

This stand treatment generally involves cutting and removing most of the overstory trees in a two-storied stand, and retaining most of the small, desirable understory trees that have developed beneath the overstory canopy. In this specific project, the stands proposed for this treatment currently have lodgepole pine trees in the overstory (most in the 8-14" diameter sizes) and the understory trees are generally comprised of spruce, grand fir, hemlock, cedar and Douglas-fir (generally 2" or less in diameter). The lodgepole pine trees in the overstory are relatively unhealthy (largely due to their age and their tall, spindly form) and mortality from bark beetle attacks and/or storm damage is predicted to continue to occur in the lodgepole pine trees and add hazardous fuels to these stands.

The treatment would remove most of the lodgepole in the overstory, leaving any healthy larch or other conifers present. The smaller understory trees would be thinned at a later date with a pre-commercial thinning activity conducted by hand. The slash would be treated in the same manner as with the commercial thinning treatments. Although it is anticipated that tree planting would not be needed over most of these areas, a small amount of tree planting is expected and this would occur in small openings that may be created. Currently, there is an average of approximately 45 percent canopy cover in these areas and after treatment, approximately 40 percent would remain[4].

Irregular Shelterwood with Mechanical Fuel Piling and Burning – (853 acres, 22 percent of the total treatment acreage)

Unlike the other treatment types that have been discussed thus far, this treatment is specifically designed to regenerate the stand and establish a new age class of trees. This treatment would result in cutting and removing about half of the existing canopy cover in these areas and creating openings in the stand (Figure 2-7). After the merchantable trees that have been designated for cutting are removed, most of these areas will contain very small, unmerchantable trees remaining in the "understory". Because these small trees have often been suppressed by the overstory trees, they are generally poor quality trees and are usually not the desired species. Therefore, most of these small unmerchantable trees would be cut via a "hand slashing" activity. The fuels that result from both the cutting of the merchantable and unmerchantable trees would be treated in a similar manner as with the commercial thinning units and either mechanically piled and burned, or collected and utilized. After fuel treatments are completed, trees of the desirable species (most often western white pine and western larch) would be planted in the openings. These planted trees, in combination with other trees that "naturally" seed in and establish themselves, would regenerate the openings to establish a new age class of trees.

[4] The estimate of 40 percent includes considering the smaller, understory trees as part of this estimate.

Figure 2-7. This stand is an example of an irregular shelterwood harvest completed with the Lakeface-Lamb Fuel Reduction Project.

On average, the stands that are proposed for this type of treatment have an existing canopy cover of 67 percent and following the treatment, it is predicted that the average residual canopy cover would be 30 percent. However, as mentioned above, there would be substantial openings in these stands. The larger trees that are left would be distributed in an irregular fashion, with some clumped together and others scattered over the area. In general, the stands proposed for this treatment type tend to be 100-120 years old, however there are some that are younger (for example, in the 80 year old range). In regard to trees densities, these stands may average approximately 300 trees per acre now and after treatment, an average of approximately 20-40 trees per acre would remain (Figure 2-8). The trees that are left would generally be the larger trees that were present originally, and would be the more desirable species to leave (e.g., mostly ponderosa pine, larch, cedar, white pine). In addition to leaving larger trees as described above, some of the small, understory trees would be left as well. If they occur in the stand, some of these understory trees would be retained to provide some diversity for both scenery reasons as well as wildlife functions.

Figure 2-8. Stand proposed for a shelterwood with reserves harvest in the Lakeview-Reeder Project.

Currently the stands proposed for this treatment type are generally dominated by some combinations of Douglas-fir, western hemlock, grand fir, lodgepole pine and western redcedar trees. The overstory canopies tend to be moderate to very dense, and these areas tend to have a substantial number of understory trees that serve as ladder fuels. As compared to the stands that are proposed to treat using the commercial thinning or improvement cutting treatments, the stands proposed for shelterwood with reserve treatments tend to have fewer trees of the more desirable species, tend to have more insect or disease agents affecting the trees, and/or they do not contain enough good quality trees that would likely withstand wind/snow storms if the stands were thinned. Therefore, the decision was made to propose that these stands be regenerated via this treatment.

Shelterwood with Reserves and Underburning – (265 acres, 7 percent of the total treatment acreage)

This treatment type is similar to the shelterwood with reserves treatment described above, with the key exception being how the slash is treated. Rather than mechanical piling and burning the piles or collecting and utilizing the slash, this treatment entails lighting a prescribed fire over the treatment area to reduce the fuels (Figure 2-9). This treatment would be used in those areas where the tree species that were left after the harvesting activity, are those species that are fairly tolerant of fires. For example, ponderosa pine, larch and Douglas-fir. Those species (when they are fairly large) can generally withstand the prescribed burning without having a high likelihood of being killed. Prior to the burn, there may be some instances in which slash that is immediately next to leave trees, is pulled from the tree boles to reduce the likelihood that the leave trees are killed during the burn. In order to contain the prescribed fire in the desired area during burning, some firelines would need to be constructed prior to the burn. Depending upon the topography and other conditions, some of these firelines would be constructed by hand (aka “handlines”) while some would be constructed by using an excavator.

Figure 2-9. Underburning with a low-intensity prescribed fire in the Lakeface-Lamb Project.

With the exception of how the slash would be treated, all of the other discussion items that are presented above for the irregular shelterwood with mechanical fuel piling and burning treatment, apply to this treatment as well. Therefore they are not repeated here.

Seed Tree with Mechanical Fuel Piling and Burning – (55 acres, 1 percent of the total treatment acreage)

This treatment type is very similar to the shelterwood with reserves and mechanical fuel piling and burning treatment that was previously described. However, this treatment would result in a more open stand condition. Although the treatment would not be as void of trees as a clearcut treatment would be, this seed tree treatment would still be very open appearing. The areas proposed for treatment with this method currently have an average of 55 percent canopy closure, and the treatment would reduce that to approximately 8 percent. Rather than leaving 20-40 trees per acre as would the shelterwood with reserves treatment, this treatment would leave 5-10 per area. As opposed to the stands that would be treated using the shelterwood method, these stands have even fewer healthy, desirable trees to leave. Thus, that is the primary reason that this treatment type was selected as opposed to the shelterwood method.

All of the other discussion items presented for the shelterwood with mechanical fuel piling and burning treatment are similar for this seed tree method.

Special Cut with Mechanical Fuel Piling and Burning – (43 acres, 1 percent of the total treatment acreage)

In a few instances, proposed treatments would occur within Riparian Habitat Conservation Areas (RHCA's). In order to ensure that proposed activities do not detrimentally affect the RHCA's, a "special cut" treatment is being prescribed to achieve both fuel reduction objectives and riparian management objectives (RMO's). Essentially, these special cuts would be similar to a commercial thinning but with a slightly higher residual canopy cover remaining after treatment. Generally, these zones have an average canopy cover of 71 percent, and after treatment it is anticipated that the residual cover would approximate

63 percent. In all instances, a special cut would be used to “feather” the stand from a more open condition, to the untouched portion of the RHCA zone. This special cut zone may vary in width from 30 to 100 feet. As with a commercial thinning, after the merchantable trees that have been designated for cutting are removed, most of these areas will still contain numerous very small, unmerchantable trees remaining in the “understory”. Because these small trees create “ladder” fuels, those that are not needed to meet RMO’s would be cut via a “hand slashing” activity in order to meet fuel reduction objectives. The fuels that result from both the cutting of the merchantable and unmerchantable trees, would be grapple piled in the stand and the piles would subsequently be burned. No tree planting would occur with this treatment.

Hand Slashing with Handpiling and Burning – (14 acres, <1 percent of the total treatment acreage)

This type of treatment is proposed in a few instances when other fuel treatment types would not be feasible or would probably not meet other resource objectives (e.g., scenery and recreation). As discussed in more depth in the fire and fuels section, this type of treatment is very expensive and it generally does not remain effective in reducing fuels for very many years.

Generally, this treatment does not involve cutting or removing trees of a typical merchantable size (i.e., trees over 7” in diameter). Rather, most of the smaller understory trees are cut and the slash from those trees as well as most of the existing surface fuels are piled by hand and the piles are burned (Figure 2-10). Most of the trees that would be cut with this treatment would be trees less than 3” in diameter. While this treatment generally does nothing to space out the crowns of the overstory trees, it does reduce the lower ladder fuels as well as the surface fuels. In some instances, this treatment may also involve a limited amount of pruning to remove lower limbs on some of the trees.

Figure 2-10. Hand piled stand in the Lakeface-Lamb Project.

Hand Slashing with Mechanical Fuel Piling and Burning – (46 acres, 1 percent of the total treatment acreage)

This treatment type is similar to the hand slashing with handpiling and burning treatment discussed above. The only substantial difference is that this treatment would involve a machine piling the slash rather than having it piled by hand. This is cheaper than handpiling and when the topography, soils and the setting makes the use of it feasible, it generally results in a higher percentage of the surface fuels and ladder fuels being treated. As opposed to the hand slashing with handpiling and burning treatment described above, this treatment would generally involve cutting some of the trees between 3” and 7” in diameter, as well as many of the trees less than 3” in diameter. All of the other items are similar to the hand slashing with handpiling and burning treatment described above.

Burn Only – (1475 acres, 38 percent of the total treatment acreage)

Brush Fields – Most of the areas proposed for this treatment are currently dominated by a decadent shrub community. In many situations, a very light stocking of trees also occurs scattered through these shrub fields (Figure 2-11). The conifers are primarily Douglas-fir and/or ponderosa pine. The treatment proposed for these areas involves conducting a prescribed burn with the objective of reducing the amount of dead foliage in these areas and encouraging the new sprouting of the shrubs. Although there may be some hand lighting of these areas, it is anticipated that a lot of the area would be ignited using a helicopter with a torch.

Figure 2-11. Brush field burning in the Lakeface-Lamb Project.

Mortality on the few smaller trees occurring within these areas would likely be 10%-50%. The few larger trees would likely incur 10%-30% mortality. However the mortality would likely be on the lower side as the larger trees have an established crown that often shades out the shrubs and creates a micro-site where the fire behavior decreases. The most significant indicator of the burn would be scorch on the lower limbs which would "prune" the larger trees. Typically, green-up after a brushfield burn takes place within a few weeks and softens the contrast of the red limbs by mid-late summer.

Aspen Stands – In addition to conducting prescribed burning in decadent shrub fields, one additional burn only type of treatment is proposed. It involves conducting a prescribed burn through some quaking aspen stands (Figure 15). Not only would that treatment reduce the amount of existing dead wood in those stands, that treatment is also being proposed to cause the aspen to re-sprout. It is anticipated that in these aspen stands, that a small amount of hand slashing work would occur to cut down some of the small trees prior to the prescribed burning. This would be done to create a suitable fuel bed prior to the burn in order to help create conditions under which the prescribed fire would adequately burn through the stands.

Figure 2-12. An aspen stand proposed for burning in the Lakeview-Reeder Project.

In the aspen areas the fire behavior would be minimal, but the mortality on species such as lodgepole pine may be higher due to thinner bark. The red may be visible from the private homes between Vimmy Ridge and the Reeder Bay road, but for the most part the red trees would not be highly visible. Most of the mortality would be expected on the smaller understory trees and the clumps of aspen that would be targeted for regeneration.

Road Access Activities

In order to adequately access the fuel reduction treatment areas, some road maintenance, reconstruction and construction activities would be required on NFS lands. In addition to providing access to conduct the fuel reduction treatments themselves, these road improvements would also serve an important secondary purpose- to improve access for fire suppression activities when wildfires do occur in these areas. Lastly, while conducting the road work necessary to access the treatment areas and provide better suppression access, additional measures would be taken on these same roads to further improve their condition for aquatic resources. This additional work would be conducted for the specific purpose of reducing the amount of sediment that is currently reaching nearby streams, as well as reducing the amount of additional sediment that would otherwise have been created through the use of the roads for fuel reduction activities.

These road access activities include:

- Construction of approximately 2.5 miles of new permanent road;
- Construction of approximately .5 miles of new temporary road;
- Reconstruction of 5 miles of existing roads; and,
- Maintenance on approximately 17 miles of existing road.

A permanent road would be constructed across currently inaccessible NFS lands on the north side of Lakeview Mountain. Temporary road construction includes building four short spurs (not more than 75 feet long) to access treatment units along Highway 57 and building a 2,300 foot spur off of an existing road on Lakeview Mountain. All temporary roads would be obliterated after completion of proposed activities. On the roads proposed for reconstruction, activities would be conducted to make the roads safer for travel and/or to reduce the amount of sediment production. Such activities include replacing damaged culverts or culverts that are too small, installing relief culverts in ditch lines, adding gravel surfacing, creating rolling dips or water bars, roadside brushing and blading of the roadbed. To a lesser degree, some additional work would include realigning small portions of a few roads to help reduce road grades, lessen sharp corners or in some instances, increase the width of existing narrow roadways. On roads proposed for maintenance activities, most of the work would include roadside brushing, blading of the roadbed and spot gravelling.

Project Mitigation Activities

As discussed in more detail in chapter 3, the fuel reduction and road access activities would produce some short-term sediment to streams within the project area. To mitigate these impacts, some road related mitigation activities are proposed. In addition, the fuel reduction and road access activities would have some disturbance impacts to grizzly bears in the project area. To help offset those impacts, some additional road related activities are proposed for the primary purpose of mitigating potential disturbance to the bears. The following activities are included in this proposal to mitigate either sediment impacts, grizzly bear disturbance impacts, or both.

- **Road #308 relocation and associated activities for sediment mitigation** – As mentioned earlier, Kalispell Creek is a WQLS for sediment. Along the middle portion of Kalispell Creek, the #308 road parallels, and is very close to, the stream for several miles and is a known sediment source (see Figure 17). This project would obliterate a portion of this road segment and in its place, establish another route that is located away from the stream that would serve to connect the two remaining segments. The new route would come off of the 1362 road, head west and eventually tie into the existing 308 road in the vicinity of the 308C road. This project would involve removing approximately three miles of the #308 road where it is encroaching on the riparian zone, as well as constructing approximately 1.8 miles of new road away from the stream and reconstructing approximately 3.6 miles of existing road. Lastly, this activity would include placing some woody debris jams into the stream to help stabilize the stream channel as well as provide fish habitat. As discussed in more depth in chapter 3, all of these activities would reduce existing sediment sources into the creek, help offset the expected sediment generated from using the 308 road for hauling timber associated with the fuel treatments, and would help towards meeting the Forest Services obligation for a long-term reduction of sediment.

Figure 2-13. This photo shows a segment of Forest Service Road 308 that is tightly constricting the mainstem of Kalispell Creek. Estimates suggest that removing about 3 miles of Road 308 (where it closely parallels the creek) could reduce sediment delivery to Kalispell Creek by 200-400 tons[5] over 10 years

[5] This estimate assumes an annual erosion rate of between 1/8 and ¼ of an inch per year from a three mile road that is 16 feet wide. This does not include the incidental road failures at culverts that could produce hundreds of tons from one discrete source. Culvert failures in the past have produced almost 700 tons of sediment from location (Estimate a failure of a culvert that is 4 feet deep, damaged road width of 5 feet, road width of 16 feet and weight estimate of 2.16 tons/yd^3.)

Figure 2-14. This photo was taken one year after the treatment of an encroaching segment of FS Road 416. (FS Road 416 is located in the Quartz Creek drainage of the PLRD). Like FS Road 308, FS Road 416 was immediately adjacent to stream and was actively delivering sediment. Treatment of FS Road 416 included recontouring the road prism, seeding exposed soils and planting native vegetation.

- **Additional Sediment Mitigation Activities** – During the planning of this project, it was noted that there were two stream crossings located on roads that would either be used as haul roads during the fuel reduction activities, or would be otherwise affected by the project, that needed to be improved in order to mitigate sediment inputs or the potential for culvert failures and road "blow-outs". Specifically, on Road 1356 UD (a tributary to Reeder Cr.), there is a need to install a culvert to avoid additional sedimentation from the hauling and other use of the roads. In addition, on Road 1347 there is a stream crossing (Fedar Cr.) that is at risk for failure. While this road will not be used for hauling timber, there is a substantial amount of "burn only" treatment which is proposed above this crossing in this same drainage. The additional water yield, although minimal, that is expected from those activities could further predispose the crossing to failure. Therefore, to mitigate this potential effect and ensure that this crossing does not fail as a result of the fuel reduction activities, this crossing would be improved. Currently, there are pipes under the road at this location that are not large enough to allow for the stream flow, especially in light of the beavers that chronically plug the pipes. At this location the following work would be performed before the burning activity is conducted upstream.

Figure 2-15. Road maintenance is vital to maintaining the FS transportation system and protecting resources. This photo shows one of the undersized pipes located at the Fedar Creek and FS Road 1347 crossing that is blocked by beaver activity. If this crossing failed, many cubic yards of sediment would immediately be delivered to Fedar Creek and ultimately Granite Creek. As part of the larger LVR project, undersized culverts would be replaced with much more suitable crossings that could accommodate high flows and resist failure.

- **Grizzly Bear Disturbance Mitigation Activities-** As discussed in more detail in chapter 3, some of the proposed fuel reduction and road access activities would have impacts to grizzly bears through disturbance. To help mitigate those impacts, two road systems which are currently gated and closed to public motorized access, would be physically blocked for all motorized access in order to create more "core" habitat. These roads are the 1014 road (aka as the Bolder Meadows road) and the 1340A-F, and 1340AUA-D roads (Fedar Cr). The 1014 road is within the Kalispell-Granite BMU and the 1340 roads are within the Lakeshore BMU. On these roads, the culverts and other drainage structures would be removed, any unstable areas recontoured, the road bed ripped and seeded, and the beginning of the roadbed made impassable to motorized vehicles. This would occur prior to the fuel reduction activities.

Forest Plan Consistency Activities

In order to be consistent with Forest Plan standards as well as federal and state laws regarding aquatic resources as well as grizzly bear habitat, some additional activities are included into the proposed action. While these activities are not needed to mitigate the effects of the fuel treatment activities themselves, they are necessary in order to be consistent with Forest Plan standards and other laws for resources within the analysis area. These activities and issues are briefly discussed below. More information is included in chapter 3 in the aquatic and wildlife sections.

Fish Passage Activities

While information was being gathered for this project, it was determined that there were barriers to fish passage due to undersized or improperly designed road crossings in the analysis area. The Forest Plan contains two standards (fisheries standard #4, pg II-31, and facilities standard #9, pg II-36) that require that roads be designed to allow fish passage to suitable habitat. Therefore, these standards are not currently being met and the following activities are included to achieve consistency with those Forest Plan standards.

Within the project area there are 8 fish barriers currently preventing fish from freely moving up and down streams. These barriers are culverts that are either too small or were improperly installed. These barriers occur on roads:

- 1340 (Fedar Creek crossing)
- 1340A (Fedar Creek crossing)
- 302 (Packer Creek crossing)
- 302 (Zero Creek crossing)
- 2231 (Reeder Creek crossing)
- 2516 (Indian Creek crossing)
- 308 (Potholes)
- 308 (Nuisance Creek crossing)

The fish passages on roads 308 and 1340A would be improved during the obliteration work on those roads.

In 2002, the US Fish and Wildlife Service completed a draft bull trout recovery plan for the Clark Fork Recovery Unit which includes the Priest Lake Watershed (USFWS 2002). That recovery plan identifies catastrophic wildfire as a short-term threat to bull trout habitat. Although, the fuel reduction activities would lower some fire risk to bull trout streams within the project area, the removal of fish passage barriers described above would allow faster recovery of bull trout should a catastrophic wildfire occur by allowing populations from outside the affected area to move into the affected streams.

Grizzly Bear Security Activities

Research has continuously shown that grizzly bear disturbance and subsequent mortality is linked to human disturbance due to road access within identified recovery areas (Christensen and Madel,1982; Aune and Stivers,1985; McLellan and Mace,1985; Dood et al., 1986; Kasworm and Manley, 1988; McLellan and Shackleton, 1988; Aune and Kasworm,1989; Frederick, 1991; Mace and Manley, 1993; Mace et. al., 1996; Wakkinen and Kasworm, 1997; Metzgar 1998 and Mace et al., 1999). There are two grizzly bear management units that overlap with this fuel reduction project area- the Lakeshore Grizzly Bear Management Unit and Kalispell-Granite Grizzly Bear Management Unit. These are both below the minimum grizzly bear habitat management parameters identified in the Amended Biological Opinion for the Continued Implementation of the IPNF Land and Resource Management Plan due to elevated road densities (USFS 2007). In order to create additional core habitat and reduce road densities, the roads listed below would be closed to all motorized travel (except for over the snow travel). It is important to note that currently, all of these roads listed below are closed to public motorized vehicle use; they are either gated or have a guardrail barricade on them now. Therefore, these activities would not affect public access by motorized vehicles. These activities are required to be consistent with the terms and conditions of the 2001 Biological Opinion and grizzly bear recovery plan.

Table 2-5. Road closures proposed to meet grizzly bear management standards

Road Number	Road Location	Miles
657	Diamond Flats	6.0
638 B	Granite Mountain	0.3
337 B	Virgin Creek	0.7
1376	Zero Creek	1.0
1362 C	Indian Mountain	1.1
1362 D	Indian Mountain	1.4
1323	Blacktail Creek	2.0
1323 A	Blacktail Creek	0.8
1351 (west end)	Bath Creek	2.0

2.5 Alternatives Considered But Eliminated from Further Study

During the early planning and collaborative processes that occurred, other management alternatives and/or project design features that were brought up by either the public or IDT members were considered. While none of these alternatives were fully carried through the analysis process, in numerous instances, “parts” and “pieces” of the ideas or suggestions we received did become part of the final proposed action (Alternative 2).

Table 2-6. Summary of alternatives considered but eliminated from further study

Description of other alternative or project design features that were considered	Why the alternative was not fully analyzed
Limit the fuel treatments to only those areas that are either immediately around homes (in the homes defensible space) or to forest stands that occur on dry sites in the project area. In addition, on those dry sites, limit the treatment types to thinning and prescribed burning.	An environmental group requested that we include this alternative. However, an alternative of this nature would reduce the wildfire hazard to such a small degree that it would not meet the projects' goals and objectives. The discussion above under the heading of "Issues not considered in detail" and the discussion in the fuels and forest vegetation sections of this report provide more detail.
Include Kalispell Island and/or the Lakeshore Trail area to the Twin Islands and Beaver Creek into the project area and conduct fuel treatments in those areas as well.	This alternative was suggested by local residents as well as IDT members. However, it was decided not to include these areas in this specific project as it would have added a lot of complexity to the project. However, there are plans to consider these other areas at a later time in future planning projects (PF-Fuels-3).
Rather than burning fuels, use other techniques to reduce fuel hazards such as chipping, composting, etc.	We received a few comments from the public that suggested we consider other means of reducing slash, other than burning the forest debris. One such potential is that rather than piling the slash and burning, if market conditions are conducive, the slash could be collected and transported out of the forest stands and processed for biomass utilization (either to produce ethanol, chips, pellets or another product). While market conditions do not seem favorable for making this option economically viable at this time, conditions could certainly change. Therefore, we included this potential treatment method into the proposed action for some areas in the event that it becomes feasible. In regards to the treatment of the slash by chipping, grinding or otherwise breaking up the slash and spreading the debris on the forest floor, some local research on this topic has occurred (Jain, T. and Graham, R. et al, 2007 and Graham and Jain, 2007). In general, this type of treatment is called mastication and while it breaks up the slash into smaller sizes and spreads out the fuels, the treatment actually increases the amount of small fuels on the forest floor and it can take a number of years before it decays and in the meanwhile, this can actually increase the fire hazard. This is the main reason that this slash reduction method was not proposed.
Develop an alternative that gets all of the streams in the project area to meet RMO's (Riparian Management Objectives). Include an alternative that removes or fixes all the roads having design flaws, are otherwise contributing to soil and watershed problems, or are not needed for foreseeable management activities.	These alternatives were requested by an environmental group. While we did not design alternatives to specifically address these requests (because they would not meet the purpose and need of the project), we did include numerous road related activities into the proposed action to either mitigate effects of the fuel reduction activities on aquatic resources, or improve the aquatic conditions in order to meet state water quality standards and objectives, and hence the IPNF Forest Plan. These project mitigation and Forest Plan mitigation activities are discussed more above in the proposed action description.

Description of other alternative or project design features that were considered	Why the alternative was not fully analyzed
Conduct fuel treatments without constructing any new roads. Mostly relevant to the north side of Lakeview Mountain.	An alternative that avoided all new road construction was discussed but it was decided that certain areas (like the north side of Lakeview Mountain) needed additional access to treat the fuels and for better access in an event of a wildfire. Therefore, this alternative was not fully analyzed.
Consider an alternative that would not create forest openings larger than 40 acres.	The proposed action would create forest openings larger than 40 acres in size. Forest Service policy (FSM 2471.1) and the National Forest Management Act limit openings created by regeneration type cuts to 40 acres or smaller unless one receives the Regional Foresters approval to exceed that limit. For this project, we are seeking approval to exceed that limit. However, an alternative was initially considered that would have constrained openings to the 40-acre limit, but it would not have achieved as much fire hazard reduction as the proposed action, and it would have had negative environmental effects to some aquatic and wildlife resources. For these reasons, it was eliminated from further study. Additional information is provided in the project file on this alternative and the reasons for dropping it (PF-VEG-9).
Leave all of the roads that are used for the project in an open condition so the public has access.	We received this request from a local resident. However, because this area occurs within grizzly bear recovery habitat as well as watersheds that contain water quality limited streams, this alternative would not be consistent with the IPNF Forest Plan and federal laws.

2.6 Required Design Features and Mitigation Measures

In addition to the project mitigation activities discussed already in this chapter (under the heading of Project Mitigation Activities), the interdisciplinary team developed the following design features and mitigation measures. Design features are items that generally direct the location and extent of the activities and mitigation measures are those items designed to eliminate, reduce, or offset the potential negative impacts associated with the proposed action alternative. However, both design features and mitigation measures are integral parts of the proposed action and to some degree, the determinations of effects disclosed in Chapter 3 are dependent on their implementation. The estimated effectiveness of each item is included and many of these features are addressed through language in the contracts, which the Contract Administrator monitors for compliance.

Additional information on these features is included in the project file and is available by request.

Improvements and Survey Monuments

Survey monuments, landlines, and all other improvements would be protected by buffering, appropriate provisions in the contract, or both.

Estimated Effectiveness – High. Contract provisions for protection of improvements are utilized in all contracts and have been effective in protecting these features.

Public Health and Safety Features

Dust Abatement -- Dust Abatement used on Forest Service roads consists of road surface preparation and application of water or other materials. Use of materials other than water will require approval of the Forest Service, shall meet specifications provided in the timber sale contract, and follow manufacturers recommendations for application.

> Magnesium chloride or calcium chloride would only be applied under the following conditions to prevent delivery to stream channels:
>
> - Only the road prism would be treated, not the ditch line.
> - These products would not be applied during rainstorms or when storms are forecast within 24 hours.

Estimated Effectiveness – High. Contract provisions for dust abatement applications are utilized in contracts and have been effective in protecting natural resources.

Traffic Signing – During logging activities signs would be posted to inform the public of log truck traffic on major haul routes. Log hauling and some yarding and decking of logs would occur along Roads 308, 1362, 2231A, 2231C, 2231, 1339, 1339C, 1339B-C, 238, 238UA, 1356UD, 1356UA, 1356, 1044, 1044B, 1339A, 1044UA and 1339UAR.

Estimated Effectiveness – High. Contract provisions for traffic signing are utilized in contracts and have been effective in protecting public safety.

Air Quality – For local air quality reasons; restrictions on prescribed burning may be implemented by the Priest Lake Ranger District, in addition to those imposed by the North Idaho and Montana Airshed Groups.

Estimated Effectiveness – High. The Idaho Division of Environmental Quality recognizes the North Idaho Smoke Management Memorandum of Agreement (1990) as the best available control technology

for prescribed burning. This mitigation has a high degree of effectiveness to keep air pollution from smoke at acceptable levels and ensure that air quality standards would be met.

Road Reconstruction and Maintenance

A contract package for road improvement, reconstruction, or maintenance would include the site-specific BMP criteria to be applied during project implementation.

All slash would be removed from road ditch lines according to contract specifications.

Estimated Effectiveness – High to Moderate. See the discussion on Best Management Practices for more information.

Threatened, Endangered, or Sensitive Wildlife Species

Location of areas needing special measures for protection of plants or animals listed as TES are shown on the map(s) included in the contract package and buffers are designated on the ground. Measures to protect such areas are included in the contract as applicable, this can include restrictions on timing of activities to minimize or avoid impacts to some species.

Estimated Effectiveness – High. Contract provisions for protection of TES habitats and locations are utilized in all contracts and have been effective in protecting these resources (See Forest Plan Monitoring and Evaluation reports).

See Botany, Wildlife and Fisheries sections for additional requirements for TES.

Cultural Resources

Cultural resources (including any newly encountered historic or pre-historic cultural sites) including buildings, objects, and properties would be protected by avoiding or buffering the sites. This includes caves, sinkholes, vertical shafts, and related features protected by the Federal Cave Resources Act of 1988.

Estimated Effectiveness – High. Contract provisions for protection of cultural resources are utilized in all contracts and have been effective in protecting cultural resources (2000 Forest Plan Monitoring Report, Summary of Findings, page 2).

Noxious Weed Infestation and Spread

Noxious weed treatment would be conducted according to guidelines and priorities established in the Priest Lake Weed Control Project FEIS (USDA 1997). Methods of control may include biological, chemical, mechanical and cultural.

Gravel or borrow pits to be used during road construction or reconstruction would be free of new weed invader species (as defined by the IPNF Weed Specialist). A list of weed species considered to be potential new invaders is included in the project file. Any priority weed species (as defined by the IPNF Weed Specialist) identified during road maintenance would be reported to the District Weed Specialist. A list of priority weed species is included in the project file.

Weed treatment of all haul routes and service landings would occur prior to ground disturbing activities where feasible. If the timing of ground disturbing activities would not allow weed treatment to occur when it would be most effective, it would occur in the next treatment season following the disturbance.

All timber sale contracts would require cleaning of off-road equipment prior to entry onto National Forest lands. If operations occur in areas infested with new invaders (as defined by the IPNF Weed Specialist), all equipment would be cleaned prior to leaving the site.

All newly constructed roads, skid trails, landings or other areas of disturbance (including maintenance on existing roads) would be seeded with a weed-free native and desired non-native seed mix and fertilized as necessary.

All straw or hay used for mulching or watershed restoration activities would be certified weed-free.

Road segments identified for weed treatment and proposed for obliteration would be treated prior to obliteration.

Estimated Effectiveness – Low-High. The above mitigation measures are accepted weed prevention practices developed by public land management agencies and university cooperative extension offices and promoted by weed management organizations across the nation (e.g. Sheley et al. 2002, Drlik et al. 1998, USDA 2001a). The above measures include those required in Forest Service Manual (FSM) 2080 for activities related to timber harvest and roads. They are described in FSM 2981.2- 1a and FSM 2081.2 - 6a, respectively (see project file). Also included are weed prevention practices recommended but not required (see project file).

For new weed invaders, the estimated effectiveness of the above measures is high; the measures are expected to be very effective at preventing establishment of new invaders. According to current research (Hobbs and Humphries 1995), early detection and treatment of infestations before explosive spread occurs can significantly reduce the social cost of weed invasions.

For existing infestations confined to road prisms in the project area, estimated effectiveness is moderate to high; the measures are expected to be somewhat to very effective at reducing the spread of these in the project area. Effectiveness of treatments on National Forest lands could be reduced if adjacent landowners do not treat their weed infestations.

For existing infestations of hawkweeds, goatweed and knapweed, estimated effectiveness is expected to be low in portions of the project area where these weeds are already established in natural openings away from existing roads.

Existing weeds and new invaders are also spread by wildlife, winds, water and hikers – the mitigation measures would have no effect on these sources of weed spread.

Watershed Hydrology and Fisheries

Best Management Practices – Best Management Practices (BMPs) are incorporated into many different phases of the project. The hydrologist would review the planned design of all temporary roads and all road maintenance to assure compliance with BMPs. The engineering representative and hydrologist would monitor all temporary and reconditioned roads to ensure that they were built or restored to specifications.

A sale administrator would visit each active cutting unit at a frequency necessary to assure compliance with the BMPs and the timber sale contract. Minor contract changes or contract modifications would be agreed upon and enacted, when necessary, to meet objectives and standards on the ground.

BMP effectiveness would be monitored following at least one runoff season after BMP implementation by the project hydrologist. Rehabilitation projects typically are monitored annually or biannually for effectiveness and maintenance needs. The sale area would be periodically monitored for about 5 years post treatment.

Decommissioned Roads – Decommissioned roads would be checked periodically during the first year (and periodically thereafter if no problems are noted) to monitor effectiveness of erosion control and noxious weed control. Proposed road obliteration work would be monitored by a hydrologist during and post implementation to determine the effectiveness of obliteration prescriptions

Road Erosion – Road erosion, and other sources of erosion, would be noted and corrected as part of the anti-degradation feedback loop.

Fisheries – The project fish biologist would monitor the project to insure compliance with the Riparian Habitat Conservation Area requirements of INFS.

Features Designed to Protect Stream Channel Integrity and Hydrologic Function

Inland Native Fish Strategy –Cutting of trees would be limited in Riparian Habitat Conservation Areas (RHCA's) and would only be conducted where fish habitat would be enhanced. All proposed treatments would adhere to the guidelines established by the Inland Native Fish Strategy (INFISH). These RHCAs include 300-foot (slope distance) protection zones for streams that support fish, 150-foot protection zones for perennial streams that do not support fish, along with ponds or wetlands greater than 1 acre, and 75-foot protection zones for intermittent or ephemeral streams, ponds or wetlands less than 1 acre and sensitive landtypes throughout the project area.

Estimated Effectiveness – Generally High. These requirements would be implemented since they are incorporated into the project design.

Protection of Seeps, Bogs, Wallows and Springs – All known or discovered seeps, bogs, elk wallows and springs less than one acre in size would be protected with an INFISH buffer approximately 75 feet in diameter. There are no known areas larger than one acre within the project area.

Estimated Effectiveness – High. This practice would be implemented because it would be incorporated into the project design and unit layout, and implemented by the contract administrator.

Protection of Fish When Using Streams for Prescribed Burning Control – To avoid adverse effects to fish and redds while using natural water sources, water removal may not exceed 90 gallons per minute and pumping sites would be located away from spawning gravels. The intake hose would be screened to prevent accidental intake of small fish. An emergency spill clean up kit would be on site in the unlikely event of a fuel spill outside the containment system. This is consistent with INFISH direction (USDA 1995).

Estimated Effectiveness – High. These requirements would be implemented since they are incorporated into the project design.

Water Quality and Aquatic Habitat

Features Related to Timing of Road Activities

Timing of Road Decommissioning – Unless circumstances change during implementation that would extend the duration of time a road is needed, roads would be decommissioned within the following timeframes:

Temporary roads or existing road segments proposed for decommissioning that are not needed for post-harvest activities (e.g. fuel treatment or tree planting) would be decommissioned the same season following harvest activities or no later than the following season.

Other road segments proposed for decommissioning that are needed for post-harvest activities, such as prescribed burning or tree planting, would be decommissioned within two to five years of harvest activities.

Estimated Effectiveness – High. Decommissioning the roads will enhance the hydrologic recovery of the watersheds by increasing infiltration and minimizing the risk of future road failures.

Features Designed to Protect Soil, Water and Fish Habitat

Best Management Practices – All activities would be designed to protect water quality and fisheries habitat. Best Management Practices (BMPs) are the primary mechanism to enable the achievement of water quality standards. The Forest Service Handbook 2509.22 (Soil and Water Conservation Handbook) outlines BMPs that meet the intent of the water quality protection elements of the Idaho Forest Practices Act. Site-specific best management practices that have been specifically designed for these alternatives and are part of the design criteria are described more fully in Appendix A.

Estimated Effectiveness – Moderate to High. Depending on the practice. A description of each practice and an estimate of its effectiveness are located in Appendix A. Research has evaluated the effectiveness of BMPs (Seyedbagheri 1996, USDA Forest Service Monitoring Reports 1995 - 2003). The researchers found that properly implemented BMPS are moderately to highly effective at preventing resource damages. These practices would be implemented since they are requirements tied to the timber sale contract. The Forest Service Timber Sale Administrator would frequently review the project for compliance with these and other timber sale requirements. The North Zone aquatics staff would also do periodic monitoring to assess the effectiveness of these practices.

Sediment Reduction – Spot gravelling with approximately 6 inches of gravel would be required at all stream crossings, rolling dips, and in any specified wet areas. At eight locations within or adjacent to the proposed project, stream crossings will be improved and/or replaced to reduce sediment delivery to fish bearing streams.

Estimated Effectiveness - Moderate to High. The research strongly supports the use of spot graveling to reduce sediment delivery to streams. (Burroughs and King 1989, Foltz and Truebe 1995, Sheridan et al. 2005, Cornish 2001).

Protection of Seeps, Bogs, Wallows and Springs – All known or discovered seeps, bogs, elk wallows and springs less than one acre in size would be protected with a buffer approximately 100 feet in diameter. There are no known areas larger than one acre within the project area.

Estimated Effectiveness – High. This practice would be implemented because it would be incorporated into the project design and unit layout, and implemented by the contract administrator.

Soil Productivity

The following practices are required with the implementation of this project and are designed to minimize the detrimental impacts of soil compaction, displacement, severe burning, and nutrient and organic matter depletion on long-term soil productivity. The use of these practices would insure that the soil quality standards listed in the Forest Plan and Regional Soil Quality Standards would be met.

The design features have been separated into two primary categories:

- Minimizing Soil Impacts: these are guidelines applied to all treatment units;
- Soil Restoration Techniques: these are techniques applied to specific areas of damaged soils in all units and across the entire area on those units that currently exceed 15% detrimental disturbance.

Minimizing Soil Impacts

Protection of soils within stands identified for ground-based yarding

- Existing skid trails within units and slash mats would be used whenever feasible to reduce additional impacts from harvest and site preparation activities. Trails would be carefully selected for the least environmental degradation and optimal efficiency.
- All new skid trails would be designated and approved in advance and laid out to take advantage of the topography and minimize disruption of natural drainage patterns.
- All equipment would stay on designated skid routes, with the exception of feller-bunchers & harvesters.
- Harvester trips off of main trails would be limited to three passes. Where feasible, harvesters would place slash in front of the vehicle and work on a slash mat.
- Where terrain is conducive, trails would be spaced at maximum distance, except where converging. Conventional tractor skidder trails should be no closer than 75 feet apart in the summer on dry soils. In the winter on snow or frozen ground, skid trails should be spaced no closer than 50 feet apart. Harvester/forwarder trails should be spaced no closer than 50 feet apart, summer or winter.
- Strive to maintain narrow trails, 10 feet in width or less.
- Ground-based equipment would be limited to slopes of 35% or less. An exception would be made for short pitches (200 feet or less) of up to 45% for harvester/forwarders. Ground-based equipment should cable yard accessible steep slopes if they exceed 200 feet.

Estimated Effectiveness – High - past Forest Plan monitoring reports and literature (USDA FS 1997, 1998, 1999a, 2000, 2001, 2002, 2003 and 2004) indicate limited levels of detrimental soil compaction and displacement with these requirements. These guidelines exceed the requirement of the Idaho Forest Practices Act and meet the Forest and Regional Soil Quality Standard by limiting disturbance to less than 15% of the activity area (Adams 1999; Han 2006; Niehoff 2002).

- Ground-based operations would only be allowed when the soil is dry or frozen or snow-packed. Some simplified guidelines include:
    - Dry soil: Work would stop when trenching or mud is detected. If a fairly strong clod can be formed with the soil in the topmost 6 inches, then the site is too moist for work.
    - Frozen or Snow Packed: 0 inches of frozen soil need 10 inches of machine-packed snow (24-inch snow layer or 18 inches of settled snow); 2 inches of frozen soil need 6 inches of machine-packed snow (24-inch snow layer or 18 inches of settled snow); 4 inches of frozen soil no snow cover necessary. If necessary, pre-pack snow on designated routes before work commences. This allows soil to freeze and the snow road to solidify.

Estimated Effectiveness – High - past Forest Plan monitoring reports and literature (FS 2001a, 2002, and 2003; Flatten 2003; Philipek 1985) indicate little to no detrimental soil compaction and displacement with these requirements.

Protection of soils within stands identified for Skyline Yarding

- Skyline harvesting systems would be used on steep slopes (generally greater than 35%; see exception for harvester/forwarders). Corridors would be maintained as far apart as is feasible.
- The leading end of logs would be suspended during yarding. Yarding across any designated RHCA requires full suspension.

Estimated Effectiveness – High - the intent is to reduce the potential detrimental soil impacts of displacement and compaction. Past Forest Plan monitoring (Niehoff, 2002; USDA FS 2004) indicates low amounts of soil compaction and displacement with skyline yarding systems.

Nutrient Protection and Retention of Coarse Woody Debris

The latest soil nutrient management recommendations from the Intermountain Forest and Tree Nutrient Cooperative (IFTNC) and Rocky Mountain Research Station would be applied to each activity area. Management of coarse woody debris and organic matter in all units would follow the guidelines in Graham et al. (1994). In units where presently existing coarse material is not sufficient, project activities would provide enough dispersed dead and downed coarse material to meet the guidelines.

- Conventional removal (lop and scatter of tree branches) would be used, rather than whole-tree removal, on all units as appropriate.
- In general, activity fuel (slash) would remain on site over-winter so mobile nutrients such as potassium can leach from fine materials back into the soil. This requirement would not apply to 100-200 foot buffer zones around areas of high risk from fire. These buffer zones may be piled shortly after (a few weeks) harvesting is completed in order to reduce fire risk sooner. These areas would amount to less than 1 percent of the total treatment acres within the project and therefore, would not significantly reduce nutrient retention on these sites.
- Tree species suitable to the site would be planted.

Estimated Effectiveness – High to moderate - these practices are based on research and Intermountain Forest Tree Nutrition Cooperative recommendations (Baker 1989; Barber and Van Lear 1984; Edmonds 1987; Garrison and Moore 1998; Laskowski et al. 1995; Moore et al. 2004; Palviainen et al. 2004).

- Leave as much slash as is feasible under fuel hazard guidelines. Organic matter will ameliorate past and present soil impacts. Generally, leave at least 17 to 33 tons per acre of coarse woody debris (6-inch+ diameter) (Graham et al (1994).

Estimated Effectiveness – High - based on research (Graham et al. 1994, Brown et al. 2003) and Forest Plan Monitoring Reports (USDA FS 1998, 1999a and 2000), effectiveness is high when guidelines are used; implementation has been moderately successful.

Protection during Excavator and Grapple Piling and Biomass Gathering Activities

- Excavator and grapple piling and biomass gathering equipment would operate on a slash mat and existing skid trails on slopes under 35% when possible.
- Grapple piling would be limited to the driest season July 1 to November 1.

Estimated Effectiveness – High - Forest Plan monitoring and research (Han 2006; Niehoff 2002; USDA FS 2001a, 2002 and 2003) indicates limited soil disturbance if equipment is operated on a slash mat in the dry season.

Protection during Prescribed Burning Activities

- Wait an interval (at least one winter) between the thinning and the underburn, to conserve site nutrient capital and allow larger fuels to become firmly in contact with the soil, thus lessening their chance of complete combustion.
- Perimeter piling and whole tree yarding would be used adjacent to fire control lines or roads where fire control problems are anticipated. Perimeter width would be approximately 150 feet, or two tree lengths, and is often less depending on fuel loading or slope restrictions.

- Prescribed underburning and pile burning would take place only when the upper inch of mineral soil has a soil moisture content at or above 25 percent. Burning operations would attempt to leave at least 50% of the litter layer and 100% of the duff organic horizon. For burn only stands with unstable soils, (there is only one, stand 83802067), prescribed burning operations would only take place when conditions would preserve the litter and duff layer and protect tree and shrub roots.
- Burn piles would be small (approximately 10 to 18 ft. diameter) and numerous, rather than large and few.

Estimated Effectiveness – High - this practice is effective in retaining decomposing forest floor litter and organic matter to retain nutrients and soil productivity potential (Niehoff 1985; Niehoff 2002; USDA FS 2001, 2002 and 2003).

Threatened, Endangered, and Sensitive Plants and Forest Species of Concern (Rare Plants)

A qualified botanist would assist with unit layout as needed to ensure appropriate protection of documented rare plant populations and/or identified microsites of highly suitable rare plant habitat. Buffers would be site-specific.

Any changes to the selected alternative that may occur during layout would be reviewed, and rare plant surveys conducted as necessary prior to project implementation. Newly documented occurrences would be evaluated, with specific protection measures implemented to protect population viability. Such measures could include the following:

- Dropping units from harvest activity
- Modifying unit boundaries to provide adequate buffers around documented occurrences, as determined by the project botanist and based on topography, extent of contiguous suitable habitat for documented occurrences and the type of treatment proposed
- Modifying harvest methods, fuels treatment or logging systems to protect rare plants and their habitat
- Implementing, if necessary, contract provisions B(T)6.25#, Protection of Endangered Species, and C(T)9.51, Settlement for Environmental Cancellation

Estimated Effectiveness – High – no rare plants occur within proposed treatment units. The measures would ensure protection for rare plants and highly suitable rare plant habitat that occur in the project area.

Features Designed to Protect Wildlife Habitat

Wildlife Tree Retention – Snags and live tree replacements will be retained where opportunities exist in treatment units at levels recommended by scientific literature based on recent studies (Bull et al. 1997). Retention objectives are consistent with recent published data that suggests that populations of cavity nesters were viable in stands of ponderosa pine and mixed conifer forests that contained about four snags per acre (Bull et al. 1997). The Lakeview-Reeder project will strive to maintain more than the minimum number of snags because silvicultural prescriptions would feature retention of existing snags and large-diameter live trees, especially ponderosa pine and western larch, which can be managed as future replacement snags.

While retention objectives are accounted for on a treatment level scale, some snags would be represented on every 10 acres of treatment, in clusters or clumps where feasible, to promote good distribution of snags. Selection of snags and live tree replacements would emphasize practices that assure the highest probability for long-term retention (Bull, et al. 1997). The high hazard snags and snags in the advanced stages of decay would not be used to meet retention objectives (Intermountain Forest and Industry

Association et al. 1995). Retention practices would focus on ponderosa pine, western larch, Douglas-fir and western red cedar trees, especially veteran or relic ponderosa pine and western larch trees. Trees killed by root disease should be avoided, where possible, to meet retention objectives because of their rapid deteriorate/fall-down rate.

a) Retain all merchantable snags greater than 14 inches in diameter, to the maximum extent possible. Retain smaller snags if they do not contribute to excessive understory congestion, and retention is consistent with unit management objectives. Large snags that are felled for safety reasons should remain on site to provide for wildlife habitat and long-term site productivity.
b) Also, retain selected large Douglas-firs to achieve desired stand conditions, as described further in "Dry Forest Ecosystems" below.

Snag Management Guidelines (from R1 Protocols)

Vegetation Response Unit	Snags/Acre
Cool Douglas-fir, warm grand fir types on gentle slopes	4 > 20" dbh
Cool Douglas-fir, warm grand fir types on steep slopes	6-12 total, with 2-4 > 20" dbh
Cool, wet, and dry spruce, grand fir, hemlock and subalpine fir	6-12 total, with 2 > 20" dbh
Low elevation cedar, hemlock	12 total, with 4 > 20" dbh
High elevation spruce, subalpine fir, lodgepole	5-10 total > 10" dbh

Slash would be pulled back from veteran or relic ponderosa pine and western larch live trees and snags to protect them from the adverse effects of prescribed burning. Grapple piling would be considered to treat fuels on moderate slopes where residual snags would be at risk from broadcast burning.

Estimated Effectiveness – Moderate. This measure would be implemented using project layout, contract provisions, compliance monitoring and fuels treatment, and would have a moderate chance of avoiding and/or reducing adverse effects on snag dependent wildlife. It would not be the intent of this project to willfully remove the high hazard snags, and snags in the advanced stages of decay ("soft" snags). Some of these "soft" snags would survive and remain standing during the life of the project. Due to Occupational Health and Safety Administration (OSHA) guidelines, most contractors will remove snags deemed to pose a safety risk to ground crews. Consequently, group selection prescriptions will generally result in higher levels of snag retention than even-aged regeneration harvest units, since portions of units will be left untreated and contractor exposure to hazardous snags subsequently reduced. In addition, the "hard" snags preferred by the District for their ability to remain longer on the landscape are less likely to be felled as hazards than softer snags.

Past monitoring has demonstrated that tree harvesting and subsequent burning removes a large portion of existing snags, especially the "soft snags." However, through the strategic placement of leave patches or clumps, snags within these areas will be protected. In addition, prescribed underburning will recruit "new" snags by fire-killing residual green trees. There would be no problem meeting and exceeding live tree replacement criteria in that vegetative prescriptions are designed to leave ample green trees scattered in patches and individually (regeneration cutting), and uniformly (selective cutting) across treatment areas. Consequently, this measure should provide more than the minimum number of snags and live tree replacements.

Dry Forest Ecosystems – Because there are fewer ponderosa pine trees in the northern Rocky Mountains than were there historically (Chapter 3), it is necessary to retain selected large Douglas-fir trees in addition to the large ponderosa pine trees to achieve suitable habitat conditions for species associated with the drier habitats (e.g. flammulated owls, white-breasted nuthatch, Cassin's finch). For stands associated with the dry forest ecosystem, design harvest prescriptions to maintain the persistence of a mature ponderosa pine/Douglas-fir community by:

- Retaining an overstory canopy closure of 35-36 percent
- Achieving a relatively open landscape of ponderosa pine/Douglas-fir that is structurally complex as opposed to a landscape that is structurally simple. Design for non-uniform spacing of trees (moderate within stand variability) with patchy mirohabitats of understory trees.
- Retaining a minimum of one patch (~1/10th acre) of densely vegetated understory per five acres across all mature dry-site harvest units. Where possible, these patches should be in the vicinity of large residual snags or snag recruits.

Estimated Effectiveness - High. Using silvicultural prescriptions, marking guides, contract inspections and appropriate fuel treatment methods, this feature would have a high likelihood of avoiding or reducing adverse effects on flammulated owl habitat through retention of important habitat components (nesting, roosting and foraging).

Fuels Treatment - Prior to prescribed burning, pull back slash from veteran and relic ponderosa pine and western larch live trees and snags (to the maximum extent practicable) to protect them from the adverse effects of prescribed burning. Consider grapple piling to treat fuels on moderate slopes where residual snags would be at risk from burning. In areas where grapple piling is prescribed for fuel reduction, leave approximately one slash pile per acre unburned where consistent with fuels reduction objectives to provide habitat for small forest animals (e.g., snowshoe hares).

Estimated Effectiveness – High. Timber sale and brush disposal contracts allow for effective control of operations and have the flexibility to meet these criteria.

Goshawk Nest Site Protection – Nest searches will be conducted during project layout and implementation. Operations and related activities would be suspended within approximately ½ mile of any newly discovered nests between March 15 and August 15 to reduce risk of failure. Activity restrictions can be removed after June 30 if the District wildlife biologist determines a nest site is inactive or unsuccessful. Protect existing and newly discovered nest sites by a 40-acre, no activity buffer, and maintain at least 600 ft between any nest sites and harvest units (Reynolds et al. 1992).

Estimated Effectiveness - Moderate to High Seasonal restrictions are likely to minimize disturbance to active nests, particularly if ground-based systems are being used outside the ½ mile buffer.

Grizzly Bear - Within the Kalispell-Granite bear management unit, forest road # 1104 will be obliterated or decommissioned to create core habitat for grizzly bears concurrently or prior to construction/reconstruction of the FR#308 reroute which would reduce core habitat. Construction on FR#308 reroute would not occur during the spring season (April 1 through June 30).

Estimated Effectiveness - High. Core habitat is an important attribute for grizzly bar management. Mitigating the loss of core habitat by creating core elsewhere within the bear management unit would assure no net loss of core habitat. This provision will be built into timber harvest contracts and implemented by the sale administrator.

Grizzly Bear - Within the Kalispell-Granite bear management unit, forest roads #657, #1362C, #1362D, #1112, #337C, #337D, #1351, #1323 and #1323A would be decommissioned or put into storage to

provide core habitat for grizzly bears. Once placed into core habitat, these roads would not be entered for a minimum period of 10 years, with the exception of emergency access needs such as wildfire suppression. To reduce any potential negative short-term impacts to grizzly bears, road decommissioning or storage of roads within this BMU will be staged over a period of several years. Additionally, the obliteration and or storage of roads within this BMU would be geographically combined within each to also potentially reduce negative short-term impacts to grizzly bears. The obliteration and or storage of roads, #657, #337B, #337C, #1351, #1112 would occur outside of the spring season (April 1 – June 30) to potentially reduce negative impacts to grizzly bear use of key spring habitats.

Estimated Effectiveness – High. Guidelines for implementation would address through contract administration.

Grizzly Bear - Within the Lakeshore bear management unit, forest road #1340 would be decommissioned or obliterated prior to implementation of timber management activities within the Lakeshore bear management unit that would occur outside of the grizzly bear denning season. The implementation of this decommissioning or obliteration would not occur during the spring season (April 1 through June 30).

Estimated Effectiveness - High. Core habitat is an important attribute for grizzly bar management. Mitigating the loss of core habitat by creating core elsewhere within the bear management unit would assure no net loss of core habitat. This provision will be built into timber harvest contracts and implemented by the sale administrator.

Grizzly Bear - Within the Kalispell-Granite bear management, FR#311 would not be open to unrestricted vehicle access until FR#308 is converted to restricted access. Prior to opening of FR#311 gates and or guardrail barriers would be install on spur which leads to Forest Capital lands and on unclassified road which leads to Trail #262. Mitigation would be designed to manage open road densities and to prevent motorized access into the sensitive wetland habitats at Sema Meadows. Since spring is and important season for grizzly bears, limiting vehicle access on this road system during the spring season would potentially limit displacement from this area and surrounding habitats by bears as this area has been managed as a restricted road system 1996. As part of the construction of the FR#308 reroute, all lateral roads system off of this route would have either earthern barriers, gates or guardrail barriers installed prior to road being open for public.

Estimated Effectiveness - High. This provision will be built into timber harvest contracts and implemented by the sale administrator.

Grizzly Bear - Road maintenance activities on restricted access roads within the project area and within the grizzly bear recovery area not take place during the spring season (April 1 – June 30). Restricted access roads located within grizzly bear management units would be subject to provisions and design criteria described as part of the programmatic assessment (USFS 2004).

Estimated Effectiveness - Moderate to High. Since spring is the most sensitive time period for grizzly bears, limiting operations during this season would greatly reduce potential effects. This provision will be built into timber harvest contracts and implemented by the sale administrator.

Grizzly Bear - Timber harvest activities including felling, skidding and hauling within proposed harvest areas located within the Kalispell-Granite and or Lakeshore bear management units would be restricted to the timeframe when grizzly bears are within the den. (November 30 – April 1).

Estimated Effectiveness - Moderate to High. Since spring is the most sensitive time period for grizzly bears, limiting operations during this season would greatly reduce potential effects. This provision will be built into timber harvest contracts and implemented by the sale administrator.

Grizzly Bear - Timber harvest activities will have a set-back distance of 200 meters from all wetlands and or meadows (i.e. Bismark Meadows) associated spring bear habitats. This is intended to retain the effectiveness of the key spring habitats within the project area by maintaining day bedding opportunities for grizzly bears immediately adjoining these habitats.

Estimated Effectiveness – High. This practice would be incorporated into project design and unit layout, and implemented by the sale administrator.

Grizzly Bear - Screening (vegetation or topographical features that provide screening to a minimum of one sight distance) where it exists will be maintained between all treatment units and open roads within the planning area. . A sight distance is defined as the distance at which 90- percent of a bear is hidden from view (approximately 100 to 200 feet, depending on the type of cover and topography available.)

Estimated Effectiveness – High. This practice would be incorporated into project design and unit layout, and implemented by the sale administrator.

Grizzly Bear – Mechanized activities on burn only units would take place prior to April 1 or if implemented after April 1 would be limited to no more then 2 days per calendar year. This is intended to reduce displacement of grizzly bears from the vicinity of the project area during the spring season.

Estimated Effectiveness – High. This practice would be incorporated into project design and unit layout, and implemented by the sale administrator.

Grizzly Bear - Strict food and trash storage and food handling requirements will be required for all personnel and contractors involved in the implementation of project activities.

Estimated Effectiveness – High. This practice would be incorporated into project design and unit layout, and implemented by the sale administrator.

Grizzly Bear - Any temporary or currently undrivable roads reopened and utilized as timber haul routes will be kept unavailable for general public use during implementation, and will be obliterated or restored to an undrivable condition upon completion of post-harvest fuels treatments.

Estimated Effectiveness - Moderate to High. Since spring is the most sensitive time period for grizzly bears, limiting operations during this season would greatly reduce potential effects. This provision will be built into timber harvest contracts and implemented by the sale administrator.

Grizzly Bear - To reduce the likelihood of grizzly bears foraging along open roads and motorized trails, clover (Trifolium spp.) would not be included within seed mixes utilized along open roads and motorized trails.

Estimated Effectiveness – High. This practice would be incorporated into project design and unit layout, and implemented by the sale administrator.

Grizzly Bear – No timber harvest or fuels treatments within 200 meters of Bismark meadows. This is required to minimize impacts to bear utilization of the Bismark Meadows habitat.

Estimated Effectiveness – Moderate to High. This practice would be incorporated into project design and unit layout, and implemented by the sale administrator.

Bald Eagle - To reduce impacts to bald eagles, no fuels treatments including burn only treatments would occur within 200 meters of the shoreline of Priest Lake. Prior to implementation of any burn only treatments within one quarter miles of the shoreline of Priest Lake, the adjacent shoreline would be surveyed to detect for any previously unknown bald eagle nesting.

Estimated Effectiveness – High. This practice would be incorporated into project design and unit layout, and implemented by the sale administrator.

Bat Species - No fuels treatments will occur within 100 feet of mining adits which have known or probable use by bats.

Estimated Effectiveness – High. This practice would be incorporated into project design and unit layout, and implemented by the sale administrator.

Other Threatened, Endangered, and Sensitive (TES) Wildlife Species Management – If any TES species is located during project layout or implementation, alter timber harvest and associated activities, as necessary, so that proper protection measures are taken. Timber sale contract clause B(T)6.25, Protection of Threatened, Endangered And Sensitive Species, should be included in any timber sale contract.

Estimated Effectiveness – High. Contract provisions for protection of TES habitats and locations are utilized in all contracts and have been effective in protecting these resources (See Forest Plan Monitoring and Evaluation report).

Gray Wolf – Any gray wolf den or rendezvous sites identified in or adjacent to proposed activity areas will be spatially and/or temporally buffered as appropriate. No project activities (excluding maintenance and hauling on year-round open road systems) will be allowed within one (1) mile of occupied sites, from April 1-July 1 for den sites and from July 1-August 15 for rendezvous sites. Upon review by the Forest Level 1 team, these distances could decrease based on topographical characteristics at each site.

Estimated – High. Contract provisions for protection of TES habitats and locations are utilized in all contracts and have been effective in protecting these resources (See Forest Plan Monitoring and Evaluation report).

Boreal Toad– All known or discovered wetlands, seeps, bogs, elk wallows and springs less than one acre in size would be protected with a “no activity” buffer approximately 100 feet in diameter.

Estimated Effectiveness – High. This practice would be incorporated into project design and unit layout, and implemented by the sale administrator.

Features Designed Protect Recreational Use

If a planned road closure or decommissioning would close access to a dispersed site or recreation opportunity, mitigation would include an alternate route or an opportunity for non-motorized access. For example, for the Kalispell road #308 obliteration, mitigation would include non-motorized access or a foot trail to provide opportunity for hiking or fishing access to Kalispell creek.

Estimated Effectiveness - High – Roads that were decommissioned and converted to trails in the past have provided non-motorized access into area’s of dispersed recreation.

Any harvest activity adjacent to any system trails would require contract provisions to protect the trail and provide for 100 % slash disposal and removal of hazard trees within the trail right-of-way.

Estimated Effectiveness - High – This design feature, as required under normal contract provisions, has been used successfully in recent projects like Lakeface-Lamb Fuel Reduction. This project area has a larger amount of trails and recreation use than the Lakeview-Reeder Fuel Project and all trails within the Lakeface-Lamb project area remained in pre-project condition or were improved.

Any harvest or fuels treatment activity adjacent to any system trails that would create openings at the trailhead or near the trail that could allow motorized user-built shortcuts to the trail or off trail use would require barriers to prevent this. In addition, any skid trails that could be easily accessed by OHVs would have logs and other debris spread over the trail to create a barrier.

Estimated Effectiveness - Moderate – This design feature has been used with some success in the past. However, terrain and predicting where new trails might be built has not always provided for success.

Activities that are planned during the winter and are adjacent to groomed snowmobile trails, coordination with the Bonner County Groomer Advisory board must occur so alternate routes can be provided or trails may be closed temporarily.

Estimated Effectiveness: High – Although, longer, alternate routes currently exist that provide access into key destination areas and activities could be timed to create the least possible disturbance to snowmobile riders.

Any operation of heavy equipment and chainsaws near Reeder Bay campground would follow established quiet hours in Reeder Bay campground.

Estimated Effectiveness - High – This design feature has been implemented without difficulty for past projects like Lakeface-Lamb. In addition, activities could also be accomplished when the campground is closed.

The road decommissioning in Granite Creek would provide alternate access to the nearby dispersed camping site.

Estimated Effectiveness - High – Alternate access currently exists to this site.

Features Designed to Protect Scenery

Design Features for Treatment Units Seen from Sensitive View Points

The following features apply to all of the proposed stand treatment areas that occur adjacent to private property, recreation residences, resorts, campgrounds, trailheads, Highway 57, Road #1339, Road #302, Road #2512 and the trailhead parking area for Trail #294. The primary intent of these features is to make the forest appear more natural (as compared to how it would appear without these features) to people either traveling along these roads or when they are present at these sites. The estimated effectiveness for the following design features is based on local knowledge from implementing similar fuel treatment projects on the district such as Lakeface-Lamb and 57 Bearpaws.

Trees would be designated for removal in a fashion that would not result in leaving painted trees in these areas after the activities have been completed. If it is necessary to designate trees for retention by marking the trees with paint, then the unnatural appearing paint colors would be covered over with a more natural color after the activities are complete.

Estimated Effectiveness – High- as the district has successfully used this for past fuel reduction projects.

After the stand treatment activities are complete, boundary signs, tags and flagging would be removed, and any unnatural appearing paint colors that were used for the treatment boundaries would be covered over. When possible, rather than using paint to designate treatment boundaries in these areas, paper tags

would be used (with small painted stump marks) so the tags and/or paint can easily be removed after the treatment activities are complete.

Estimated Effectiveness - High

If log landings are necessary to harvest trees within these general treatment areas, then the landings would be located away from the most visually sensitive areas and their impact would be minimized by using vegetative screens or natural terrain features such as rock outcrops, slopes, etc. to make the landings less visible.

Estimated Effectiveness - High

Within 50 – 75 feet of cabins, resort boundaries, campground boundaries and private property boundaries, equipment and logging techniques would be used that would least likely damage residual trees.

Estimated Effectiveness – High

Skid trails would parallel the travel corridor where feasible.

Estimated Effectiveness – Moderate to High

Variable spacing of trees, groups of uncut merchantable trees and/or areas of healthy advanced regeneration would be retained.

Estimated Effectiveness – Moderate

Stumps that are created by stand treatment activities would be no taller than 6 inches in height.

Estimated Effectiveness - Moderate to High

If the lower limbs on residual trees are pruned, then the pruning heights would be varied to avoid un-natural appearance of the pruned trees.

Estimated Effectiveness - High

If small trees (sapling/pole size) exist in the understory of the treatment areas, then when feasible leave from 5 to 160 trees per acre (trees 3 feet to 20 feet in height). All uncut trees would remain unpruned. Distance from the roads, view points or view areas will vary from approximately 50 feet to 200 feet, depending on the results following logging activities. The intent is to provide some vertical diversity of tree crowns within these areas rather than completely “parking-out” the stand.

Estimated Effectiveness - Moderate to High

Slash piles would be, on average, less than 6 to 8 feet in height by 6 - 8 foot wide.

Estimated Effectiveness - Moderate

In order to avoid leaving blackened, partially burned slash, burning operations would strive to obtain at least 80 percent pile consumption in visually sensitive areas.

Estimated Effectiveness - High

Lakeshore Trail #294 Trailhead Parking area – Screen the parking area. The current buffer of trees would be retained between the parking area and the Beaver Creek Road #2512.

Estimated Effectiveness - High

Design Features for All Other Treatment Units

Design individual units to mimic the natural terrain and/or natural openings of the surrounding area (form, line, slope, etc.) so they will blend in. To achieve this, “feather” the edges of the units would avoid straight lines along with designing the shape of units along lines of natural terrain features.

Estimated Effectiveness - High

Within treatment areas proposed for regeneration harvest, there would be trees retained in a clumpy and/or irregular spacing pattern. In addition, islands of uncut healthy trees may be left. These measures are meant to create a more natural appearing opening than would occur if leave trees were left in a regular pattern.

Estimated Effectiveness - High

Skid trails would parallel the travel corridor where feasible or skid trails would be designed in a manner that would reduce the view of long straight lines if the skid trails could be viewed from any system roads.

Estimated Effectiveness - Moderate to High

As with any logging operation, for the first few years after treatment, the units may be noticeable because of ground disturbing activities. After units are burned, some scorch of tree needles is expected so there could be some red color on the trees initially. Within three years of completion of activities, including slash burning, the treated units should start to regain a more natural appearance. If the units are planned to meet VQOs, after five years, when viewed from the Sensitivity Level 1 viewpoints, the units should fully meet VQOs.

2.7 Comparison of Alternatives

The following section summarizes the activities and the environmental effects that would result from implementing either the No-Action Alternative (Alternative 1) or the Proposed Action (Alternative 2). In this section, the effects of implementing the alternatives are only disclosed for the Key Issues. Chapter 3 contains the effects discussion for the Analysis Issues as well as a more thorough discussion of the effects to the Key Issues.

Table 2-7. Summary of activities associated with the No-Action Alternative (Alternative 1) and the Proposed Action (Alternative 2).

Activity	Alternative 1 (No-Action)	Alternative 2 (Proposed Action)
Fuel Treatment Types (acres)		
Commercial Thinning with Mechanical Fuel Piling and Burning	0	1,030
Improvement Cutting with Mechanical Fuel Piling and Burning	0	39
Liberation Cut with Mechanical Fuel Piling and Burning	0	45
Irregular Shelterwood with Mechanical Fuel Piling and Burning	0	853
Irregular Shelterwood with Underburning	0	265
Seed Tree with Mechanical Fuel Piling and Burning	0	55
Special Cut with Mechanical Fuel Piling and Burning	0	43
Hand Slashing with Hand Piling and Burning	0	14
Hand Slashing with Mechanical Fuel Piling and Burning	0	46
Burn Only	0	1,475
Logging System (acres)		
Ground-based	0	2,311
Cable	0	20
Transportation System Management (miles)		
Road Maintenance	0	17.0
Road Reconstruction	0	5.0
New Construction of temporary road	0	.5
New Construction of permanent road	0	2.5
Road Storage	0	22.8
Road 308 Relocation Activities:		
Road Obliteration	0	3.0
New Construction	0	1.8
Reconstruction	0	3.6
Stream Crossing upgrades (crossings upgraded)	0	2
Fish Barrier Removal (barriers removed)	0	8

Comparison of Alternatives by Key Issues

Table 2-8. Comparison of alternatives by issue and measure[6]

Issues and Measures	*Alternative 1 (No-Action)*	*Alternative 2 (Proposed Action)*	*Comparison*
Wildfire Hazard			
Flame Length Percent of the project area predicted to burn with flame lengths greater than 4 feet	55	45	Relative to the no-action alternative, the proposed action would result in an 18% decrease in the amount of the project area that could burn with flame lengths greater than 4 feet.
Rate of Spread Percent of the project area predicted to burn with a rate of spread greater than 5 chains per hour	56	50	Relative to the no-action alternative, the proposed action would result in an 11% decrease in the amount of the project area that could burn with spread rates greater than 5 chains per hour.
Crown Fire Acres within the project area that are predicted to burn with a crown fire	16,145	12,986	Relative to the no-action alternative, the proposed action would result in a 20% decrease in the amount of the project area that could burn as a crown fire.
Minimum Travel Time Compared to the existing condition, percent increase in the amount of time it would take a wildfire to travel across certain portions of the project area	N/A	30-50	Depending on where a specific wildfire were to start and where the values of concern are located in the project area relative to the ignition point, the proposed fuel treatments could generally slow down the spread of a large wildfire moving across the project area by approximately 30-50%[7].

[6] Some of the information presented in this section includes approximate acreage of fuel treatment activities and approximate miles of road segments proposed for activities. These quantitative estimates based on field visits, aerial photo interpretation, TSMRS database information, and GIS/GPS data.

[7] As described in more detail in the fire and fuels section of Chapter 3, the proposed action would affect the spread rate of a large fire across the project area in different ways depending on where the fire started, the location of where the travel time is measured to, and the juxtaposition of the fuel treatment areas relative

Issues and Measures		*Alternative 1 (No-Action)*	*Alternative 2 (Proposed Action)*	*Comparison*
Fire Regime Condition Class Condition Class Level		3	2	The proposed action would result in the fire regime condition class decreasing from one of high-departure from historic conditions to one of moderate departure.
Forest Health				
Forest Composition Percent of project area dominated by the most desirable tree species		12	17	The proposed action would increase the number of forest stands within the project area dominated by western white pine, western larch, ponderosa pine and quaking aspen. The proposal would result in an approximate 40% increase in these species over the current condition.
Forest Structure Percent of project area dominated by trees within each structural class	Shrub/seedling/sapling	16	17	The proposed action would increase the amount of forest stands dominated by young trees (an increase of 6% over current conditions), and would decrease the amount of stands dominated by medium (a decrease of 2% over current conditions) and large trees (a decrease of 4% over current conditions. These changes would result in a trend toward more desirable conditions within the project area.
	Pole/small	8	8	
	Immature/medium	45	44	
	Mature/large	24	23	
	Old growth	4	4	
Landscape Pattern		Large areas of forest are dominated by either immature/medium, or mature/large structural stages.	The proposed action would decrease the size of the forest patches that are dominated by either immature/medium or mature/large structural	The proposed action would trend the project area towards a forest pattern that would have a reduced wildfire hazard as well as a pattern that is more similar to historic conditions.

to those other two locations. Most of the model simulations demonstrated that the fuel treatments would substantially slow down a wildfire- to the degree of somewhere in the range of 30-50%. However, some simulations were higher while others were lower.

Issues and Measures	*Alternative 1 (No-Action)*	*Alternative 2 (Proposed Action)*	*Comparison*
	The stands dominated by shrub/seedling/sapling structural stages, are generally located in small patches that are scattered over the project area.	stages. In addition, the patches of forest dominated by shrub/seedling/sapling structural stages would increase.	
Grizzly Bear Habitat[8]			
Kalispell-Granite BMU			
Total Road Density in percent of BMU with >2mi/sqmi	27	25	
Open Road Density in percent of BMU with >1mi/sqmi	29	29	
Core Habitat in acres and percent of total BMU area	49	56	
Lakeshore BMU			
Total Road Density in percent of BMU with >2mi/sqmi	53	53	
Open Road Density in percent of BMU with >1mi/sqmi	81	81	
Core Habitat in acres and percent of total BMU area	19	20	
General Disturbance	No disturbance or displacement of bears would occur beyond the existing conditions.	The proposed action would result in some short-term displacement of bears while the activities are taking place.	Compared to the no-action alternative, the proposed action would result in disturbing and displacing grizzly bears from some of their habitat. This effect would occur during the life of the project in some areas when activities are occurring. However, when completed, the project would result in a higher level of core habitat and equal or lower road densities.
Water Quality			
Reeder Creek			
Equivalent Clearcut Acres	450	1208	The ECA value in Reeder Creek would increase from an existing 5 percent ECA to as high as 13 percent ECA in 2009 and 21 percent ECA in 2010.

[8] The grizzly bear habitat figures presented below were rounded to the nearest percent.

Issues and Measures	*Alternative 1 (No-Action)*	*Alternative 2 (Proposed Action)*	*Comparison*
Increased Risk for Rain on Snow	0	1296	In Reeder Creek the amount of potential openings in the critical rain on snow zone could cause very slight increases in the amount of time that water would remain high. Because of the ability of the Reeder meadows to store runoff, it is expected that the increase in runoff from the rain on snow events could last longer, but the peaks themselves would not be discernibly higher.
Road Densities (mi/mi2)	4.3	4.5	Change +0.2
Total miles of proposed road decommissioning	0	0	No change
Crossings removed on decommissioned roads	0	0	
Crossings improved/replaced	0	7	
Proposed road improvements (miles)	0	12.7	
Proposed new roads – temp and permanent (miles)	0	2.5	
Sediment Yield (% increase)	0	14	
Sediment Yield (Tons of sediment increased)	0	46	Using the design BMPs listed in Chapter 2, the BMP Appendix and InFish buffers, the risk of sediment delivery would be minimized and sediment delivery to Reeder Creek would be highly unlikely.
Sediment increase with culvert removals (3.5 lbs/crossing)	0	0	
Riparian Function		Implementing the action alternative would not measurably alter the existing riparian ECA values.	
Stream Temperature		With the action alternative, there would be minimal disturbance of the riparian zone but no measurable change in riparian ECAs.	
Watershed Condition Class	FAR	PFC	With the large scale wetland restoration effort by NRCS.
Kalispell Creek			
Equivalent clearcut acres	858	870	No Change

Issues and Measures	Alternative 1 (No-Action)	Alternative 2 (Proposed Action)	Comparison
Increased risk for rain on snow	0	79	The amount of increase predicted are so small for Kalispell, Granite, Priest Lake Face and Boulder that it is anticipated that runoff would be no different than current conditions.
Road Densities (mi/mi2)	2.8	2.5	
Total miles of proposed road decommissioning	0	12	
Crossings removed on decommissioned roads	0	57	
Crossings improved/replaced	0	0	
Proposed road improvements (miles)	0	8.2	
Proposed new roads – temp and permanent (miles)	0	1.8	
Sediment Yield (% increase)	0	1	
Sediment Yield (Tons of sediment increased)	0	10	With the treatment of Kalispell 308, the risk of delivering 300 to 400 tons of sediment to the creek would be eliminated.
Sediment increase (lbs.) with culvert removals (3.5 lbs/crossing)	0	200	
Riparian Function		Implementing the action alternative would not measurably alter the existing riparian ECA values. A decrease in riparian road densities would be realized with the removal of Road 308 in Kalispell Creek, resulting in a decrease for the Kalispell drainage by 3.0 miles.	
Stream Temperature		With the action alternative, there would be minimal disturbance of the riparian zone but no measurable change in riparian ECAs. A decrease in riparian road densities would be realized with the removal of Road 308 in Kalispell Creek. All exposed	

Issues and Measures	Alternative 1 (No-Action)	Alternative 2 (Proposed Action)	Comparison
		surfaces would be planted following road removals to hasten vegetative recovery/shading along the stream course.	
Watershed Condition Class	FAR	FAR	
Granite Creek			
Equivalent clearcut acres	1244	1208[9]	No Change
Increased risk for rain on snow	0	427	The amount of increase predicted are so small for Kalispell, Granite, Priest Lake Face and Boulder that it is anticipated that runoff would be no different than current conditions.
Road densities (mi/mi2)	4.6	4.3	
Total miles of proposed road decommissioning	0	10	
Crossings removed on decommissioned roads	0	44	
Crossings improved/replaced	0	5	
Proposed road improvements (miles)	0	1.1	
Proposed new roads – temp and permanent (miles)	0	0.2	
Sediment Yield (% increase)	0	0	
Sediment Yield (Tons increased)	0	0	
Sediment increase (lbs.) with culvert removals (3.5 lbs/crossing)	0	154	
Riparian Function		Implementing the action alternative would not measurably alter the existing riparian ECA values.	
Stream Temperature		With the action alternative, there would be minimal disturbance of the riparian zone but no measurable change in riparian ECAs.	
Watershed Condition Class	FAR	FAR	
Priest Lake Face			
Equivalent clearcut acres	NA	NA	No Change
Increased risk for rain on snow	0	61	The amount of increase

[9] The decrease in ECA values after the project implementation is due to regrowth of vegetation that reduces ECA values

Issues and Measures	Alternative 1 (No-Action)	Alternative 2 (Proposed Action)	Comparison
			predicted are so small for Kalispell, Granite, Priest Lake Face and Boulder that it is anticipated that runoff would be no different than current conditions.
Road densities (mi/mi2)	NA	NA	
Total miles of proposed road decommissioning	0	0	
Crossings removed on decommissioned roads			
Crossings improved/replaced			
Proposed road improvements (miles)			
Proposed new roads – temp and permanent (miles)			
Sediment Yield (% increase)	0	NA	
Sediment Yield (Tons increased)	0	0	
Sediment increase (lbs.) with culvert removals (3.5 lbs/crossing)			
Riparian Function		Implementing the action alternative would not measurably alter the existing riparian ECA values.	
Stream Temperature		With the action alternative, there would be minimal disturbance of the riparian zone but no measurable change in riparian ECAs.	
Watershed Condition Class	FAR	FAR	
Boulder			
Equivalent clearcut acres			
Increased risk for rain on snow			The amount of increase predicted are so small for Kalispell, Granite, Priest Lake Face and Boulder that it is anticipated that runoff would be no different than current conditions.
Road densities (mi/mi2)	3.3	3.0	
Total miles of proposed road decommissioning	0	3.4	
Crossings removed on decommissioned roads	0	22	
Crossings improved/replaced	0	0	
Proposed road improvements (miles)	0	0	
Proposed new roads – temp and permanent (miles)	0	0	

Issues and Measures	*Alternative 1 (No-Action)*	*Alternative 2 (Proposed Action)*	*Comparison*
Sediment Yield (% increase)	NA	NA	
Sediment Yield (Tons increased)	0	0	
Sediment increase (lbs.) with culvert removals (3.5 lbs/crossing)	0	77	
Riparian Function		Implementing the action alternative would not measurably alter the existing riparian ECA values. A decrease in riparian road densities would be realized with the removal of Road 1014 in the Boulder Creek drainage resulting in a decrease of 0.87 miles.	
Stream Temperature		With the action alternative, there would be minimal disturbance of the riparian zone but no measurable change in riparian ECAs. A decrease in riparian road densities would be realized with the removal of Road 1014 in Boulder Creek. Post treatment of the road removals, all exposed surfaces would be planted to hasten vegetative recovery/shading along the stream course.	
Watershed Condition Class	FAR	FAR	
All Affected Drainages			
Hydrologic Function		Implementing the action alternative would not adversely impact the ability of the channels to balance water and sediment yields. As discussed in both the water yield and sediment portion of the effects analysis, neither sediment or water yields are anticipated to become out of balance in any one of the affected subdrainages. Therefore, since the sediment and water yields would remain in balance, the proposed timber and burning would not affect hydrologic function. The proposed road removals would positively affect	

Issues and Measures	Alternative 1 (No-Action)	Alternative 2 (Proposed Action)	Comparison
		hydrologic function because with the deep ripping, re-contouring and culvert removals slope hydrology that had been altered for many years would become more naturalized as water is dispersed across the landscape (Luce 1997). Dispersing the water and improving infiltration would improve the resiliency of the watersheds to future disturbances such as fire or rain-on-snow events. The placement of 20 inchannel structures adjacent to the removal of the 308 road in Kalispell Creek would provide the stream with the large woody debris component that it currently lacks. This would improve hydrologic function of that portion of Kalispell Creek.	

2.8 Monitoring and Adaptive Management

The IPNF has developed a forest-wide monitoring and evaluation plan that fulfills several needs. Monitoring is designed to gather the information and data necessary for evaluation. The collected information and data are then evaluated and interpreted to determine effectiveness of the project. The monitoring and evaluation plan looks at the following items:

- The degree to which the objectives, standards, and guidelines of the Forest Plan are being implemented.
- The effectiveness of management practices used in site-specific projects.
- Verification of the assumptions and models used in planning.

Forest Plan monitoring can include the following items: timber management, wildlife, watershed and fisheries, threatened and endangered plants, soil productivity, and visual quality objectives. Forest Plan Chapter IV section 7 includes the goals, elements, standards and practices to be used in monitoring and evaluation (Forest Plan, IV-7 through IV-13). Because of the nature of some of the monitoring items and the diversity of forest management projects, all of these items are rarely monitored on any one project.

Funding for the monitoring plan may vary which may lead to assessing priorities as needed to assure the integrity of Forest Plan monitoring and evaluation direction. The IPNF prepares an annual Monitoring and Evaluation Report to document the results of monitoring conducted across the entire IPNF. Reports are available for public review on the IPNF website.

For activities related to this project, all alternatives would comply with specific monitoring requirements identified by the IPNF Forest Plan. The length of time needed for monitoring is determined by the results and evaluation of the activity or effect that is being monitored. When it is certain that regulations and standards are being met, monitoring of a particular element would cease. If monitoring evaluations show that regulations or standards are not being achieved at the desired level, management intervention would occur and monitoring would continue.

Not all monitoring is considered mandatory, and its implementation is not a consideration in the determination of environmental effects. Site-specific monitoring of project activities is designed to verify that the projects are effective in meeting project and Forest Plan objectives. Monitoring projects are designed to be accomplished during project activities, but are dependent upon the availability of funds and other resources.

Predicting the effects from our land management activities also depends on research information. Research findings used for this project can be found in the List of References.

Project Implementation and Effectiveness Monitoring

Monitoring is designed wherever possible to catch and assess problems before or when they occur so corrective measures can be taken. As such, it is also a quality control/quality assurance plan. By its nature, implementation monitoring, to be effective, requires an adaptive approach to management. Monitoring, and then adapting management based on the monitoring results, is an integral feature of the action alternative.

Project implementation generally involves the efforts of a variety of individuals with both specialized and general skills and training. Employees are accustomed to working together to achieve the desired project objectives. For example, it is common for a sale preparation forester or sale administrator to discuss specific ground or project conditions with the wildlife biologist or hydrologist to apply the best practices

on the ground. Joint field reviews are taken as needed. These steady informal communications allow for incremental project adjustment throughout implementation to achieve the desired results. In addition to these less formal monitoring procedures, the following monitoring would be conducted:

Watershed Hydrology and Fisheries

Best Management Practices – Best Management Practices (BMPs) are incorporated into many different phases of the project. The hydrologist would review the planned design of all temporary roads and all road maintenance to assure compliance with BMPs. The engineering representative and hydrologist would monitor all temporary and reconditioned roads to ensure that they were built or restored to specifications. The completed reports would be given to the IPNF Aquatics Program Leader, who forwards them to the State Bureau of Water Quality on an annual basis.

A sale administrator would visit each active cutting unit at a frequency necessary to assure compliance with the BMPs and the timber sale contract. Minor contract changes or contract modifications would be agreed upon and enacted, when necessary, to meet objectives and standards on the ground.

BMP effectiveness would be monitored following at least one runoff season after BMP implementation. Watershed rehabilitation projects typically are monitored annually or biannually for effectiveness and maintenance needs. Monitoring would be correlated with watershed exams on the sale area through the 5th year after project implementation based on available funding.

Decommissioned Roads – Decommissioned roads would be checked periodically during the first year (and periodically thereafter if no problems are noted) to monitor effectiveness of erosion control and noxious weed control. Proposed road obliteration work would be monitored during the implementation phase of the project and following the project to determine the effectiveness of obliteration methods.

Road Erosion – Road erosion, and causes of erosion, would be recorded to monitor sediment introduction into the streams. This would include effectiveness monitoring of established BMPs.

Fisheries – Riparian Habitat Conservation Area requirements of INFS are monitored prior to treatment activities to verify compliance with INFS RHCA widths.

Wildlife

On a Forest-wide basis, northern goshawk nesting sites are currently being monitored. Known nesting sites are being visually inspected to determine occupancy. The monitoring frequency varies, based on funding. Surveys are conducted for additional nesting sites during project planning or implementation if nests are sighted.

A sample or portion of treatment units would be surveyed to evaluate the influences of forest management practices on wildlife tree retention practices and determine if predicted or stated objectives were achieved for snag retention.

The IPNF North Zone (Bonners Ferry, Sandpoint, and Priest Lake Ranger Districts) currently monitors core and road density (OMRD greater than 1 mi/square mile and TMRD greater than 2 mi/square mile) percentages in all Grizzly Bear Management Units (BMUs). This monitoring is reported to US Fish & Wildlife Service on an annual basis.

Soils

Treatment units that currently exceed or are at 15% detrimental impacts would be monitored post-harvest to assess if mitigation objectives were met.

Air Quality

During the burning of timber cutting residues (slash), smoke management guidelines would be followed as prescribed in the Idaho Smoke Management Memorandum of Agreement (1990), and the North Idaho Cooperative Smoke Management Plan (1990). Each airshed has a coordinator responsible for reporting all planned activity to a monitoring unit. The monitoring unit regulates the prescribed burning activities of all participants in the program. The Idaho Division of Environmental Quality recognizes this process as Best Available Control Technology for prescribed burning.

Air quality is monitored by the North Idaho and Montana Airshed Groups during the fall burning season and yearlong by the Idaho Department of Environmental Quality. Restrictions on prescribed burning for local air quality reasons may be implemented in addition to those imposed by the smoke management monitoring unit.

Timber Management

Each active harvest unit would be visited by a certified timber sale administrator at a frequency necessary to assure compliance with the timber sale contract. Minor contract changes or contract modifications would be enacted, when necessary, to meet objectives and standards on the ground.

The timber sale administrator and the engineering contracting officer representative (COR) would assure that timber and road (reconstruction and decommissioning) contract specifications are followed. The district hydrologist would also provide technical assistance and review as needed.

Units that are treated with a regeneration harvest would be surveyed by employees of the Timber Stand Improvement section of the district at one, three, and five year intervals following planting to certify regeneration. (Funding for the monitoring is mandated by the Knudtsen-Vandenburg Act in compliance with the National Forest Management Act and is assured through timber sale base rates.)

Fuels Treatment

The fuels treatments and silvicultural prescriptions and accomplishments are entered into the FACTS database after walk through surveys are conducted after the work is completed.

Noxious Weeds

Pretreatment of service landings and equipment as proposed would be documented on sale inspection reports by the timber sale administrator or engineering representative. The effectiveness of seeding disturbed areas would be evaluated upon completion of the activity. Treated areas would be surveyed and monitored according to treatment priorities established in the Priest Lake Noxious Weed Control Project FEIS.

TES Plants

Monitoring of sensitive plant populations where the proposed activity was modified by buffering to avoid adverse effects would be conducted to validate the effectiveness of mitigation measures during and following the activity.

Chapter 3 – Affected Environment and Environmental Consequences

This section summarizes the physical, biological, social and economic environments of the affected project area and the potential changes to those environments due to implementation of the alternatives. It also presents the scientific and analytical basis for the comparison of alternatives presented in the chart above.

3.1 Vegetation

Introduction

This report describes the forest vegetation resource in the project area and the effects that the alternatives would have on that resource. The analysis focuses on topics relating to forest vegetation that were either deemed to be important to the public, were necessary to cover because they involve regulatory requirements, and/or they were essential in measuring how well the alternatives would help meet the goals and objectives that were established for this project.

Scope of the Analysis

Regulatory Framework

There are numerous laws, regulations and policies that govern how forest vegetation is to be managed on the Idaho Panhandle National Forests (IPNF). This information is summarized below and is meant to provide the reader with an understanding of the regulatory framework in which the project was developed as well as the requirements that must be met regarding the management of forest vegetation. In this particular section of the report, it is not the intent to demonstrate how the proposed project is or is not consistent with all this management direction. That discussion is deferred to the end of the report after the effects of implementing the alternatives have been disclosed.

Some of the more applicable laws, regulations and policies include the Washington and Idaho State Forest Practices Acts, Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA), National Forest Management Act of 1976 (NFMA), national Forest Service policy and lastly, the Idaho Panhandle National Forests Plan (USDA 1987). In addition, because this specific project is being authorized under the Healthy Forest Restoration Act (HFRA), it is also subject to requirements within that legislation.

I. <u>Forest Plan Direction Regarding the Management of Forest Vegetation</u>
The Forest Plan contains a number of forest-wide goals, objectives, and standards regarding the management of forest vegetation. In addition, the plan also contains additional direction for specific areas (called management areas) within the forest. The most relevant direction includes the following:

Forest-Wide Goals and Objectives

1. Manage the forest resources to protect against insect and disease damage (Forest Plan, p. II-2).
2. Timber management activities will be the primary process used to minimize the hazards of insects and diseases and will be accomplished primarily by maintaining stand vigor and diversity of plant communities and tree species (Forest Plan, p. II-8).

3. Management activities will promote programs that provide a sustained yield of forest products consistent with the multiple use goals established in the Forest Plan (Forest Plan II-8).

4. Protection of timber stands from insect and disease problems will center on the silvicultural treatments prescribed for timber management activities. These include establishing rotation ages that direct the harvesting of stands before diseases such as root diseases and heart rots become a serious threat to the susceptible stands. Regenerating to species combinations that are the least susceptible to root rot diseases is the primary protection objective for the root rot diseases. Regeneration and culture of multi-species stands will be used to reduce the threat of epidemic outbreaks of harmful insects (Forest Plan, p. II-10 and II-11).

5. To help provide for a diversity of plant and animal communities, habitats, and species, standards for old growth maintenance will be established. Approximately 10 percent of the Forest will be maintained in old growth as needed to provide for viable populations of old-growth dependent and management indicator species (Forest Plan, p. II-5).

Forest-Wide Old Growth Standards

- A definition for old growth is being developed by a Regional Task Force and will be used by the Forest when completed. As an interim guideline, stands classified as old growth should meet the definition given by Thomas (1979).
- Maintain at least 10 percent of the forested portion of the IPNF as old growth.
- Select and maintain at least five percent of the forested portion of those old growth units that have five percent or more of existing old growth.
- Existing old growth stands may be harvested when there is more than 5% in an old growth unit, and the Forest total is more than 10%. Old growth stands should reflect approximately the same habitat type series distribution as found on the IPNF.
- One or more old growth stands per old growth unit should be 300 acres or larger. Preferences should be given to a contiguous stand; however the stand may be subdivided into stands of 100 acres or larger if the stands are within one mile. The remaining old growth management stands should be at least 25 acres in size. Preferred size is 80 plus acres.
- Roads should be planned to avoid old growth management stands to maintain unit size criteria.
- A long-term objective should be to minimize or exclude domestic grazing within old growth stands.
- Goals for lands to be managed as old growth within those lands suitable for timber production are identified in the management area prescriptions.

Forest-Wide Timber Standards

- Both even-aged and uneven-aged silvicultural systems will be employed on the IPNF and will meet resource and vegetation management objectives identified in the Forest Plan. Even-aged silvicultural systems will be applicable over most areas. Uneven-aged systems may be used to achieve special management objectives as determined by the ID Team during project analysis.
- Timber stands that are substantially damaged by fire, wind throw, insect or disease attack, or other catastrophe may be harvested where this salvage is consistent with silvicultural and environmental standards. All management areas are open to this potential salvage activity except Management Areas 11 and 14.

- Recommended changes in timber resource land suitability from the approved Forest Plan will be based upon the criteria contained in 36 CFR 219.14(a). Changes from suitability classification will be done in accordance with the procedures outlined in Appendix M.
- Reforestation will normally feature seral tree species, with a mixture of species usually present. Silvicultural practices will promote stand structure and species mix that reduce susceptibility to insect and disease damage.
- Project design will provide for site preparation and slash hazard reduction practices that meet reforestation needs of the area.
- Timber harvest schedules and access will be coordinated with intermingled landowners where applicable.
- Openings created by even-aged silviculture will be shaped and blended to forms of the natural terrain to the extent practicable; in most situations they will be limited to 40 acres. Creation of larger openings must conform to current Regional guidelines regarding public notification, environmental analysis and approval.
- An area of National Forest land will no longer be considered an opening when vegetation meets management goals established for the management area in accordance with FSM 2471.1. Lands in other ownership within or adjacent to National Forest land will be included in the analysis when planning openings.
- The silvicultural prescription for each stand will establish the level of management intensity compatible with the management area goals. Preferred species management as identified in the silvicultural prescription will consider both biological and economic criteria.

Forest-Wide Forest Protection Standards

- Use integrated pest management methods that provide protection of forest resources with the least hazard to humans, wildlife and the environment.
- Use silvicultural methods and schedule practices that reduce the development and/or perpetuation of pest problems.
- Vegetation management will favor the use of fire, hand treatment, natural control, or mechanical methods wherever feasible and cost effective. Direct control methods, such as chemical or mechanical, may be used when other methods are inadequate to achieve control.

Specific Forest Plan Management Direction for the Lakeview-Reeder Project Area:

As discussed in Chapter I of this EIS, most of the land within this project area was designated in the Forest Plan as being either management area (MA) 1 or 4. The primary purpose of MA 1 lands as designated in the forest plan is "…. for timber production for the long-term growth and production of commercially valuable wood products…". As for MA 4, the Forest Plan indicates that these areas "… consists of lands designated for timber production within big game winter range".

Agency Direction since the Forest Plan was adopted

Since the IPNF Forest Plan was adopted in 1987, there have been a lot of changes in management philosophy and national direction. Principles of biological diversity, historic range of variability and landscape fire, wildlife, and human ecology have advanced and are better understood. New Perspectives, Ecosystem Management and increased emphasis on sustainability all occurred since the Forest Plan was adopted (Thomas 1996, Dombeck 1998, USDA, 1999a). These changes led to the development of large and mid-scale ecosystem assessments such as the Interior Columbia River Basin Ecosystem Management

Project (ICBEMP), the Northern Region Overview, and the Geographic Area (GA) assessments conducted on the IPNF. These assessments, as well as the Forest Plan monitoring efforts, have identified problems and demonstrated the need for management changes on National Forest lands in order to maintain sustainable terrestrial and aquatic ecosystems. In 2003, the Idaho Panhandle and Kootenai National Forest developed a report titled "Analysis of the Management Situation for Revision of the Kootenai and Idaho Panhandle Forest Plans". This report and associated documents presents a summary of the findings from the various ecosystem assessments and Forest Plan monitoring efforts. Some of the findings presented in that report are relevant to the management of vegetation in this project area and are discussed later in this report.

II. Healthy Forest Restoration Act (HFRA)

As discussed in Chapter 1 of the EIS, this project is an authorized project under the HFRA. HFRA provides direction regarding when, and under what conditions, it is appropriate to conduct treatments in old growth stands and also presents direction on what sizes of trees and types of treatments should generally be used. Because this project does not propose any treatments in old growth stands, the direction in HFRA related to that topic is not discussed here. However, in regards to tree sizes and treatments the HFRA says the following [HFRA, Sec. 102 (f)]:

> (f) LARGE TREE RETENTION.—
> (1) IN GENERAL.—Except in old growth stands where the management direction is consistent with subsection (e)(2), the Secretary shall carry out a covered project in a manner that—
> (A) focuses largely on small diameter trees, thinning, strategic fuel breaks, and prescribed fire to modify fire behavior, as measured by the projected reduction of uncharacteristically severe wildfire effects for the forest type (such as adverse soil impacts, tree mortality or other impacts); and
> (B) maximizes the retention of large trees, as appropriate for the forest type, to the extent that the trees promote fire-resilient stands.
> (2) WILDFIRE RISK.—Nothing in this subsection prevents achievement of the purposes described in section 2(1).

III. National Forest Management Act

The National Forest Management Act of 1976 is the basic law that governs vegetation management treatments on national forest lands. Several sections in the act, and its accompanying regulations, specifically address terms and conditions relevant to the vegetation resource. These include sections on timber suitability, and management requirements for vegetative manipulation, including tree regeneration timeframes and Regional opening size limits.

Guidelines established by Title 16 United States Code (U.S.C) Section 604(g)(3)(B) are to provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives, and within the multiple-use objectives of a land management plan adopted pursuant to this section, provide, where appropriate, to the degree practicable, for steps to be taken to preserve the diversity of tree species similar to that existing in the region controlled by the plan.

The minimum specific management requirements to be met in carrying out site-specific projects and activities for the National Forest System are set forth in Title 16 United States Code (U.S.C) Section 1604:

- Under 16 U.S.C. 1604 (g)(3)(E), a Responsible Official may authorize site-specific projects and activities on NFS lands to harvest timber only where: (i) soil, slope, or other watershed conditions will not be irreversibly damaged; (ii) there is assurance that such lands can be adequately restocked within five years after harvest; (iii) protection is provided for streams, streambanks, shorelines, lakes, wetlands, and other bodies of water from detrimental changes in water temperatures, blockages of water courses, and deposits of sediment, where harvests are likely to seriously and adversely affect water conditions or fish habitat; and (iv) the harvesting system to be used is not selected primarily because it will give the greatest dollar return or the greatest unit output of timber; and

- 16 U.S.C. 1604 (g)(3)(F), insure that clearcutting, seed tree cutting, shelterwood cutting, and other cuts designed to regenerate an evenaged stand of timber will be used as a cutting method on National Forest System lands only where - (i) for clearcutting, it is determined to be the optimum method, and for other such cuts it is determined to be appropriate, to meet the objectives and requirements of the relevant land management plan; (ii) the interdisciplinary review as determined by the Secretary has been completed and the potential environmental, biological, esthetic, engineering, and economic impacts on each advertised sale area have been assessed, as well as the consistency of the sale with the multiple use of the general area;(iii) cut blocks, patches, or strips are shaped and blended to the extent practicable with the natural terrain; (iv) there are established according to geographic areas, forest types, or other suitable classifications the maximum size limits for areas to be cut in one harvest operation, including provision to exceed the established limits after appropriate public notice and review by the responsible Forest Service officer one level above the Forest Service officer who normally would approve the harvest proposal: Provided, That such limits shall not apply to the size of areas harvested as a result of natural catastrophic conditions such as fire, insect and disease attack, or windstorm; and (v) such cuts are carried out in a manner consistent with the protection of soil, watershed, fish, wildlife, recreation, and esthetic resources, and the regeneration of the timber resource.

Project Goals and Objectives

As presented in Chapter 1 of the EIS, there are two broad goals for proposing this project. The first goal (along with corresponding objectives) involves reducing hazardous fuels to decrease the threat of a wildfire negatively affecting the community. That goal and how well the alternatives would meet it is discussed at length in the fire and fuels section of the EIS. The second goal is to “Restore, enhance and protect forest ecosystem components to improve forest health, increase biological diversity, as well as reduce threats from catastrophic wildfire and insect and disease infestations.” The forest ecosystem components of concern related to forest vegetation are composition, structure, pattern and function. In order to make progress towards meeting that goal, two specific objectives were established. These include;

1. Show Improvement in the Fire Regime Condition Class
2. Modify the tree composition, structure and pattern in the forests to be more resistant and resilient to disturbances.

The first objective mentioned above, “Show Improvement in Fire Regime Condition Class”, is discussed in the fire and fuels section of the EIS. The second objective is discussed at length in this report as well as a determination as to how well the alternatives would meet that objective.

Public Input

During the scoping and collaborative efforts that occurred for this project, we received 61 substantive comments and/or requests that related to the management of forest vegetation (PF-VEG-1). This input was used in several ways. Some was used early in the planning efforts to revise where the fuel treatment areas were proposed, as well as how much and what kinds of treatments should be proposed. Some input influenced what design features/mitigation measures were included to lessen the potential negative effects of the proposed activities, and lastly, some comments were used to determine what analysis topics should be included in this report and to what depth they should be considered (PF-VEG-1).

Some of the more prevalent comments we received included concerns over how the proposal would affect the health of the forests (including insect or tree disease occurrences) or the old growth stands. We were asked to disclose how the project would be consistent with HFRA requirements for large tree retention, how the project would affect forest patterns, how much tree cutting had occurred in the area in the past, and why it was necessary to propose regeneration treatments and create forest openings.

Analysis Issues

After considering the public comments and requests, the regulatory requirements and the goals and objectives for proposing the project, five issues or topics were identified for analysis. Some of these topics are very broad (e.g., forest health) and involve many aspects, while others are somewhat narrow in their scope (e.g., past timber harvesting). When discussing the affected environment and the environmental consequences that the alternatives would have upon forest vegetation, the report will focus on these issues:

- Effects of the alternatives on forest health (forest composition, structure, function, pattern, resistance and resiliency to disturbances)
- Effects of the proposal on old growth forest stands
- Need for regeneration treatments and forest openings
- Extent and type of past timber harvesting
- Consistency with the Forest Plan and other laws regarding the management of forest vegetation (including large tree retention requirements of HFRA)

General Analysis Methodology

The general methods and information sources that were used for this analysis are discussed below. When discussing the affected environment and environmental consequences for each of the analysis topics later in this report, some additional information is presented on the analysis methods, assumptions, literature and data that were used.

Information that was used to describe the affected environment and environmental consequences comes from a variety of sources. Historical conditions and ecological processes were assessed using information from large and mid-scale ecosystem assessments and other relevant research. Information on existing conditions of National Forest System lands for habitat types, forest cover types, forest structural stage, origin, past harvest activity, etc. are based primarily on corporate data housed in Forest Service Oracle relational databases including the Timber Stand Management Record System (TSMRS) and FSVeg (Field Sampled Vegetation). The TSMRS database includes a compilation of past management and harvest activities. It was compiled using field records and aerial photographs, and is considered 85-95% accurate from the 1960's to present. TSMRS data is updated in an ongoing basis and is the most current reflection of the existing condition. During the planning of this project, field site visits were made to all the areas proposed for treatment as well as many other stands in the project area that were not included into the proposed action for treatments.

Information regarding existing vegetative conditions on private lands is based on aerial photo interpretation and observations made by project team specialists in the area. Information on current and foreseeable private land activities was acquired from the Idaho Department of Lands and some contacts with landowners. Aerial photo interpretation was generally used to estimate stand structures on these private lands while the forest type was estimated primarily by a "nearest neighbor" approach.

With a couple of exceptions that are discussed below, the effects analysis area that was selected for the forest vegetation resource is the Lakeview-Reeder project area. The project area is approximately 29,000 acres in size and given the historic sizes of stand replacement wildlife events that occurred in north Idaho, this analysis scale is appropriate. Stand replacement wildfire events that historically occurred in north Idaho were often tens of thousands of acres in size and these fires were the most significant events in shaping the forests (USDA, 1999; Zack and Morgan 1994). Therefore, when discussing historical forest conditions and disturbances, a fairly large area similar to this project area is necessary.

However, when discussing the issue regarding old growth and Forest Plan standards, a larger analysis area was needed. There are portions of five different old growth management units (OGMU) that overlap with the project area (PF-VEG-2). In addition, there is an additional OGMU that does not occur in the project area, but it does fall within an area that contains some proposed activities relating to aquatic and grizzly bear mitigation items. Therefore, the geographic analysis area for the old growth resource will encompass six OGMU's. The second exception to using the project area boundary as the effects analysis area, involves the discussion of how the alternatives would effect the forest vegetation outside of the project area boundary for the road related storage and decommission activities proposed for aquatic and grizzly bear mitigation measures.

For details on how each individual proposed unit would be treated under the action alternatives, refer to tables Appendix C. Those tables indicate what silvicultural prescription would be implemented for each treatment area.

The following vegetation management ***Design features*** will be implemented with the proposed action (Alternative 2). A silvicultural diagnosis has been completed and approved by a certified silviculturist at the time of this analysis. All vegetative treatments would have silvicultural prescriptions approved by a certified silviculturist before treatment. Silvicultural prescriptions would consider site-specific factors such as physical site, soils, climate, habitat type, current and future vegetative composition and conditions, as well as interdisciplinary team objectives, NEPA decisions, other regulatory guidance, and Forest Plan goals, objectives and standards. All regeneration areas would be regenerated with site-adapted species/seed source. Sites will be prescribed burned, mechanically treated or a combination of both to reduce fuels and shrub competition sufficient to establish desired regeneration. In areas treated with regeneration harvest, site preparation for regeneration, fuel treatments, and planting/regeneration would occur within five years of harvest completion. Harvest unit layout will consider suitability limitations on a site-by-site basis on the ground. Harvest and site preparation treatments will consider the short and long term potential negative effects (including blow down, fire mortality, etc) of proposed activities on adjacent trees and stands with site by site prescription modifications, such as change in unit boundary, modification of prescribe burning prescriptions, etc.

Affected Environment

Forest Health

As mentioned earlier, one of the main topics covered in this analysis is the question of how the project would affect the health of the forest. This was not only a concern brought up by the public, but it is an important issue related to the purpose and need for proposing the project. One of the specific objectives for proposing this project was to modify the tree composition and structure in the forest so that the stands

within the project area would be more resistant and resilient to disturbances. As discussed below, both of these are part of our definition of forest health.

Before presenting the existing forest conditions within the project area and talking about whether or not the forests are healthy, it is first necessary to discuss what we mean within this EIS when we use the term forest health. As described by Karr et al (1994), the term forest health can have both utilitarian, as well as more ecosystem based definitions depending upon ones viewpoint. The Forest Service, with its multiple use objectives and emphasis on ecosystem management, uses an ecosystem based definition for forest health.

One recognized definition of forest health is:

> The perceived condition of a forest derived from concerns about such factors as its age, structure, composition, function, vigor, presence of unusual levels of insects and disease and **resilience** to disturbance. Perception and interpretation of forest health are influenced by individual and cultural viewpoints, land management objectives, spatial and temporal scales, the relative health in stands that comprise the forest, and the appearance of the forest at a point in time (Helms, 1998). Helms (1998) defines resilience as: The capacity of a plant community or ecosystem to maintain or regain normal function and development following disturbance.

In terms of the reference to "resilience to disturbance" in the definition of forest health above, the concept is that a healthy forest is one that is resilient to changes and that has the ability to bounce back after stress from natural or human causes (Joseph et al, 1991, Radloff et al., 1991, USDA Forest Service, 1992). The idea that a healthy forest would have the ability to replace itself was discussed by Aldo Leopold when he said "health is the capacity of the land for self-renewal (Leopold ,1949). Monnig and Byler's discussion of the forest health includes the idea that following disturbances, a healthy forest should be able to replace itself at a rate that is similar to the historic pattern (Monnig and Byler, 1992). Lastly, in addition to incorporating resilience into what we consider part of forest health, there is one more ecological term that we would like to incorporate into our broad concept of forest health, and this is "ecological integrity". Angermeier and Karr (1994), and Karr (1991) define this as:

> The capacity to support and maintain a balanced, integrated, and adaptive biological system having the full range of elements and processes expected in a region's natural habitat.
> "…the ability to support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of the natural habitat of the region." That is, an ecosystem is said to have high integrity if its full complement of native species is present in normal distributions and abundances, and if normal dynamic functions are in place and working properly. In systems with integrity, the "…capacity for self-repair when perturbed is preserved, and minimal external support for management is needed."

The Forest Service has recognized the need to manage the national forests on a sustainable basis using forest ecosystem management concepts (Dombeck, 1998). Many of the ideas and elements of forest ecosystem management have been touched on in the discussion above. In addition, other elements and themes of forest ecosystem management are presented by Kimmins (Kimmins, 2003 and Kimmins, 2004) and these were also considered.

Historical and Existing Forest Conditions and Disturbance Processes

The following section of this report presents a discussion of the historical and existing forest conditions and disturbance processes within the project area as well as those at larger scales. By comparing and contrasting the historical and existing conditions, one is able to draw some conclusions in regards to whether or not the existing conditions are healthy, sustainable, resistant and resilient to disturbances. This information, along with the knowledge of other resource needs and objectives for the project area, can

then be used to develop a description of the desired forest condition for the area and potential management activities that could be used to trend the forest towards more desirable conditions.

The Forest and its Ecosystem Setting

This section provides a description of the forests that occupies the project area as well as those that occur at larger scales such as the surrounding landscape. Considering multiple scales in a hierarchal fashion is one of the fundamental concepts of Ecosystem Management. Insight gained from using this approach can help improve or maintain the integrity of the forest ecosystem- which is one of the overall purposes for practicing ecosystem management (Haynes et al. 1996). In 1992, Dale Robertson, Chief of the Forest Service, directed all employees to begin striving towards achieving ecosystem management objectives. One outcome of this direction was that we are being asked to consider how the stand nests within the broader-scale landscape and how the stand can be managed to help achieve desired future conditions at larger scales (FSH 2409.17, 8.1-8.4). This "larger picture" provides a better context in which to determine what the management objectives should be for a forest within a project area, or for an individual stand of trees. Therefore, before discussing the forests within the project area itself, I will summarize some of the more relevant findings from several large to mid-scale landscape assessments.

In 1993, the Forest Service adopted an ecosystem classification and mapping system called the National Hierarchical Framework of Ecological Units (ECOMAP 1993). This system stratifies the Earth into progressively smaller areas of increasingly uniform ecological potentials. The forests within the Lakeview-Reeder project area fall within the Northern Rocky Mountain Forest Steppe-Coniferous Forest-Alpine Meadow Province (Bailey 1994). This is a geographic area from east of the Cascade Mountains in Washington State to the Continental Divide in Montana, into Canada to the north, and throughout northern Idaho. This Province is further divided into ecological Sections. This stand occurs within Section M333A- Okanogan Highlands. This Section occurs across much of the panhandle of northern Idaho and into northeastern Washington. The physical, ecological and cultural features of this Okanogan Highlands Section have been described and include such items as climate, geomorphology, soils, flora, fauna, hydrology, potential natural communities, disturbance regimes, land use and cultural ecology (Bailey 1994).

The Lakeview-Reeder project area occurs within a portion of northern Idaho and northeastern Washington that has some of the most diverse and productive forests in the Northern Region of the Forest Service. This is largely due to a relatively moist and warm climatic as well as the presence of forest soils that are "capped" with a layer of volcanic ash. The volcanic ash has a high water and nutrient holding capacity, both of which combine to create very productive soils. Within the LVR project area, the vast majority of the area (approximately 92%) is dominated by coniferous forests. The small percent that is not forested are generally areas along streams, ponds or lakes that are dominated by riparian vegetation, are meadows dominated by grass species, or are areas along ridges or south facing slopes that are dominated by shrubs species.

<u>Climate</u>

The forests in the project area developed and adapted to a very unique and dynamic climate. A summary of the climate is provided below to give the reader an understanding for how it influences the forest vegetation.

The climate is a transition-type climate and is influenced by three competing air masses:

(1) moist, moderate temperature Pacific inland maritime airflow -- from the west;
(2) dry continental air mass with greater temperature extremes-- from the east; and
(3) cold, dry arctic air -- from the north.

The relative strengths of these air masses can vary greatly over time, change rapidly, and are controlled by large-scale weather patterns, including the position of the jet stream and continental-scale patterns of high

and low pressure systems. Northeastern Washington and northern Idaho is an area where the variability caused by the interaction of these 3 air masses is great (Ferguson 1999). Summer is characteristically sunny and dry, though July and August are the only distinct summer months. July and August are thus also the peak fire-danger months. Annual precipitation averages 32 inches.[10] The wettest months are normally November, December, and January. Close to 60 percent of the annual total precipitation occurs during the period from November through March. A smaller secondary peak in precipitation normally appears in May and June, followed by a sharp decrease in July. Snowfall accounts for approximately 50 percent of the total precipitation and snow cover usually persists from early December through the end of March. The seasonal maximum depth averages 30 inches. The main season of lightning (or thunderstorm) activity extends from late May through August. Storms occur on an average of 3 or 4 days each month in June, July, and August.

Monthly mean temperatures range from 24 °F in January to 65 °F in July[11]. The annual mean is 44 °F. A large diurnal range occurs in summer, with July maximum temperatures averaging 83 °F and January maximums average 30 °F. Extreme temperatures have been as high as 103 ° to 105 °F and as low as -36 °F. Temperature inversions are commonplace, particularly on a clear summer and early autumn nights. Relative humidity is usually high throughout the day in late autumn and winter, averaging 70 to 80 percent or higher in mid-afternoon. In July and August, afternoon values average near 35 percent in the valley and 45 percent at 5,500 ft. Summer nighttime humidity in the valley typically recovers to over 90 to 95 percent by dawn. Winds in this area have a prevailing direction from the southwest most of the year. Summer afternoon winds at 20 ft above ground in the open average 3 to 4 mi/h; above the treetops, about 6 mi/h; and at mountaintop locations, about 9 mi/h.

Biophysical Setting

Existing and historic forest vegetation responses to disturbance vary by ecological or biophysical setting. Each biophysical setting has characteristic potential natural communities, soils, hydrologic function, landform and topography, climate, air quality, and natural processes (nutrient and biomass cycling, succession, productivity, and fire regimes). Each setting also includes moisture and temperature gradient, resulting in growing conditions that are more similar within than between each setting. To simplify the measurement of some of these physical and environmental factors, a classification system called habitat typing is used. Habitat types are based on natural relationships and reflect ecological patterns and the capability of vegetation on a site. The designation of habitat types and the classification of forest stands were established to characterize vegetation based on potential climax conditions. Climax conditions represent the culmination of overstory and understory plant succession without disturbance. Because climax species, by definition, are those species that are self-perpetuating in the absence of disturbance, and because disturbances are relatively common on most sites, the occurrence of climax conditions is rare (Cooper et al. 1991). In various sections of this report, the terms succession and seral stages are used. Succession can be defined as the sequential replacement over time of one plant community by another, in the absence of major disturbance. The different stages of succession are often referred to as seral stages. Developmental stages are as follows:

> Early seral: Communities that occur early in the successional path and generally have less complex structural developmental than other successional communities. Seedling and sapling size classes are an example of early seral forests.

[10] The climatological information was gathered from a weather station within the Priest River Experimental Forest, located about 20 air miles to the south of the project area.

[11] These are midpoint values between the average daily maximum and minimum temperatures (based on a 5 p.m. observation time)

Mid-seral**:** Communities that occur in the middle of the successional path. For forests, this usually corresponds to the pole or medium sawtimber growth stages.

Late-seral: Communities that occur in the later stage of the successional path with mature, generally larger individuals, such as mature forests.

Although every habitat type is unique in some way, habitat types can be grouped based on similarities in natural disturbance regimes, successional pattern, and structural characteristics of mature stands. In an effort to categorize vegetation responses to disturbance (primarily fires), and to describe potential forest cover types capable of dominating these sites, habitat types in the Lakeview-Reeder project area have been aggregated into habitat type groups. Information on habitat groups is derived from Forest Habitat Types of Northern Idaho (Cooper et al. 1991) and Biophysical Classification – Habitat Groups and Descriptions (USDA, 2005).

Moderately Cool & Moist, and Moderately Warm & Moist Habitat Type Groups – Habitat types within these groups account for 87 percent of the project area and 83 percent of the Priest River Subbasin (see Table 3-1). These are the most common habitat types in the mountains of north Idaho and are moist forest sites. These sites usually occupy low to mid-elevations, and include stream bottoms and adjacent benches and toe slopes. Habitat types of this group include the moistest of the grand fir series, and the majority of the western hemlock and cedar habitat types. Grand fir, western hemlock, western redcedar, and Douglas-fir trees dominate these sites today. However, prior to the introduction of the blister rust disease, these sites were known as the "white pine type" since over 40% of the sites were dominated by white pine. Today, only four percent of the Priest River Subbasin (USDA, 1999) and three percent of the project area are classified as a western white pine forest type.

Large stand-replacing fire intervals were approximately 200 years on these moist habitat type groups (Zack and Morgan 1994). Between these large stand-replacement fires, typically there would be mixed-severity fires occurring every 55-85 years. The large lethal fires often provided fuel for a reburn a few decades later. Double and triple burns were once common on these landscapes.

Approximately 77% of the areas proposed for treatment with this project occur on sites within this moist habitat type group. Various treatment types are proposed for these sites dependant upon the specific stand conditions that are present.

Moderately Warm & Dry, and Moderately Warm & Moderately Dry Habitat Type Groups – These habitat type groups account for approximately five percent of the Lakeview-Reeder project area and four percent of the Priest River Subbasin. The dominant forest vegetation in this group consists primarily of Douglas-fir, grand fir, ponderosa pine and western larch. Very dry sites within this habitat group were historically dominated by large, old ponderosa pine or Douglas-fir, with canopy cover often less than 30 percent and seldom reaching 50 percent. Historically, grasses and low shrubs dominated the understory and were maintained by low-severity fires that tended to occur at intervals of 10 to 30 years (Smith and Fischer, 1997).

Downed woody fuels consisted of widely scattered, large trees, twigs, branches, and cones; often the most abundant surface fuel was cured grass. Before the 20th century, these sites were characterized by frequent underburns that eliminated most tree regeneration, thinned young stands, and perpetuated open stands dominated mainly by ponderosa pine.

The more common, moderately dry forests in this habitat type group are also often open-canopied, although canopy cover could exceed 50 percent. Ponderosa pine and Douglas-fir dominate the overstory, with western larch as a co-dominant on slightly moister sites. The species composition and structure of moderately dry forests is dependent largely on the frequency and severity of fires. Historically, low-

severity fires at intervals of less than 50 years maintained a high, open canopy in these stands and perpetuated dominance by ponderosa pine.

Very long fire-free intervals have in many cases produced mature stands with few ponderosa pines or western larch. While large Douglas-fir can survive low-intensity fires, the dense understory and ladder fuels resulting from absence of fire increase the potential for lethal, or stand-replacing fires. Moister forests within this group historically burned frequently enough to maintain a structure dominated by ponderosa pine and larch. Where fire has been excluded for a very long time ponderosa pine and larch have gradually declined, with Douglas-fir persisting in the overstory.

In the old growth stage of stand succession, ponderosa pine, Douglas-fir, and western larch stands are usually single-storied and open-canopied (Green et al. 1992). Old growth of this type historically was maintained by frequent, low-intensity disturbance.

Approximately 10% of the areas proposed for treatment with this project occur on sites within this dry habitat type group. Most of the treatments that are proposed on these sites involve prescribe burning in decadent shrub fields.

Cool & Moist, and Moderately Cool & Wet Habitat Type Groups- These groups comprise less than one percent of the project area and nine percent of the Priest River Subbasin. Sites that are occupied by these habitat type groups generally occur on either low-lying, frosty drainage bottoms or at the upper elevations of the higher mountains. They can consist of a diversity of species with western larch, Douglas-fir, white pine, Englemann spruce, lodgepole pine, alpine fir, and grand fir. The fire-free interval for stand-replacing fires on these sites may be 50-130 years (Smith and Fischer 1987). Periodic fire disturbances and high amounts of low to moderate fire intensities favor species such as lodgepole pine, Douglas-fir, and western larch.

Within the project area itself, there are only 231 acres that have these habitat type groups and none of those areas are proposed for fuel treatments.

As depicted in Table 3-1, the distribution of habitat type groups within the project area is fairly similar to that of the greater Priest River Subbasin. Within the project area, there is a slightly higher percentage of moist habitat type sites and slightly fewer cold/moist sites than are present at the larger scale of the Priest River Subbasin. However, because these differences are rather minor, one can conclude that the historical disturbance agents and the composition of the forests in the project area would have been similar to the average historical conditions within the larger Subbasin area.

Table 3-1. Comparison of habitat type groups between the project area and the Priest River Subbasin (National Forest lands only).

Area	Dry	Moist	Cool/Moist	Cold/Dry	Non Forest
Lakeview-Reeder project area	5%	87%	<1%	0%	7%
Priest River Subbasin	4%	83%	8%	1%	4%

Forest Conditions within the Interior Columbia Basin

The forests in this project area occur within a portion of the larger Columbia River basin. In 1993, President Clinton directed the Bureau of Land Mangement and the Forest Service to conduct an integrated ecological assessment of the eastside forests in this area in order to "develop a scientifically sound and ecosystem based strategy for management of eastside forests." This direction resulted in the development

of a project known as the Interior Columbia Basin Ecosystem Management Project (ICBEMP). Because the forests within this project area are "nested" within the area covered by this assessment, findings from this assessment that could be relevant to the management of the forests in this project area, are summarized below. The geographic area covered by ICBEMP was broken down into subbasins and this stand occurs within subbasin #106 (Priest River).

Throughout the Interior Columbia Basin, disturbances such as fire and insect mortality have played an important role in determining forest tree composition (Quigley and Arbelbide ,1997). In northern Idaho and eastern Washington, the most significant historic natural disturbance was fire. In addition to natural disturbance, the assessment found that land management activities and introduced pathogens have dramatically altered the species and age composition of trees. Forested ecosystems have become more susceptible to severe fires and outbreaks of insects and diseases. Findings from this assessment for the river basins on the Idaho Panhandle National Forests show that the river basins have a low composite ecological integrity primarily due to past alterations. The Lakeview-Reeder project area lies within lands classified as Forest Cluster 4 in the Scientific Assessment. The forests within this area were rated low for forest integrity. The primary risks to forest integrity in this area were identified as forest compositions susceptible to insects, disease and fire. Risks to late and old forest structures in managed areas were also identified as threats to forest integrity. Opportunities to address these risks were identified as treatment of forested areas to reduce fire, insect, and disease susceptibility; and restoration of late and old forest structure in managed areas (Quigley, Haynes and Graham, 1996)

Historically, coniferous tree composition in the Interior Columbia Basin was dominated by ponderosa pine, western larch, and western white pine. These long-lived tree species typically established after some form of disturbance and have the potential to occupy a site for 200-300 years. Many of the local disturbances initiated these long-lived species and maintained them in mature conditions. Stands of these trees adapted to regenerate in and to survive local fire regimes. Other disturbances, such as historic levels of insect populations and wind and winter storm damage, contributed to stand mortality. As trees died, they became fuel wood and over time created conditions for large stand-replacing fires. Effective fire suppression, the loss of white pine due to the introduced blister rust pathogen, and land management activities such as logging has caused the character of the forests to change. Forests across the Interior Columbia Basin are now dominated by shade-tolerant grand fir, western hemlock, and Douglas-fir. These late successional species are more vulnerable to disturbances such as insects and diseases, and are less adapted to fire, drought and climatic variability than the more seral species. The results are that current stands have are more insect and disease activity and have higher risks for fire. The following is a list of findings that were made in the ICBEMP Scientific Assessment that are applicable to northern Idaho and the stand.

- *Interior ponderosa pine has decreased across its range with a decrease in old single story structure. The primary transitions were to Douglas-fir and grand fir/white fir.*
- *There has been a loss of the large tree component (live and dead) within roaded and harvested areas. This decrease affects terrestrial wildlife species that are closely associated with these old forest structures.*
- *Western larch has decreased across its range. The primary transitions were to interior Douglas-fir, lodgepole pine, or grand fir/white fir.*
- *Western white pine has decreased by 95 percent across its range. The primary transitions were to grand fir/white fir, western larch, and shrub/herb/tree regeneration.*
- *Generally, mid-seral forest structures have increased in dry and moist vegetation groups, with a loss of large, scattered, and residual shade-intolerant tree components, and an increase in the density of smaller shade-tolerant diameter trees.*

- *Insects and diseases always existed in forests, but the size and intensity of their attacks has increased in recent years due to increased stand density.*
- *Dry forests have had an increase in fuel loading, duff depth, stand density, and a fuel ladder that can carry fire from the surface into the tree crowns. As a result wildfire intensity has increased.*

Forest Conditions within the Northern Region

In 1998, the Northern Region of the Forest Service published an ecosystem assessment for the entire region that was called the Northern Region Overview (USDA, 1998). This assessment considered and incorporated findings from the ICBEMP and the Northern Great Plains Assessments and focused on priorities for restoring ecosystem health and availability of recreation opportunities. Some of the findings of the overview pertinent to vegetation conditions are discussed below. For the assessment, the Region was divided into Zones. The stand occurs within the Northwest Zone of the Region and includes the Kootenai, Flathead, west half of the Lolo, the Idaho Panhandle, and Palouse RD on the Clearwater.

Due to the interaction of agents such as blister rust and mountain pine beetle, followed by salvage harvests since the 1930s, over 95 percent of the white pine type has changed to grand fir, Douglas-fir, and western red cedar/western hemlock cover types with an associated change to a largely mid-seral stage structure. The risk regionally is high for a continued loss of western larch cover type and emergent structure due to the lack of low intensity, periodic disturbance and the shift toward stand-replacing fire. Current structures are typified by mid- to mature age/size classes with relatively few areas in the seedling and sapling structural stage. The typical stand structure and composition is multi-layered and is comprised primarily of Douglas-fir and grand fir. The acreage of the Douglas-fir cover type has increased greatly, with an associated increase in mid-seral species. This is a result of a combination of fire exclusion, selective harvest of large early-seral species, and especially the loss of western white pine. An increase in root disease has correspondingly reduced the productivity and health of forests in northern Idaho and western Montana in this type as a higher percentage of the most susceptible host species (Douglas-fir and grand fir) exists today (Byler et. al., 1994).

The overview findings conclude that there are multiple areas of concern in this zone, but that "this sub-region holds the greatest opportunity for vegetation treatments and restoration with timber sales." The overview states, "The timber management (timber harvest) tool best fits with the forest types in northern Idaho and is essential, for example, to achieve the openings needed to restore white pine and larch…"

Forest Conditions On the Idaho Panhandle National Forests and within the Priest River Subbasin

The Idaho Panhandle National Forests have been in the process of revising the Forest Plan. During the planning process for that effort, staff prepared a number of documents that presented the historic and existing conditions for the forest vegetation resource across the IPNF. Some of the findings presented in that report that are relevant to the management of vegetation in this project area include:

- In warm and dry habitats, there has been a shift from ponderosa pine and larch to Douglas-fir and grand fir.
- Significant reductions of western white pine, white-bark pine, western larch, sub-alpine larch, and ponderosa pine cover types
- An increase in density of trees and a shift to a largely mid-seral structural stage.
- There has been a decrease in both early and late-successional stage forests

- In general, patch sizes and interior habitat have decreased and fragmentation of the landscape has increased
- There has been an increase in shade-tolerant, fire and drought-intolerant tree species
- A reduction in large snags exists on portions of the landscape
- Higher fuel loading resulting from decades of fire suppression has resulted in more intense wildfires over larger areas
- Disturbance processes have changed from historic ranges

Concurrent with the development of the Northern Region assessment, the IPNF began gathering and analyzing ecosystem information for the major river basins on the forest. These subbasin reviews, called Geographic Assessments (GAs) are essentially step-down integrated ecosystem assessments at a mid-scale landscape level. The purpose for developing the GA's was to develop a scientifically based understanding of the processes and interactions occurring in the Subbasins so that activities can be developed to promote healthy and resilient ecosystems. The data for the assessment compare historic and current ecological conditions of the subbasin ecosystems. The assessment identifies ecosystem trends and changes in vegetation over the last 100 to 200 years. Findings of the North Zone Geographic Assessment are similar to those of the Northern Region and Interior Columbia Basin Assessments, but provide more specific information on lands in the subbasin ecosystems (USDA, 1999). The project area occurs within the Priest River subbasin. In addition to analyzing the ecological conditions across this entire subbasin, the GA also considered conditions within smaller geographic areas- typically one or more watersheds. The six-step process outlined in the "Ecosystem Analysis at the Watershed Scale" (Regional Interagency Executive Committee and Intergovernmental Advisory Committee, 1995) was followed for the analysis. Below is a summary of some of the findings from the GA that are relevant to the management of this stand.

As depicted in Table 3-2, the amount of ponderosa pine, western larch, and western white pine dominated stands has decreased dramatically from historically conditions within the Priest River subbasin. In contrast, the amount of Douglas-fir, grand fir/western hemlock, and western redcedar has increased substantially.

In the 1897, John B. Leiberg, who was a Botanist with the General Land Office, surveyed the Priest River Reserve. At that time, the reserve covered approximately the same area as the Priest River Subbasin. In regard to what kind of tree of forest he saw, in his report he states:

…there are but few tracts within its boundaries that do not now, or did not a few years ago, support a dense, magnificent forest…of these, the western white pine and tamarack (larch) form about 91 percent of the total…the white-pine zone is the predominant one in the reserve."

Forest Composition, Structure and Pattern within the Project area compared to conditions at the larger Priest Subbasin Scale

Forest Composition

Forest cover types describe the tree species that dominate a particular site. These cover types were used to describe the existing and historical forest composition (from the TSMRS database) within the Priest River Subbasin and Lakeview-Reeder project area. Existing cover types were developed from the TSMRS database and the historical information was derived from the Priest River GA (USDA, 1999).

Table 3-2 presents the existing and historical forest composition for the project area and for the larger Priest River Subbasin. This information illustrates the dramatic shift that has occurred over time. Within the Priest River Subbasin, larch and white pine together historically comprised 59% of the cover types

and now these species comprise only 8%. Ponderosa pine historically comprised 4% of the cover types in the Subbasin and now it only occupies 2%. Conversely, grand fir/hemlock, as well as Douglas-fir and cedar increased dramatically. These four species historically dominated 23% of the cover types as compared to 73% today.

Table 3-2. Percent of forest cover types in the project area as compared to current and historic levels across the Priest River Subbasin*.

Conifer Species Forest Cover Type	Current Percent of forest cover types in the project area	Current Percent of Priest River Subbasin	Historic Percent of Priest River Subbasin	Percent Change From Historic To Current For Priest River Subbasin
Douglas-fir	23	19.9	9.0	+121
Grand fir/W.Hemlock	25	25.7	6.0	+332
W. Larch	8	3.8	21.7	-83
Cedar	16	27.2	8.5	+220
Ponderosa Pine	<1	1.6	3.7	-56
Lodgepole Pine	16	5.2	6.0	-14
White Pine	3	4.1	37.1	-89
Subalpine Fir/Spruce	<1	11.5	7.8	+47
Unknown	<1			
Non Forested	7	No data	No data	
Total	100	100	100	

*Figures for the project area include private lands. Figures for the Priest River Subbasin represent only National Forest lands.

Reliable information is not available to estimate what the historical forest composition was within the project area. However, because the distribution of habitat types within the project area is fairly similar to that of the larger Priest River Subbasin, it is reasonable to assume that the historical composition in the project area was also fairly similar to the distribution within the larger Subbasin.

Currently in the project area, grand fir/hemlock, Douglas-fir and cedar comprise the majority of the composition, while larch, white pine and ponderosa pine occupy very little. The primary cause of these changes was the introduction of the blister rust disease, fire suppression, and past timber harvest practices. Blister rust was the most important factor in the reduction of white pine (USDA, 1999). Past logging practices of selectively removing the ponderosa pine and larch, along with fire suppression are the main reasons that those species have declined. Fire suppression, as well as harvest activities that do not create significant openings, are the current causes for the increase in the shade tolerant hemlock, grand fir and Douglas-fir.

The changes in forest composition that are presented here are consistent with the trends that were noted within the larger ecosystem assessments conducted for the Upper Columbia River Basin and for the Northern Region. While the IPNF Forest Plan does not mandate that we manage the forests to achieve the historical compositions (or structures), it is generally recognized in the more recent GA and broader scale assessments (including the new proposed land management plan for the IPNF) that significant departures can lead to less resilient, healthy and productive forests.

Some silvicultural strategies to restore white pine to the moist sites include creating openings through regenerating stands and planting resistant seedlings, using prescribed fires to prepare seed beds and reduce competition, and pruning and thinning young white pine to remove rust infections to extend the

life of the trees (Samman et al. 2003, pp. 6-8; Fins et al. 2001, pp. 16-18; Neuenschwander et al. 1999, p. 18). Many of these strategies are being proposed as part of this project.

Western larch is the most shade-intolerant conifer in the inland northwest and therefore it requires openings to regenerate and grow well (Burns et al. 1990, p. 168). It also favors seedbeds that have been burned (Schmidt et al., 1976). When it is mature, western larch tree is the most fire resistant conifer in the northern Rocky Mountains (Wellner, 1970). Although it outgrows other species when young, by the time it reaches 60 to 90 years old, growth slows down and shade-tolerant species can begin to out-compete the larch. Figure 3-1 is a photo of a stand in the Kalispell Creek drainage where the western larch (the needles have naturally turned yellow as this deciduous conifer begins to shed its needles in the fall) have initially outgrown the more shade-tolerant species (the shorter green trees). However, as the western larch naturally begins to slow down in height growth, without some disturbance, these larch will likely to overtaken by the "understory" trees that are much more tolerant of shade and will grow in height at a faster rate than will the larch.

Figure 3-1. Photo of a stand in the Kalispell Creek drainage showing western larch trees (with the yellow foliage) growing above the more shade-tolerant conifers (the green trees).

Historically, mixed and low severity fires played a key role in maintaining larch stands by selectively killing the more shade-tolerant, less fire resistant species (USDA, 1999). In the absence of fire or another disturbance, such as thinning that would favor the larch, the larch will begin to die out of the stands in the few decades after age 90. Therefore, in order to increase the amount of larch on the landscape it is necessary to create openings (preferably in association with prescribed burning) and regenerate the species or thin the stands. Where young stands already contain larch that have adequate crowns, it is necessary to keep the stands somewhat open through thinning in order to prevent the shade tolerant species from out-competing the larch (Schmidt et al., 1976). Western larch has few serious insects and

diseases that affect it and one of the important reasons that it has decreased in abundance is from the lack of thinning, either mechanical or fire induced (Carlson el al 1995). Some of the activities that are proposed for this project involve thinning in stands to give the existing larch more growing space, or planting western larch seedlings in stands proposed for regenerating.

Quaking aspen is not listed in Table 3-2 as a forest cover type that occurs within the project area. However, that is simply due to the very small number of acres of those trees that occur within the area relative to the large size of the project area. Within the area, there are approximately 69 acres (all occur on Vimmy Ridge) of forest stands that are dominated by aspen trees (see Figure 15 in Chapter 2 for a photo). Other scattered individual and clumps of aspen trees occur throughout the project area but do not dominant the larger stands that they occur within. In 1998, the Northern Region of the Forest Service identified the decline of aspen stands across the region as one of the larger forest health concerns (USDA, 1998). The primary cause for the decline was noted as fire exclusion and competition by other conifers. Aspen is a relatively short lived, shade-intolerant species that requires fires or other disturbance agents to reproduce and thrive. Because wildfires have been suppressed within the project area, and because the project area contains fewer young forests than it probably did historically, it is also probably true that less aspen exists in the project area today than historically. In addition, the aspen that is present within the project area are likely made up of older age classes that are beginning to decline in their health.

During the last few years, researchers have noticed a die-off of aspen stands in the Rocky Mountain region of the Forest Service (Worrall, et. al., 2008). The die-off or recent decline of aspen has been termed Sudden Aspen Decline (SAD) and is being researched all over the west (Rogers, 2008). As part of the wide-spread monitoring that is occurring across the western United States, plots were established in some stands on the Priest Lake Ranger District, and within a couple of stands that occur in the Lakeview-Reeder Project area. Preliminary observations have not indicated that this SAD phenomenon is occurring at Priest Lake (pers. com.Holly, 2008).

As mentioned in Chapter 2, the proposed action for this project includes conducting some prescribe burning activities in the aspen stands on Vimmy Ridge. The intent is to regenerate these relatively old aspen trees and kill most of the surrounding conifers that are competing with the aspen. Using prescribed fire to regenerate aspen is a fairly common and successful method designed to perpetuate this important species (Shepperd et al., 2001).

Forest Structure

Forest structure can be described by the size, age, and arrangement of trees in a stand. For this analysis, five structural stage categories were used to measure and characterize the forests (see box entitled Forest Structural Stages). Size classes were used as a proxy for describing these structural stages as size class can be cross-walked to stand age and structure.

The distribution of structural stages within the Lakeview-Reeder project area as well as Priest River Subbasin is shown in Table 3-3. Existing structural stages were determined from the TSMRS database and the historical information was developed as part of the GA (USDA, 1999).

Shrub/Seedling/Sapling Structural Stage - Within the project area, this structural stage comprises approximately 16% of the forests, which is approximately 5% less than the historic amount that occurred across the larger Priest River Subbasin. In addition, within the Priest River Subbasin and the project area, much of this structural stage is actually composed of older sapling size trees that are beginning to make the transition to the pole/small tree structural stage. The current level of natural or man-made openings in the forests has not been sufficient to maintain the historic levels of shrub/seedling/sapling stands. As the older sapling stands mature and move into the pole structural stage within the next two decades, the amount of shrub/seedling/sapling stands will likely decline to well below historical levels (USDA, 1999).

Table 3-3. Percent of forest vegetation in each structural stage.

Structural Stage	Percent of project area	Current Percent of Priest River Subbasin	Historic Percent of Priest River Subbasin	Percent Change of Historic to Current for the Priest River Subbasin
Shrub/Seedling/Sapling	16	18.2	20.9	-13
Pole/Small	8	10.7	12.0	-10
Immature/Medium	45	24.5	19.9	+23
Mature/Large	24	31.0	22.9	+36
Old Growth	4	15.5	24.3	-36
Totals	97*	99.9	100.00	

*Approximately three percent are non-forested areas.

Forest Structural Stages

Shrub/seedling/sapling Stage – This is the youngest and smallest stage and generally includes forests where the tree diameters are less than 5". These stands tend to be less than 35 years old and most have resulted from past regeneration harvests or natural events such as fire. These stands may consist of seedlings less than one year or trees planted in clearcuts in the late 1960s or 1970s that are now 30-40 feet tall. Some stands may retain a considerable number of large overstory trees while others may have no large tree component.

Pole/Small Timber Stage – This stage usually occurs from approximately 35 to 60 years old and is dominated by trees with diameters of approximately 5-10 inches and the stands are generally dense. These stands may have developed from fires or from harvesting in the 1950s and 1960s.

Immature/Medium Timber Stage – This stage occurs from about 60 to 100 years after a disturbance and is generally dominated by trees in the 10 to 15 inch diameter range. Stands in this category tend to be fairly dense and have either developed from early logging in the 1940s and early 1950s, or are a result of wildfires in the 1920s and 1930s.

Mature/Large Timber Stage – This stage occurs when stands are more than 100 years old and are dominated by trees over 15 inches in diameter. Stands in this mature/large timber stage generally resulted from the wildfires in the late 1800s and early 1900s. Conditions within this stage can be quite variable. Some can be fairly open as a result of insect mortality, root diseases, past harvest activities or fires, or harsh soil conditions. Stands unaffected by these disturbances will be dense and have fairly closed canopies.

Old Growth Stage– This stage occurs when trees reach diameters greater than 21" and are older than 150 years. These are stands that resulted from fires or other natural disturbances prior to about 1850. These stands often contain different age classes of trees from multiple disturbances.

Pole/Small Timber Structural Stage – Approximately 8% of the forests in the project area are occupied by this structure. Although this amount is somewhat less than both the current (10.7%) and historical structure (12.0%) of the Priest River Subbasin, many older sapling stands are transitioning to this pole/small timber structural stage and therefore this structural stage will become more prevalent in the near future. *Immature/Medium Timber Structural Stage* - Currently about 45% of the project area, and 25% of the Priest River Subbasin is occupied by this structural stage. As compared to the historical amount in the Priest River Subbasin (about 20%), there is currently much more of this structural stage present. Many of these stands, both in the project area and the Priest River Subbasin, originated after the wildfires in the 1920s and 1930s and will remain in this stage for many years. Over the next few decades, this structural stage will likely remain above historic levels and actually increase over the Priest River

Subbasin (USDA, 1999). Compared to historical conditions, the existing stands in this structural stage tend to be denser with more canopy layers.

Mature/Large Timber Structural Stage - This structural stage currently occupies approximately 24% of the forests within the Lakeview-Reeder project area and 31% over the Priest River Subbasin. Historically, the Priest River Subbasin contained an average of approximately 23%.

Old Growth Structural Stage - Within the project area, approximately 4% of the forests occur within this structural stage. Approximately 16% currently occurs across the larger Subbasin where 24% occurred historically. Within the Subbasin, historically there were significant amounts of old growth (and mature/large) white pine, larch and cedar (especially in riparian areas) on moist sites, and ponderosa pine on dry sites. However, very little of these types of old growth remain. They have been replaced by hemlock,

Douglas-fir, grand fir and cedar stands growing on upland sites (USDA, 1999). For the Douglas-fir, hemlock and grand fir, there are serious doubts about the long term stability or sustainability of these forest types as old growth (USDA, 1999).

In regard to wildfire hazards in and adjacent to the project area, the amount of the overall forest that occurs within each structural stage has implications. For example, as compared to the older stands, the younger stands (those in the shrub/seedling/sapling stage or those in the pole/small timber stage) generally have less dead and down fuels, have less dense tree crowns, and a greater percent of the total fuels in the stands are live fuels. In addition, these younger stands generally have not reached a stage where trees are beginning to die because of competition with each other. Because of these fuel characteristics, these younger timber stands will generally burn with lower flame lengths and be easier to control than are older stands.

The stands in the Immature/Medium or Mature/Large timber structural stages generally have the most hazardous fuels. Within these stands, the trees are undergoing a lot of competition between each other for limited sunlight, water and nutrients and this often results in competition-induced tree mortality. The trees that die either do so directly from this competition or more often, they are weakened to the extent that forest insects and/or diseases kill them. Dead surface fuels build up in these stands and in addition, many of the stands within these structural stages have dense tree crowns (high crown bulk densities) that predispose them to higher chances of crown fires. Lastly, stands within these structural stages often have shade tolerant tree species growing in the understory of the taller trees, and these understory trees can serve as ladder fuels to allow surface fires to transition into crown fires. Another issue that often occurs within stands that are in these structural stages is that trees will develop into tall and skinny trees that are very susceptible to storm damage. As trees undergo competition between themselves, a tree will allocate resources (photosynthate) to different needs in order of priorities. Height growth has a higher priority than diameter growth (Oliver and Larson, 1996). This means that high-density, low-vigor stands may eventually develop tall, spindly trees because height growth continues even after diameter growth slows or stops. Such trees have an unbalanced height to diameter ratio and are called “wet noodles” because they can not support themselves and tend to experience snow breakage or just fall over (see figures 3-15 and 3-16 later in this report for photos of this). Over time, these wet noodle trees add to the fuel quantities of dead down fuels.

In contrast to stands in the Immature/Medium or Mature/Large timber structural stages, in general, the stands in the old growth structural stage tend to have less hazardous forest fuels. This is because they often have less quantities of down dead fuels and in some instances, the distance between the understory tree crowns and the overstory tree crowns is relatively far, and this can make it more difficult for a fire to transition from a ground fire to one burning in the tree crowns.

For the reasons discussed above, the project area and the larger basin, have more stands today that have hazardous fuel conditions than was probably present historically.

Allocated Old Growth

For this project, the stands that had been previously identified as old growth as well as potential old growth stands were reviewed. This review process is found in the forest vegetation section of the project file (PF-VEG-3). Portions of six old growth management units (OGMUs) overlap with the Lakeview-Reeder project area (PF-VEG-2). Table 3-4 presents the total number of acres of allocated old growth stands, as well as the various categories of old growth that occur within each of the OGMUs. Old growth stands are defined in the Regional Task Force Report "Old Growth Forest Types of the Northern Region" (Green et al. 1992). Although it varies by forest cover type and habitat type, in order to meet old growth criteria, most stands in the project area have to have a minimum of 10 trees per acre that are 21" in diameter or larger, and 150 years old or more. Old growth stands were allocated for retention based on direction from the Forest Plan (page II-20), the Regional Task Force Report mentioned above, and Forest Supervisor letters of direction for implementing the Forest Plan old growth standards (PF-VEG-4). As shown in Table 3-4, the amount of allocated old growth within the OGMUs varies substantially between the six OGMUs. OGMU #9 has only 67 acres of old growth while OGMU #22 contains 2,799 acres. The variability of old growth within these areas is due to the fire history of the area as well as the past harvesting that occurred.

Table 3-4. Acres of Allocated Old Growth Stands that occur within the six Old Growth Management Units that overlap the project area

Old Growth Mgmt. Unit #	*Acres in OGMU*	*Acres of Allocated Ancient Cedar*	*Acres of Allocated Field Verified Old Growth*	*Acres of Allocated Photo Inventory Old Growth*	*Acres of Allocated Potential Old Growth*	*Total Acres of Allocated Old Growth (and % of OGMU)*
9	8,826		67			67 (1)
20	12,691		100		317	417 (3)
21	9,579		657	85	231	973 (10)
22	9,738		2,682	63	54	2,799 (29)
23	10,242		819	4	85	908 (9)
24	13,852	105	2,369		18	2,492 (18)

As discussed in more detail in the environmental consequences section of this analysis, no alternatives propose fuel treatments or other activities within allocated old growth stands.

Forest Pattern

In order to understand how forest ecosystems function and how management activities could affect them, it is important to consider the pattern of forests on the landscape and how they are arranged. The pattern of forests on the landscape can affect wildlife and plant habitats and dispersal, disturbance (fire, insects, pathogens) spread and size, and human values such as aesthetics (USDA, 1999).

As part of the GA for the northern zone of the IPNF, a landscape pattern analysis was conducted to determine how the pattern of forest structure has changed from 1935 to 1994. A portion of the Priest

River Subbasin was selected as one of the analysis areas for this study. The area within the Priest River Subbasin that was selected for analysis is similar to the project area in that both areas contain portions of the landscapes that are roaded and have had some level of forest management within them, and both areas have portions of there areas are lightly roaded or unroaded (USDA, 1999). The FRAGSTATS program (McGarigal and Marks, 1995) was used to determine different aspects of landscape pattern using the forest structural stages.

The FRAGSTATS program generates indices that can be used to characterize landscape pattern. Two of these indices are presented below in Table 3-5. The GA (USDA, 1999) contains a more thorough list. The results of the analysis conducted for the GA focused on three categories of structural stages: the early-successional "seedsap/no tree" structural stage, the mid-successional “medium” tree structural stage, and the late-successional “large” tree structural stage.

Table 3-5. Landscape Pattern Indices for a portion of the Priest River Subbasin.

Structural Stage	FRAGSTATS Index	Priest 1935	Priest 1995	% Change
Seedsap/No Tree	% of landscape	34.6%	26.5%	-23%
	Mean patch size (acre)	97.6	79.1	-19%
Medium	% of landscape	43.1%	52.2%	21%
	Mean patch size (acre)	339.5	566.4	67%
Large	% of landscape	12.7%	9.0%	-29%
	Mean patch size (acre)	313.6	145.3	-54%

Compared to historical conditions, both the early successional structures (seedsap/no tree stage) and the late successional structures (mostly old growth) have changed in similar ways. The area that these structural stages cover in the analysis area declined from historic levels: 23 % for the seedsap/no.tree stage and 29% for the large tree stage. In addition, the average patch size declined substantially because smaller patches were created and dispersed across the landscape. This has increased the fragmentation of these structural stages.

Changes to the mid-successional medium tree structural stage were in the opposite direction. This structure now occurs over a larger percent of the landscape than historically and average patch sizes have increased.

Historic fire regimes (large stand-replacing fires at long intervals with smaller fires in the interim) tended to create large areas of similar stand structure. Immediately following disturbance, shrubs, and seedlings would dominate these large areas. As trees in these areas grew through the various structural stages, minor disturbances would alter stand structure on a smaller scale. Some watersheds would be composed mainly of old forest structural stage with “islands” of younger age classes where small-scale disturbances occurred. Other watersheds would consist mainly of younger age classes with “islands” of mature and old structural stages that survived the large stand-replacing fires.

A quantitative landscape pattern analysis was not performed for the Lakeview-Reeder project area. However, by reviewing the fire history and the existing structure maps of the project area (PF-VEG-5), it is apparent that similar trends to those described above for the Subbasin have occurred in the project area as well. Compared to the early 1930’s (after the most recent large fire occurred in the project area), the patch sizes for the young and old structural stages in the project area are much smaller than they were prior to that time period.

Disturbance Processes

Disturbance is a key process for change in vegetation on the landscape. Disturbance can be both natural (e.g. wind storms, wild fire, insect mortality, ice damage) and human caused (e.g. prescribed fire, timber harvest). The following discussion presents the primary disturbance agents that have influenced the forests in the past and those that affect them today.

Fire

Fire is the major historic disturbance that produces vegetation changes in north Idaho ecosystems. Fire has burned in every ecosystem and virtually every acre of the coniferous forests of northern Idaho and eastern Washington (Spurr and Barnes, 1980). Fire was the principle agent for the widespread occurrence and even the existence of western larch, lodgepole pine, western white pine and whitebark pine. Fire maintains ponderosa pine throughout its range at lower elevations and kills ever-invading Douglas-fir and grand fir (Smith and Fischer, 1997).

Northern Idaho, northeastern Washington, and western Montana are an island of moisture in the dry interior west. These forests are very productive and produce high levels of organic material. Because these areas generally have more precipitation, wildfire return intervals are longer than in most of the interior west. A recent study describing fire history in the Coeur d'Alene River Basin indicated that an average of once in every 19 years there was a fire season that burned five percent or more of the study area in a single summer (Zack and Morgan 1994). The study showed that historically, in an average summer, fires were patchy with variable intensity. During the periodic drought years, however, there were large stand-replacing crown fires that covered tens of thousands of acres. Lethal stand-replacing fires revisited individual forest stands on an average of once every 200 years - plus or minus 80 yrs (Zack and Morgan 1994).

Based on the Zack and Morgan study (1994), historically over a 70-year period, the total acreage of stand-replacing fires would be approximately equal to one-third the area of the forest. These stand-replacing burns would be a combination of single stand-replacing fires in the range of tens of thousands of acres, and reburns of some of these areas a few years after the initial stand-replacing fire. During that same 70-year time period, mixed-severity fires would have occurred across an area approximately the size of the entire forest.

Fire was also the major natural disturbance event in the Priest River Basin and the Lakeview-Reeder project area. Regarding the role of fire in the area, in 1897, John G. Lieberg states:

> *"One meets with burnt areas everywhere -- in the old growth, in the second growth, in the young growth, and where the seedlings are beginning to cover the deforested areas have just commenced to obtain a fair hold. The burnt tracts are in large blocks, thousands of acres in extent, and in small patches of 15 to 50 acres which extend in all directions through the forest…The burnt areas are scattered all over the reserve, but the largest amount of damage lies within the zone of the white pine…The most extensive plats of burnt forest are found in the northern and western portions of the reserve*" (Lieberg 1899).

The historical fires that occurred within the project area are described in detail in the fire and fuels section of this analysis. However, in regard to forest vegetation, it suffices to say that wildfires were prevalent and heavily influenced the forests. During the 60 years, fire suppression of the low and mixed severity fires in the Priest River Subbasin and the project area has virtually eliminated this natural disturbance process. Rapid suppression of all the fires has removed the opportunity for fires to grow in size and intensity and become stand-replacing type fires. As discussed in various areas of this section, fire suppression is one of the most important factors that led to the change in forest composition, structure, and landscape pattern.

Insects and Diseases

Many insects and diseases are found in the project area and most are native and exist at endemic levels. However, there are some native as well as non-native insects and diseases that are likely functioning outside of their historic role. These insects and diseases are discussed in detail below. Other forest diseases, such as stem decays[12], rusts[13], needle diseases[14] and dwarf mistletoe[15] exist in the project area but are generally not considered to be significant as they are likely functioning within their historic role.

White Pine Blister Rust: White pine blister rust, an exotic pathogen, was introduced to North America around 1910. Blister rust is a fungal disease that forms cankers on branches or stems of trees that eventually kill or weaken the "five-needled" pine tree species (see Figure 3-2). In this area, the major tree species affected by this disease is the western white pine tree. Weakened trees become susceptible to other disease or to insect attack. Eventually, white pine was infected over the entire Priest River subbasin. Trees were either killed or there was an accelerated harvest to recover their economic value. Loss of mature white pine and the continuing mortality of younger trees due to blister rust have led to the increase in Douglas-fir, grand fir and hemlock now seen across the landscape. Efforts were made to control blister rust through eradication of the alternative hosts, currant and gooseberry. Although these methods had been somewhat successful in the eastern United States, topography and landscape scale in the west prevented success and the program was dropped in 1968 (Neuenschwander et al. 1999). Applications of antibiotics also proved unsuccessful and emphasis has shifted to development of genetically rust-resistant trees that can be planted throughout the natural range of white pine. There have been successes in genetically improving tree resistance, planting those trees and then using cultural treatments like pruning to improve survival (Schwandt, Marsden, and MacDonald 1994). These programs are continuing today. It is recognized that the best strategy to save white pines from blister rust is to increase the numbers of rust resistant white pines in these ecosystems by aggressively planting them in openings (Samman et al. 2003, p. ii; and Fins et al. 2001, p. 10). It is believed that this pine tree has a genetic memory that has persisted over the 190 million years since white pine's ancestors last had contact with the fungus (Millar and Kinlock 1991).

[12] Common stem decay fungi in the project area include brown pocket rot, quinine conk, Indian Paint Fungus and red ring rot.
[13] In the project area, western gall rust, comandra and stalactiform rusts occur at low levels on lodgepole pine.
[14] Periodically, western larch in the area get infected with larch needle blight and/or cast. However, these needle fungi rarely kill trees.
[15] Larch dwarf mistletoe is present in the project area on some western larch, however, in most instances, this native plant is not present at high levels.

Figure 3-2. A young western white pine tree that is infected by white pine blister rust. The rust canker is girdling the tree. Photo by Susan Hagle, USFS.

Historically, western white pine had an important ecological role in forests of the Interior Northwest (Harvey and others 1995; Monnig and Byler 1992). Especially important was this species ability to form a stable, relatively long-lived, forest that was perpetuated by a combination of mixed-severity and stand-replacing wildfires (Zack and Morgan, 1994). Even though fire occurred in this forest type fairly regularly, old-growth structures often persisted for several centuries (see Figure 3-3). Across its range, western white pine is now estimated to be less than 5 percent of what it was at the turn of the 20th century (Neuenschwander and others 1999).

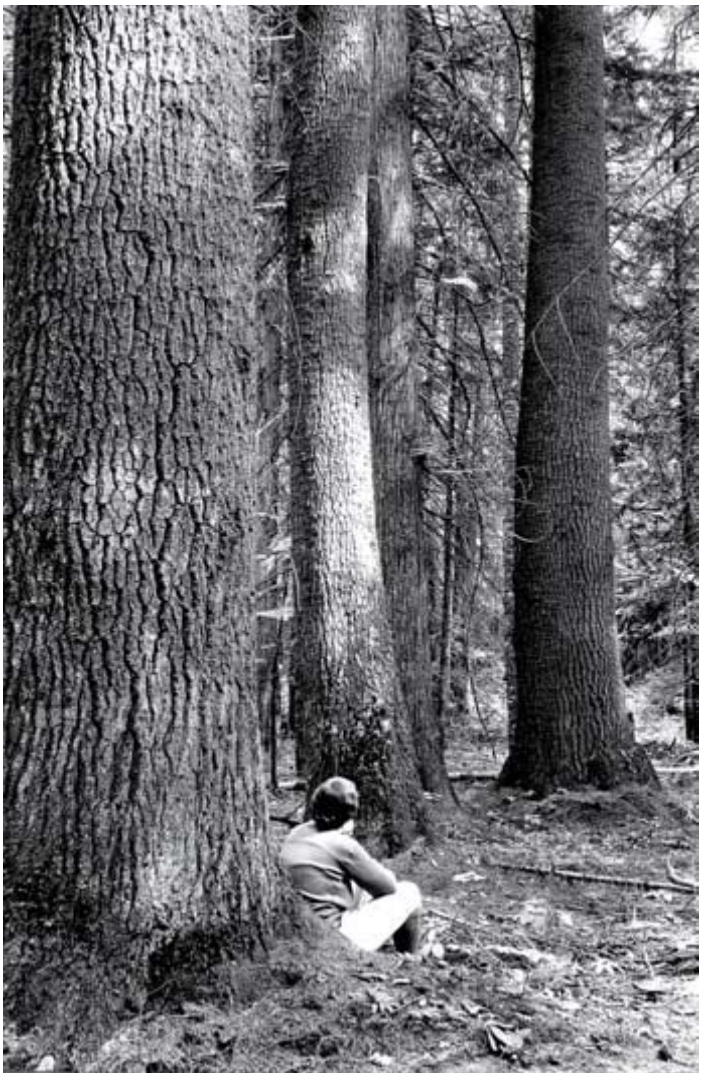


Figure 3-3. An example of an old-growth western white pine stand. Photo taken at Priest Lake, Idaho circa 1920. Courtesy of USDA Forest Service, Rocky Mountain Research Station, Moscow, Idaho.

In the absence of the western white pine, the forests in the region are much less productive and are unstable. They have become insect-pathogen-fire-prone forests that are less valuable for many amenities, including carbon sequestration (Atkins and others 1999; Harvey and others 1995; Monnig and Byler 1992). Despite their inherent high growth potential, the forests that were formally dominated by western white pine trees are now one of the lowest storage compartments for fixed carbon in the northern Rocky Mountains (Birdsey 1992). In the past, northern Idaho white pine sites have produced high volumes of white pine and other species and volumes that rank among the best in the country (Haig et. al., 1941).

It is a tall, straight tree that self prunes well with relatively open, low-density foliage (Graham 1990). When less than mature, it is highly tolerant of most endemic insects and pathogens, especially when compared with late seral and climax species that are its most common associates (Harvey and others, 1995). The species is effectively perpetuated only through stand-opening disturbances. Historically, this occurred through fire or insect and pathogen activities, mostly the latter, as they affected competing species.

As the western white pine have lost their dominance in these forests, other more nutrient demanding tree species have increased their numbers. This has led to higher nutrient demands where nutrient storage and cycling rates are depressed and this in turn, will likely lead to ever increasing stress, with associated endemic insect and pathogen activities creating a domino effect that destabilizes the ecosystem and leads to more mortality and more frequent fires (Harvey et. al., 2008).

In order to restore white pine even to a small portion of its historic range, regional forest pathologists and geneticist have concluded that aggressive steps must be taken (Fins et. al., 2001). Among these, is the needed activity of creating more opportunities for artificial regeneration (tree planting) of improved rust-resistant seedlings. In their technical report titled "Death of an Ecosystem: Perspectives on Western White Pine Ecosystems of North America at the End of the Twentieth Century", forest pathologists, university professors, and foresters have concluded that "Without aggressive intervention sufficient to change current trends, the outlook for this magnificent tree and, perhaps more importantly, the ecosystem it once supported, is obviously dismal. Although current efforts have had much success, they have not been widespread enough to turn the tide in this battle." (Harvey et. al., 2008).

Many of the timber stands within Lakeview-Reeder project area contain at least a small number of western white pine trees, either as living trees, or as dead standing and down trees. While it appears that white pine blister rust has killed most of the white pine trees that once occurred within the stands, scattered live trees can often be found in these stands. Surface fuels within many of the stands are at moderate or high levels and to some degree, this is a direct result of mortality that has occurred in the past due to the blister rust disease. Within the project area, there are some past harvest areas that have been planted with seedlings that were bread to be resistant to the disease. The proposed action includes planting most of the areas that have regeneration treatments with blister rust resistant white pine seedlings (as well as other tree species).

<u>*Root Disease:*</u> Historically, root diseases were a significant factor in reducing the competition from Douglas-fir and grand fir to maintain western white pine, western larch and on some sites, ponderosa pine. Douglas-fir tended to regenerate readily in the early stages of stand development, but dropped out as a significant component due to high rates of mortality caused by root disease (Byler and Zimmer-Gorve ,1990). Western white pine, ponderosa pine and larch have a higher level of resistance at this stage of stand development to root diseases and were able to capitalize on the increased availably of growing space. Fire exclusion and the loss of these species from the blister rust disease has reduced the opportunity for early seral species to become established in areas with root diseases. Individual trees, as well as disease centers of dead/dying trees were noted to have been infected by root diseases in many of the proposed treatment units in the project area. During the planning of the project, a forest Pathologist from the Forest Health Protection staff of the Forest Service made a visit to the project area with the District silviculturist who was working on this project to discuss the root disease (PF-VEG-6).

Armillaria root rot (*Armillaria ostoyae)* was found on Douglas-fir and grand fir trees in many of the stands proposed for treatments (see Figures 3-4 and 3-5 below). Figure 3-4 shows the white mycelial fans produced by the fungus under the tree bark of a Douglas-fir tree and Figure 3-5 illustrates the coffee colored stain on the outer bark of another Douglas-fir tree. The stain is caused by extensive resinosis that often occurs as a defense mechanism by the tree. This root disease was found causing mortality to scattered individuals, as well as small groups of Douglas-fir and grand fir trees in stands in the project area and proposed treatment units. Although it was somewhat rare, Armillaria root rot was also noted killing individual trees of other species in the project area such as cedar, hemlock and even young white pine trees. While these tree species are not immune to this root disease, they are less susceptible than are Douglas-fir and grand fir trees.

Figure 3-4. Photo of a Douglas-fir tree in one of the stands in the project area on Lakeview Mountain. Note the white mycelial fan under the bark that is caused by the Armillaria root rot.

Figure 3-5. Photo of a Douglas-fir in a stand within the project area on Lakeview Mountain. The tree is exhibiting the characteristic brown basal staining caused by the armillaria fungus.

Another fairly common root disease that was noted to be killing and/or weakening trees in the project area was laminated root rot (*Phellinus weirii*). This is another very common root disease that occurs at Priest Lake and elsewhere in the region. It can often be found killing or weakening Douglas-fir and grand fir trees. Figure 3-6 below illustrates a common phenomenon in which the laminated root rot weakens the tree roots and creates a situation that predisposes the tree to being windthrown before the fungus actually kills the tree.

Figure 3-6. Photo taken by Robert James (retired USDA Forest Pathologist) of a downed tree that blew over as a result of laminated root rot.

Although there were other root diseases found to be affecting trees in the project area (brown cubical root rot - Phaeolus schweinitzii, and annosum- Heterobasidion annosum are two of them), the armillaria and laminated root rots are the most prevalent. In terms of successional development, root diseases were a significant factor historically in reducing the competition from Douglas-fir and grand fir to maintain western white pine, western larch, and on some sites, ponderosa pine. Douglas-fir and grand fir tended to regenerate readily along with white pine, western larch and others in the early stages of stand development, but Douglas-fir and grand fir dropped out as a significant component in the stands due to high rates of mortality caused by root disease (Byler and Zimer-Gorve, 1990). At this stage of stand development, western white pine, ponderosa pine and larch have a higher level of resistance to root disease than does Douglas-fir and grand fir, and were able to capitalize on the increased availability of growing space. Fire exclusion and the loss of white pine, ponderosa pine and larch through white pine blister rust and harvest have reduced the opportunity for these long lived early seral species to become established in root disease areas. In the absence of fire, forest insects and diseases drive forest succession by affecting tree species, size, and stand density. Insects and diseases outside of the historic disturbance range are considered signs that the functions of these disturbance agents are not resilient over the long term. The condition of heavy root disease and ladder fuels promotes and increases the risk of stand-replacement fire (USDA, 1998) which also has relevance to the rate of successional change and ecosystem resiliency.

While conducting public scoping and collaboration efforts for this project, we received some comments and requests in regards to considering how the alternatives would affect the incidence of root disease in the treatment areas. As a result, the recent literature that was relevant to this issue was reviewed. Approximately forty research papers concerning the effects of root diseases on forest trees in the inland western forests were reviewed (PF-VEG-7). These studies emphasized the susceptibility of western conifers to root diseases and the effects of management activities on these tree diseases. Conclusions from this literature review in regards to how the alternatives would affect the incidence and severity of the root diseases is discussed in the environmental consequences section of this report.

Insects: The more significant forest insects of Priest River Subbasin include mountain pine beetle, western pine beetle, Douglas-fir beetle and fir engravers. These are discussed in more detail below. Other insects are present, but are probably less significant in terms of killing trees or otherwise affecting these forests[16] .

Historically, mountain pine beetle played a major role in mature white pine forests. Outbreaks were recorded in the early to mid 1900s that killed up to 50% of the mature white pine in some stands and spread over thousands of acres. With the decline of white pine due to blister rust and harvesting, the natural role and significance that this insect plays has changed. More recently, this insect has been found attacking younger, smaller white pine trees that are also infected with blister rust (Neuenschwander et al., 1999).

Within some of the stands that are proposed for treatment in the project area, the mountain pine beetle was observed attacking some of the few scattered, remnant mature white pine that are present. In addition to attacking white pine, the mountain pine beetle can often be found attacking and killing lodgepole pine trees (see Figure 3-7). The lodgepole pine become more susceptible to being attacked as they become fairly large in diameter.

[16] Within the project area, other insects that have affected trees include the spruce beetle, red turpentine beetle, roundheaded and flatheaded borers and pine engraver beetles.

Figure 3-7. A lodgepole pine tree in the project area that was attacked by the mountain pine beetle and killed. The red material on the outside of this tree bole is the boring frass and pitch that results from the beetles "boring" into the tree.

Some of the stands proposed for treatment in this project area have had substantial amounts of the lodgepole pine trees killed by this beetle and this had added substantially to the amount of surface fuels that are present (see Figure 3-8).

Figure 3-8. This photo was taken in a stand dominated by lodgepole pine trees in the project area along the Reeder Creek road. The area is proposed for fuel treatment. The lodgepole pine trees in the stand have been experiencing substantial mortality due to mountain pine beetles attacks. This has increased surface fuel loadings as a result. While the dead tree in the foreground is a grand fir tree (killed by fir engraver), most of the down trees are lodgepole pine.

The western pine beetle is also an important native insect. On some of the drier sites in the project area that contain scattered old ponderosa pine or younger pine, this bark beetle was observed killing individual ponderosa pine trees and occasionally small groups of these trees. Typically, ponderosa pine mortality from this insect would increase dramatically in dry years and would be more significant in fairly dense stands where the trees are competing heavily for a limited amount of moisture and other resources. Figure 3-9 (see below), depicts a large dead ponderosa pine tree that was killed by the western pine beetle in the project area. A nearby ponderosa pine shown in Figure 3-10 has not been attacked, but the surrounding dense trees are undoubtedly competing with that individual old tree for limited water and soil nutrients. Research has shown that by reducing the density of stands that the vigor of these trees can be enhanced and this could possibly prevent attacks by these beetle species (Johnson, 1972; DeMars and Roettgering, 1982; Miller and Keen, 1960).

Figure 3-9. This photo was taken on Lakeview Mountain in the project area. A large, old ponderosa pine that had been attacked and killed by western pine beetles in the project area. Woodpeckers have flaked away the outer bark to feed on the beetle larvae.

Figure 3-10. A large old ponderosa pine in the project area that was located fairly close to the tree that was attacked by western pine beetle shown in figure 3-9. This ponderosa pine tree is being crowded by more shade tolerant tree species that are growing up under it and competition stress may eventually predispose this tree to being attacked by the beetles also.

Douglas-fir beetles are native bark beetle insects and have always been present throughout the Priest River Subbasin. However, the substantial increase in Douglas-fir trees across the landscape has led to

increased population levels. In addition, the presence of root disease areas has resulted in even higher levels of the Douglas-fir beetles and the propensity for rapid beetle population buildups during favorable conditions. Douglas-fir beetle outbreaks occur following disturbances such as windfall, snow breakage or fire. This was the case in the project area and elsewhere in the Priest River Subbasin in 1996. A series of snowstorms in November of 1996 occurred over the basin and brought wet, heavy snow. This precipitated the Douglas-fir beetle epidemic. Some stands within the project area received heavy mortality from the beetle epidemic. Figures 3-11 and 3-12 show some of the areas within the project area where substantial numbers of Douglas-fir trees were killed as a result of the beetle epidemic. Tree mortality that results from these beetles eventually adds to the surface fuels within the stands.

Figure 3-11. This photo was taken in the project area on the eastern portion of Bismark Mountain in 2000. The red/brown trees were killed by the Douglas-fir bark beetle.

Figure 3-12. This photo was taken in 2000 within the project area. The area is on the southern slope of Watson Mountain. The red/brown trees were killed by the Douglas-fir bark beetle.

Fir engraver beetles are another significant insect that has affected the stands within the project area and some that are proposed for treatment. Individual or small groups of recently killed, and older killed, grand fir trees occur in occur in a number of the stands proposed for treatment in this project. While root disease was certainly associated with some of the recently attacked grand fir trees, there were occasions where it appeared that the fir engraver beetles were attacking and killing trees that were not already predisposed to beetle attacks as a result of root disease. Fir engraver beetles are typically attracted to trees that are weakened by root disease, drought or defoliation (Furniss and Carolin, 1977). In this project area, attacks have probably occurred as a result of the recent drought in the region and the presence of root diseases in many of the stands. According to Idaho State pest condition reports, as well as Forest Service aerial detection surveys, the population of this beetle in Idaho has increased dramatically since 2001. In 2000, approximately 2,400 acres were infested in Idaho and by 2004 the number had increased to 212,800 acres. Figures 3-13 and 3-14 depict grand fir trees in the project area that were killed by this beetle and the resulting accumulations of fuels on the forest floor.

Figure 3-13. This photo taken in a stand within the project area on the lower portion of Cooper Mountain. Note that most of the trees in the foreground have been killed by the fir engraver bark beetle. After a few years, it is expected that these standing trees will decay and fall, and as a result the fuels on the forest floor will increase.

Figure 3-14. This photo was taken on Lakeview Mountain in the project area within an area where grand fir trees were being killed by fir engraver and root disease, and Douglas-fir were being killed by root disease. Note that most of the dead trees have since fallen and this has increased fuel loadings.

Summary of Insect and Diseases

In summary, with the impact of the white pine blister rust and the decrease in fire, the role that insects and pathogens play as disturbance agents is growing and changing in the project area and across the greater landscape. With the drastic reduction of the white pine, and the decreased amounts of ponderosa pine and larch, root pathogens have been transformed from thinning agents into major change agents that create openings in Douglas-fir and grand fir stands and accelerates succession towards the shade tolerant species (USDA, 1999). Because we have more Douglas-fir relative to historical conditions, Douglas-fir and fir engraver bark beetles are more significant as disturbance agents than they were historically. They accelerate succession in the short run, and in the long term they create fuel conditions and stand structures that may increase the risk of stand replacing wildfires (USDA, 1999).

Weather Disturbances

As mentioned already, the weather in the Priest River Subbasin is very unique to the inland area of the western U.S. Strong maritime air flow carries high levels of moisture to this area. Moist maritime air that moves across the Northwest carries significant moisture descending from the Cascade Mountains and across the Columbia Plateau. When this warm/moist air is driven into the Selkirk Mountains, heavy/wet snows can occur and are common in the Priest River subbasin. These storms often result in significant windthrow and breakage in species of trees such as Douglas-fir, western hemlock and grand fir, especially when the ground is not frozen. The narrower crowns of western white pine, the deep rooting habits of ponderosa pine and the deciduous nature of western larch make them less susceptible to this damage. Root diseases make Douglas-fir especially vulnerable to windthrow events. Dense stands, where tree canopies form contiguous "interlocking" tree crowns and trees tend to be relatively tall and have small diameter trees, are especially susceptible to damage from heavy snows and/or winds (see Figures 3-15 and 3-16 below). This can lead to heavy loadings for decades afterwards.

Figure 3-15. This photo was taken in a stand that is proposed for fuel treatment along the Reeder Cr. road. The down and "hung-up" trees were likely a result of snow breakage events – possible from a large, extensive snow storm that occurred at Priest Lake in November of 1996.

Figure 3-16. While this photo was not taken in the project area, it depicts the dense stand conditions that can lead to tall, spindly trees that are susceptible to snow breakage and "collapse". Stand conditions like this are present in stands proposed for treatment on the north side of Lakeview Mtn.

In northern Idaho, precipitation tends to vary on a decadal basis, with wet periods and dry periods each lasting several years to decades (Finklin, 1983). Extended droughts both raise the fire danger and stress trees, especially the more drought intolerant species. During droughts these stressed trees are less able to resist insect and pathogen attacks. This climatic variability creates an environment prone to a high frequency and variety of disturbances. The combination of air masses with different moisture and temperature conditions, and topography with lots of relief, creates ideal conditions for summer thunderstorms. Rocky Mountain forest ecosystems are (and were historically) a mosaic of disturbance-derived patches of various age and composition. Historically, fire was the primary disturbance agent throughout most Rocky Mountain ecosystems, but insects, pathogens, and weather events were also important (Barbour and Billings, 2000).

Extended droughts, windstorms, ice storms, heavy wet snow storms, and sudden extreme freezes are all weather disturbances that impact forests, either by direct mechanical damage to trees, or by creating high stress that increases the probabilities of other disturbance agents. Windstorms may often have a disproportionate impact on the taller overstory trees, and function to accelerate succession by releasing understory shade-tolerant trees. All the mechanical agents (wind, ice, heavy wet snow) tend to have a disproportionate impact on overcrowded stands, because tree boles in overcrowded stands are relatively thin, and thus more prone to mechanical damage and breaking (USDA, 1999). In general, weather events raise the probability of subsequent insect or fire disturbances. Trees broken or blown down in severe weather events provide breeding grounds for some bark beetles species. Weather events that cause large amounts of tree breakage or blowdown are frequently the precipitating event that leads to bark beetle epidemics. In turn, blowdown from weather events and trees killed by insects both create woody fuels that increase fire hazard (USDA, 1999).

In addition to storms affecting the forests, periods of droughts can have significant effects on tree mortality. The tree species that are more prevalent today than historically are generally those that are the most affected by extended drought.

Native American Influences

Prior to any European settlement of the Priest Lake Basin, the Kalispel Tribe of Native Americans had summer camps in the basin and had trail systems from the Pend Oreille Valley over to Priest Lake. Although Native Americans intentionally started fires in parts of northern Idaho and Washington to improve forage for their horses or for hunting purposes, there is no evidence that this occurred in the Priest Lake area (Sims, 2002).

Euro-Settlement Influence

Euro-American settlement of northern Idaho and northeastern Washington, which began in the latter part of the 1800s, resulted in many changes to the forest vegetation. In addition to the previously discussed effects of fire suppression and introduction of blister rust, agricultural land clearing and logging have influenced the composition and structure of forest vegetation.

Timber Harvest on Forest Service Land

Historic Harvest Activities - Historic Forest Service timber sale maps and records document timber harvest in the project area back to the year 1916. However, only a limited amount of information exists for timber sales that occurred before 1950. In general, only the acres harvested, year and type of treatment are recorded for these early sales. Beginning around 1950, additional information on logging systems and fuel treatments were recorded as well.

Most of the early logging was selective cutting to remove larger and more valuable trees. On drier sites, especially the more accessible areas, the more valuable ponderosa pine and larch were sometimes removed from areas within the Subbasin. The more shade tolerant Douglas-fir and grand fir were left to dominate. Unless these areas burned during slash reduction operations or by wildfire, ponderosa pine and larch were unable to naturally regenerate. Tree planting was only initiated on areas that were severely devoid of trees due to logging or fires and generally stands with Douglas-fir and grand fir understories were not planted. On moist sites, western white pine and western larch were removed for their value in the early days. With blister rust spreading at a rapid rate, a lot of western white pine was quickly salvaged in order to capture value. Stands of Douglas-fir, grand fir cedar and western hemlock resulted. Following the selective logging, the slash was piled and burned or left to abate naturally. Cutting and skidding was done as soon as the ground was firm enough in late spring and continued until snow became too deep. Horses were used predominately to skid logs to chutes or straight to landings. Dalkena Lumber Company used sleighs and snow roads built in the winter to transport logs from landings to Priest Lake to await the spring time log drive. Diamond Match Company constructed a narrow gauge railroad up Kalispell Creek to transport logs to Kalispell Bay to wait for the log drives (see Figure 3-17). The section of the existing 308 road proposed for obliteration was built on a portion of this railroad.

Figure 3-17. A 1929 photo of the narrow gauge logging railroad that was constructed and operated in the Kalispell drainage.

All of the older timber sales that occurred in the project area are listed in Appendix B and in general, those early sales were not included in the TSMRS data base.

Recent Harvest Activities- The more recent timber sales are listed in Table 3-6 below. That information was generated by records within the TSMRS data base. While that table indicates that a few sales occurred in the area prior to 1950, those records are incomplete and one should use the historic sale information presented in Appendix B for a better representation of the extent of early logging activities.

As indicated in Table 3-6, most of the timber harvest activities that occurred on National Forest lands in the project area since 1950, were either clearcut, sanitation/salvage, or thinning harvest types.

Timber Harvest on Private Lands

There are 4,397 acres of private lands within the project area. Of this, the majority of currently available forest land has had limited timber harvest on and off since the early 1900's. Often timber harvest has coincided with residential development as some land owners have subdivided or cleared lots for building. Those lands have been converted and are not considered forest land any longer. In general, much of the larger tracts of private forest land are still managed as productive forests. Stimson Lumber Company is the only industrial landowner within the project area with 1486 acres. They have harvested all but one parcel within the last few decades and most recently on Lakeview Mountain in the late spring of 2007. They have relied on natural regeneration to reforest their lands. Another 26 acres of private non-industrial forest lands exist within the watershed analysis area and are currently in a forested condition. Stimson owns an additional 3,105 acres within the watershed analysis area and has harvested these lands within the last few decades. Forest Capitol is a newer landowner in this area and holds 770 acres within the Granite Creek watershed that was harvested in decades past.

Table 3-6. This table depicts all of the harvest activities that occurred on Forest Service lands within the project area that are listed in the TSMRS data base. The acres of the various harvest types are listed.

Harvest Type	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	Grand Total
Clearcut					171	1192	691	536	243	2	2835
Clearcut with Reserves									44		44
Group Selection Cut										7	7
Improvement Cut								4			4
Liberation Cutting								13	290	3	306
Permanent Land Clearing						85			1		86
Salvage			12								12
Sanitation/Salvage	335	338		170	539	66	549	295	590	256	3138
Seed Tree Final Cut with Reserves									18		18
Seed Tree Seed Cut							1	40	23		64
Shelterwood Final Cut									17		17
Shelterwood Final Cut with Reserves									33		33
Shelterwood Preparatory Cut										217	217
Shelterwood Seed Cut							32	443	135	185	795
Shelterwood Seed Cut with Reserves									10	17	27
Single Tree Selection							18		16		34
Special Cut									147	4	151
Thinning						170	1703	1881	192	3	3949
Grand Total	335	338	12	170	710	1513	2994	3212	1759	694	11737

Forest Health Conclusions

Thus far, this report has provided a comparison between the historical and existing forest conditions for the project area as well as the larger Priest River subbasin. In addition, findings for larger geographic assessments were presented to provide more context to the discussion. The overall conclusion is that the structure, composition, pattern and ecosystem function of the forest within the project area, and those at larger scales, is much different today than it was historically. More specifically, the following conclusions can be made:

Forest Composition- The species composition of the forests within the project area and the larger Priest River Subbasin has changed dramatically since European settlement. There has been a substantial reduction in the percent of the landscaped dominated by western white pine, western larch and ponderosa pine. In contrast, Douglas-fir, grand fir, hemlock and cedar has dramatically increased. The tree species that are more common today tend to be shorter lived, more susceptible to insects and diseases, less resistant to fire and drought, and more tolerant of shade. In regards to fuels and wildfire hazard, these changes have generally made the forests more susceptible to fires. This has created a situation that could jeopardize the long-term health, function and resilience of the forest ecosystem.

In regard to the implications to fire hazard, this shift from forests dominated by western white pine and larch, to forests dominated by hemlock, Douglas-fir and grand fir, has increased the fire hazard. Western white pine and western larch tend to be tall and self prune well. They also carry large branches high in their crowns and have good foliar dispersion (Minore 1979). Foliage and small branch wood from western white pine and western larch is of particularly low bulk density (and nutrient content) compared to most climax species (Minore 1979). Consequently, stands of white pines and western larch carry their canopies well above surface fuels, tend not to have ladder fuels, do not carry crown fires well, and generally have

low nutrient content. Thus, canopy nutrient stores are relatively well protected from fire. In comparison, intermediate-age Douglas-fir, true firs, western hemlock and western red cedar are not tall, do not self prune well (especially when young), carry large branches low in their canopies (strong conical shape), do not have good foliar dispersion, and have relatively high bulk densities with resulting high nutrient concentrations in foliage and small branchwood (Minore 1979, Brown 1978, Van Wagner 1977). So, stands dominated by these species often have ladder fuels, carry crown fires well and have a generally high nutrient content in tissues susceptible to loss from fire.

Forest Structure and Pattern – As compared to historical conditions, the distribution of structural stages within the project area and Priest River Subbasin has changed substantially. The amount of Shrub/Seedling/Sapling structural stage is below historic levels for the Priest Subbasin. Without some large wildfire event or other major disturbance, this structure will likely fall below the historic range within a couple of decades. In contrast, the amount of the landscape within the Subbasin that is within the immature/medium and mature/large timber structures is above historic levels. The amount of old growth structure in the Subbasin is currently below historic levels. In addition, the composition of old growth has shifted from stands dominated by larch, white pine and/or ponderosa pine, to stands dominated by hemlock, grand fir and cedar. At the project level scale, these same trends are occurring.

As mentioned early, because the structural stages that are more prevalent today (immature/medium and to a lesser degree, the mature/large timber structure) tend to have more hazardous fuels than do the structures that are less common today, the hazard of large fires is elevated. Compared to the early 1900s, the forests within Priest River Subbasin and the project area have become more fragmented. The average patch sizes for the shrub/seedling/sapling and the old growth structural stages have decreased in the Subbasin and the project area. In contrast, patches of immature/medium and mature/large structural stages have increased in size.

Forest Ecosystem Function – Historically, western white pine was considered to have served as a "keystone" species in forests within this area. As discussed in detail in Mills et al., 1993), a keystone species is one whose loss leads to significant changes in ecosystem structure, materials, and energy flows. Because of the blister rust disease and subsequent logging to capture expected morality from the disease, very little white pine remains and this trees' ecological role as a keystone species has been altered (McDonald et. al., 2000). As mentioned earlier, western white pine historically comprised approximately 37% of the trees in the forests within the Priest subbasin and now it is 4% (3% for the project area). Therefore, there are a lot of processes and functions that have been altered. For example, because stands dominated by western white pine have different canopy structures than stands without white pine, the dynamics of hydrologic processes could have changed (McDonald et. al., 2000). Relative to the historic forests, these stands made up of the climax species would fix less photosynthate and release more carbon as a result of accelerated decomposition of the rot prone, standing trees (McDonald et. al., 2000). In addition, increased mortality from root rots and insects would increase fuel loads and these forests would have more fuel ladders. The shallow rooted, climax species that have low and dense crowns have larger accumulations of litter on the soil surface than do forests dominated by seral species. This can lead to more nutrients (mostly nitrogen) in the top soil horizon and predispose them to potential losses from wildfires (Harvey and Morgan, 2001).

Because of the decline of the white pine and larch, and the increase in Douglas-fir, grand fir and hemlock, the role that insects and pathogens have is growing and changing. Root diseases changed from a thinning agent into a major stand-change agent. Bark beetles such as the Douglas-fir bark beetle and fir engraver beetle have increased relative to their historic role because their primary host trees (Douglas-fir and grand fir) have increased in abundance. Now, both insects and pathogens are responsible for a much larger proportion of forest disturbance than they were historically. These insects and pathogens accelerate the succession of these forests from earlier to mid seral species, to late seral or climax species (Byler and Hagle, 2000).

Lastly, because of the large change in the composition of the forests in the area, it has been suggested that the genetic strategy of the dominant conifers may change (Rehfeldt, 1994). In the historic forests that were dominated by seral tree species, insect and diseases probably served as stabilizing agents, removing the maladapted late seral and climax species early in stand development, which would preserve only the best climax trees and favor the dominance of the long-lived seral species (Harvey and others 1999).

Because of the dramatic changes that have occurred to these forests that were once dominated by white pine and larch, prominent forest pathologists, university professors, and research foresters have concluded that without aggressive intervention, the recovery of the western white pine ecosystem will not occur for centuries, if ever (Harvey, et. al., 2008). Based on the definition and discussion of forest health that was presented earlier in this report, one could conclude that the forests in the project are unhealthy. If forest ecosystem components such as species composition, structure, pattern and disturbance processes can be restored to levels closer to those within the historic range of variability, then both fuel reduction and forest restoration objectives could be met.

Desired Future Conditions

In order to trend the forests within the project area toward a more healthy state, the following general conditions listed below are desired. These conditions are based upon the knowledge inferred from the historical disturbance regimes, successional processes, and the integration of social desires (such as having a lower wildlife risk) for forests within the project area. These conditions are designed to help sustain the productivity and diversity of the forests while making them more resistant and resilient to disturbances.

The desire is to modify the forest composition to:

- Increase the amount of forests dominated by western white pine (blister rust resistant trees), western larch, and ponderosa pine. Compared to the other native conifers, these species are generally more shade-intolerant, fire-resistant, relatively drought-tolerant, insect and disease resistant, and long-lived. In addition, increase the amount of young aspen trees within the project area.
- Decrease the amount of forests dominated by grand fir, western hemlock, Douglas-fir, lodgepole pine and western redcedar. In general, these species are shade- tolerant, fire intolerant, more susceptible to insect and diseases, drought intolerant, and/or they are short-lived tree species.

Table 3-7 below shows what the current forest cover types are within the project area as well as the desired amounts. The desired ranges that are shown generally correspond to the historic range of variability that was determined for the IPNF and are based on the percentage of the project area that occurs within each of the habitat type groups.

Table 3-7. Existing and desired forest cover types within the project area.

Forest Cover Type Groups	% of forested lands currently existing within the project area within each forest cover type	Desired Condition
western white pine and western larch	12	40-80
ponderosa pine	<1	3-5
Douglas-fir, grand fir, western hemlock and western redcedar	64	25-45
lodgepole pine	16	3-5
Englemann spruce, subalpine fir	<1	<1
quaking aspen/cottonwood	<1	<1

The desire is to modify the forest structure and pattern to:

- Increase the amount of forests within the Shrub/Seedling/Sapling structural stage and within the old growth structural stage.
- Decrease the amount of forests within the immature/medium, and to a lesser degree, the mature/large structural stages. In addition, decrease the density of trees that occur within stands of these structural stages.
- Increase the patch size in both the shrub/seedling/sapling structural stage and the mature/large and old growth structural stages, and decrease the patch size in the Immature/medium structural stage.

Table 3-8 below shows what the current forest structure cover types are within the project area as well as the desired amounts. The desired ranges that are shown generally correspond to the historic range of variability that was determined for the IPNF.

Table 3-8. Existing and desired forest structure within the project area.

Forest Structure Classes	% of forested lands currently existing within the project area within each forest structure class	Desired Condition
Shrub/seedling/sapling	16	15-29
Pole/small	8	8-16
Immature/medium	45	13-27
Mature/large	24	14-26
Old growth	4	17-35

By modifying the tree composition, structure and pattern of the forests within the project area as described above, the forests would be more resistant to a wildfire and the trees would be more likely to survive a fire if one were to occur.

Identification of fuel treatment needs and proposed activities

As mentioned earlier, during the public collaboration and scoping efforts that occurred for this project, we received some questions and concerns regarding why it was necessary to regenerate some forest stands in order to reduce the hazardous fuels. We were also questioned about how the various treatments would affect fire behavior and whether or not the treatments would be effective. The following discussion is meant to address those issues as well as describe the process that was used to decide what areas should be proposed for fuel treatments and what kind of treatment activities should occur within each of the forest stands. In addition to the information presented here, Chapter 2 contains additional details on each of the eight treatment types that are being proposed.

During the early planning stages for this project, the forest stands in the project area were evaluated for their fire hazard potential. Foresters, fuel and wildfire suppression specialists, and a silviculturist assessed the existing fuel conditions in the forest stands (such as quantity and type of ground fuels and the canopy density and canopy base height) and the likely future trend of the fuel conditions. In addition to considering the fuel conditions within the individual stands, they evaluated other factors which can influence fire hazard- such as prevailing winds, topography, fuel conditions in surrounding stands and proximity to potential ignition sources, private property, homes, egress routes and other values. Using this process, the higher priority stands were identified for some form of treatment. A specific treatment type was then proposed for each of these stands. As described in Chapter 2, there are eight different fuel treatment types being proposed in this project. The reasons for proposing a certain treatment type over another type were dependent upon the site-specific conditions within the stand and an assessment of how effective the treatment would be in reducing the hazard and trending the forest conditions toward the desired conditions as described above.

In general, if it was determined that an intermediate treatment[17] (e.g., a commercial thinning) would effectively reduce the hazardous fuels for a considerable period of time, than an intermediate treatment was proposed rather than a regeneration method[18]. It was only when the composition, health and/or structure of the stand was such that an intermediate treatment would not be very effective (in its longevity and/or degree of effectiveness) in reducing the hazardous fuels, that a regeneration treatment was proposed. As an example, if a specific forest stand had hazardous forest fuels (surface, ladder and crown fuels- see Figure 9 in Chapter 2 for an example) but still had enough healthy trees of a desirable species (for example larch trees) and condition to leave, then the stand could be thinned and fuels reduced without creating an opening and regenerating the stand. On the other hand, in the example above if the larch trees were tall and “spindly”, a thinning treatment would not be very effective in reducing the hazardous fuels because following the thinning, one would anticipate that the spindly trees to topple over in wind and/or snow storms and therefore, the surface fuels would accumulate again fairly quickly (see Figure 3-16 in this report for an example). This same type of diagnosis process was used on all the stands proposed for treatments, as well as many that were not. Notes were taken of the stand conditions while the foresters, fuel specialists and/or silviculturist walked through the stands and potential fuel treatments were noted (PF-VEG-8). Eventually a preferred treatment method was proposed. Occasionally, the treatment method

[17] An intermediate treatment is a collective term for any treatment in a stand that is designed to enhance growth, quality, vigor, and composition of the existing stand rather than regenerate a new stand. For this project, the intermediate treatments that are proposed and described in chapter 2 are all those *except* the irregular shelterwood seed tree treatments.

[18] A regeneration method is a treatment designed to create a new age class of trees in the stand. For this project, the regeneration methods being proposed are the shelterwood with reserves and the seed tree with reserves methods.

that was preferred by the forester or fuel specialists was modified during interdisciplinary team discussions in order to mitigate some other resource concerns (for example to maintain scenery or mitigate wildlife concerns).

If a forest stand was evaluated and it was determined that some form of an intermediate treatment would not be effective in treating the fuels, and instead it was necessary to regenerate the stand, than a specific regeneration treatment method was selected. In general, if there were a fair number of trees (e.g., 20 to 40 trees per acre) within the stand that were of a preferred species and in a fairly healthy condition, then a shelterwood treatment was proposed. If fewer than approximately 20 trees per acre were of a preferred species and in a healthy condition, then the seed tree treatment was proposed. For more information on those treatments, please see the description in Chapter 2.

When designing the proposed fuel treatment activities for the stands, documented scientific principles were used to modify and reduce the hazardous fuels and trend the forest toward being more resistant and resilient to wildfire and other disturbances. Recent scientific publications were reviewed such as: Agee and Skinner (2005); Skinner et. al., (2004); Peterson et. al. (2005); Graham et al., (1999 and 2004); Stephens and Moghaddas (2005); Pollet and Omi (2002); Omi and Martinson (2002). Among other things, these studies concluded that when designing fuel reduction treatments to alter the potential fire behavior within forest stands it is important to:

1. Reduce surface fuels- this reduces the potential flame lengths, reduces tree torching, and allows for easier suppression.
2. Increase height to live crown (gap between surface fuels and canopy fuels)- this necessitates a longer flame length for tree torching.
3. Decrease crown density- this makes tree-to-tree crown fire less probable
4. Retain big trees of fire-resistant species (i.e. pines)- this results in less mortality for the same fire intensity

The treatments that were selected for stands in the Lakeview-Reeder project area follow the four principles above. For each of the treatment types that are being proposed for this project, Chapter 2 contains a description of how the fuels would be manipulated. In addition, the fire and fuels report presents modeling results that illustrate how different treatment types would affect fire behavior indicators, such as flame length, torching index, crowning index and rate of spread.

In addition to designing the treatments at the stand level to modify potential fire behavior within the stand, the larger landscape scale was also considered. It is at this larger landscape (multi-stand level) scale where treatments have more potential for disrupting large fire growth and reducing fire movement and ultimate wildfire size. When designing the treatments in the project area, one of the factors that was considered was where the treatments units should be placed on the landscape and how large they should be in order to be as effective as possible in slowing the spread of a large, fast moving wildfire. In recent years, it has been recognized that the spatial arrangement, size and the amount of the landscape that is treated can important factors in how fast and intense a large fire can burn through a forest (Finney, 2001, Finney et. al., 2007, Finney et. al., 2005, Weatherspoon and Skinner, 1996). Research on this topic was reviewed and where both applicable and feasible, the concepts and strategies were used in designing the treatments. For example, in regards to how large the fuel treatment units should be, research has suggested that larger units could be more effective in slowing the spread of a wildfire for several reasons. In a study of actual wildfire behavior, Finney et. al. (2005) noted that fire severity decreased more in larger treatment units as compared to smaller ones, and decreased more as one went from untreated areas further into areas that had been treated. In addition, in this same study it was concluded that larger treatment units may stay effective for a longer period of time than would smaller ones. In addition, researchers have found that larger treatment units could be more effective than smaller ones because fires

burning up to larger treatment areas would be less likely to spot across the treatment area into untreated fuels (Weatherspoon and Skinner, 1996, van Wagtendonk, 1996). Lastly, larger treatments could better serve as fuel breaks where suppression forces could engage the fire more safely and under more severe conditions, than in smaller treatment areas. In a review of the scientific knowledge related to how modifying the forest structure can change fire behavior and how fuel treatments could influence the behaviors of large fires at the landscape scale, Graham et. al. (2004) concluded that treating small or isolated stands without assessing the broader landscape will most likely be ineffective in reducing wildfire extent and severity.

When one looks at the map of the proposed treatments (see Figure 1 in Chapter 1), it is apparent that the treatment areas that are proposed tend to be fairly large and tend to be concentrated in certain locations within the project area. Rather than dispersing the treatment areas more widely throughout the project area, one of the reasons for the concentration of treatment units has to do with the discussion above regarding treatment sizes. Another reason that the treatment areas are relatively large is the desire to try and avoid unnecessary fragmentation of the forest structures on the landscape, especially with the young forest structures (shrub/seedling/sapling classes).

As mentioned already, some of the forest stands proposed for fuel treatment necessitate a regeneration type treatment in order to effectively treat the fuels. A regeneration treatment will produce an opening in the stand, and as discussed in Table 7 within Chapter 2, forest openings larger than 40 acres in size require approval from the Regional Forester. The proposed action (Alternative 2) would create eight openings on National Forest lands that are larger than 40 acres in size. In addition, when combined with an existing adjacent opening on private property, one of the proposed openings on National Forest lands would combine to produce one additional opening larger than 40 acres in size. A detailed list and map of the openings that would be created in excess of 40 acres is in the project files (PF-VEG-9). An alternative that would have kept the opening sizes to 40 acres or less was considered but it was dropped from detailed analysis as it would not have fully met the purpose and need for this project. Table 7 and the project file (PF-VEG-10) contain more information on the rationale for eliminating that alternative from more study.

Environmental Consequences

The following discussion focuses on the effects that the alternatives would have upon forest health (forest composition, structure, pattern, resistance and resiliency to disturbances), old growth stands and forest openings. In addition, at the end of this section, a discussion is presented as to how well the alternatives would meet the forest plan direction and other regulatory requirements and goals that are relevant to this project.

Alternative 1 (No-Action)

Forest Health

Direct and Indirect Effects

In contrast to the proposed action, the no-action alternative would not treat fuels within any of the forest stands within the project area and would not implement the other activities that are associated with the proposed action. Rather than trending the forests within the project area towards conditions that are more desirable, the no-action alternative would forgo active management of the 3,864 acres of forest stands that are proposed for fuel treatments, and the result would be that over time, the existing forest conditions would continue their current trend of departure from a healthy condition.

In the short term, baring any large disturbances such as wildfires, the composition, structure and landscape pattern of the forest would remain in the general condition that exists today. However, over

time, due to the processes associated with forest succession in combination with inevitable disturbances such as forest insects, diseases and weather events, the stands would change. In regards to the forest composition, in general, the relatively short lived tree species such as lodgepole pine, quaking aspen and subalpine fir would decline in dominance. In addition, even though a small amount of western white pine exists in many of the stands that are proposed for treatment under Alternative 2, because these trees generally have a very low resistance to the introduced blister rust disease, most of these trees are expected to continue to die as they become infected. Because western larch and ponderosa pine are both very shade intolerant, they require periodic disturbance events such as low to moderate intensity wildfires or mechanical thinning of surrounding trees to survive and compete against the more shade tolerant species that often grow in the same stands. Therefore, under this no-action alternative, larch and ponderosa pine would be expected to continue to decline. Meanwhile, the more shade tolerant, insect and disease susceptible, drought prone and fire susceptible species such as grand fir, Douglas-fir, western hemlock and cedar would increase in prevalence. Therefore, in regards to the composition of the forest and relative to the proposed action, this no-action alternative would eventually lead to an even greater departure from the healthy forest conditions that are desired.

In regards to forest structure, as compared to the proposed action, this no-action alternative would not trend the forests towards more desirable conditions. Rather, the amount of young forest stands in the project area would continue to decline into the future and further depart from the historic range. In addition, the percentage of the project area dominated by trees in the immature/medium structure class would continue to be much higher than would have been expected historically.

In summary, baring a significant wildfire in the project area, the implementation of this alternative would result in forest conditions trending away from those conditions that are desired. The forests would continue to become less resistant to disturbances and possibly less resilient. Insects, diseases and weather disturbances would likely become more prevalent than historically. In addition, as discussed earlier, some forest processes and ecosystem functions (such as nutrient recycling and photosynthesis) could be affected and result in forests that are less productive.

With the absence of fuel treatments, this no-action alternative could have other indirect effects. As discussed in the fire and fuels analysis, this no-action alternative would result in higher risks of an intensive wildfire occurring within or burning into the project area and suppression efforts failing. A high-severity fire is not certain to occur within the project area during a given timeframe but if one were to occur, it could result in indirect effects to forest health. Hot fires can detrimentally affect the soil through soil nutrient losses (see the soil productivity analysis for more information) and high erosion rates and these can decrease the productivity of the soil and retard the regeneration and growth of a new forest. In addition, if fuel loadings are unnaturally high in stands as a result of past fire suppression activities and/or higher tree mortality due to a shift of species composition that has occurred and more insect/disease effects, the severity of the wildfire could be abnormally high and this could result in even the tree species that would normally be resistant to fires, such as larch and ponderosa pine, being killed by the fire.

Cumulative Effects

Appendix B of this EIS contains a comprehensive list of the past, ongoing, and foreseeable future activities that have, or are expected to, occur within the analysis area in the future. That appendix summarizes what the direct/indirect effects of those activities have been (or are expected to be) on the forest vegetation resource. In general, the affected environment discussion presented earlier in this analysis provides a summary of how the past activities have influenced the forest to shape the conditions that exist today. Therefore, the cumulative effects discussion for all the topics (forest health, old growth, forest openings) will primarily focus on whether or not ongoing and foreseeable future activities in the project area could potentially add, subtract or negate the impacts that this project would have upon the analysis topics that are being analyzed.

As presented in Appendix B, there are four ongoing or foreseeable actions that are, or could be expected to reasonably occur in the analysis area in the future, that could have some level of cumulative effects to those direct/indirect effects discussed above. These include: future large wildfires, future fire suppression activities, ongoing and future timber management on private lands, and ongoing and future insect/disease disturbances.

If a large wildfire were to burn in the project area, the effects on forest health could be varied. If the fire did not burn hot enough to damage the soil productivity, than the openings created by the fire could be regenerated with desirable tree species and this could help trend the forest to more desirable conditions. However, an unusually intense wildfire could also damage the soil productivity and have negative effects on the rate of tree regeneration and its growth, or kill old growth stands or individual trees in stands that have old growth characteristics. In regard to fire suppression, if fires are suppressed that would otherwise have burned with low to moderate intensities, than the effects of suppressing them on forest health may have been negative. Depending upon the specific conditions, those type of fires could have favored the desirable fire resistant species (such as larch, ponderosa pine) and killed the less desirable species (hemlock, grand fir, etc), and those fires could have reduced the surface fuels (at least temporarily, until the trees that were killed by the fire fell down). However, on the other hand, if fire suppression activities were responsible for extinguishing a wildfire that would have otherwise developed into an intense, large fire, than as discussed above, undesirable effects to forest health may have resulted.

In regards to harvesting and timber management activities on private lands, generally this results in a trend toward less desirable, shade-tolerant species compositions. This often occurs because harvesting on private lands commonly results in the more valuable and larger shade-intolerant tree species being harvested more frequently than the smaller, less desirable species. Therefore, this effect would add to the direct/indirect effects that would occur from implementing this no-action alternative. In regard to forest structure and pattern, private harvesting and management practices tend to favor young/small sized timber stands over stands dominated by mature/large sized trees. In addition, often these private parcels are fairly small in size, so harvesting on private property tends to produce small patch sizes of forest structure that are very fragmented. In general, these effects would add to the trends that would occur if the no-action alternative were implemented. These potential effects would also likely influence the occurrence and severity of forest insects and diseases. In general, the harvest practices on private lands would favor the more insect and disease prone tree species, and therefore to at least a small degree, these effects would add to the effects that the no-action alternative would have on the occurrence and severity of forest insects and diseases.

Old Growth

Direct and Indirect Effects

This no-action alternative, as well as the proposed action, would not directly affect any of the allocated old growth stands within the analysis area. No treatments were proposed in old growth stands in the proposed action, and therefore the direct effects of the no-action alternative on old growth are the same for both alternatives. However, relative to the proposed action, there are some potential indirect effects of the no-action alternative.

The proposed action would treat forest fuels over approximately 13% of the project area. As discussed in the fire and fuels section of this EIS, those fuel treatments would result in a reduction in risk that a large wildfire would burn in the project area. Based on this, it is reasonable to assume that there would be a reduction in risk that the allocated old growth stands occurring in the project area would be adversely affected by a wildfire. Therefore, relative to the proposed action, the no-action alternative would indirectly result in a higher risk that old growth stands could be detrimentally impacted by a wildfire. However, the magnitude of this affect can not be determined.

As discussed above in the desired future condition section of this report, there is a desire to eventually increase the percentage of forest within this project area from its current level of 4% old growth, to a desired level of somewhere between 17 and 35%. The goal is that some of the older stands in project area that currently do not meet the criteria for old growth, would continue to grow and develop old growth characteristics and eventually meet the minimum criteria. However, if an intense wildfire were to burn significant percentages of the project area, that goal might be more difficult to meet in a reasonable time period. Therefore, relative to the proposed action, implementing this no-action alternative could decrease the chances of meeting this future old growth goal.

Cumulative Effects

Most of the ongoing or foreseeable future activities (across all ownerships) which are anticipated to occur within the old growth analysis area are not likely to affect the old growth stands that occur on National Forest lands. Therefore, there are no additional cumulative effects beyond the direct/indirect effects disclosed above.

Forest Openings

Direct and Indirect Effects

Relative to the proposed action, which would create forest openings, this no-action alternative would not directly create openings in the forest through fuel treatments. However, as discussed above, the no-action alternative would not treat any of the forest fuels in the project area and thus there would an indirect effect of the project area having a higher fire risk. This increased fire risk could potentially increase the chances that a large wildfire would burn portions of the project area and create forest openings. However, there is no reasonable way to predict the probability of this occurring in any given timeframe, nor quantify the opening sizes that would be created.

Cumulative Effects

Even though the no-action alternative would not directly create openings on National Forest lands in the project area, there are some past, ongoing and foreseeable future activities that have occurred, or are anticipated to occur, on private lands that would create openings. Currently, the Stimson Lumber Company has approximately 961 acres of logging planned on Lakeview Mountain (see Appendix B for more information). It is estimated that approximately 50% of this harvesting would create openings. In addition, ongoing and future residential development and harvesting on other private ownership will likely produce other openings in the forest.

Alternative 2 (Proposed Action)

Forest Health

Direct and Indirect Effects

Alternative 2 would improve forest health in the project area in several ways. The fuel treatment activities would improve the forest composition, structure and pattern. In the process of beneficially affecting those forest attributes, this alternative would help create a forest that is more resilient and resistant to disturbances.

Forest Composition: As depicted in Table 3-9 below, the proposed action would increase the amount of forest dominated by the most desirable species- those that tend to be long-lived, insect and disease resistant, drought tolerant and fire resistant. The amount of western white pine, western larch, and ponderosa pine in the project area would increase by approximately 5% or 1,490 acres. Some of this increase would be due to unhealthy stands being regenerated by planting them with a combination of

blister rust resistant white pine, western larch and/or ponderosa pine seedlings. Although it would be a rather small effect, the amount of quaking aspen in the project area would go up by approximately 30 acres as a result of some of the prescribe burning activities. The rest of the increase in the desirable species would be due to thinning type intermediate treatments that would favor the retention of these tree species over the less desirable species.

While white pine, western larch and ponderosa pine would increase in dominance as a result of this alternative, the less desirable species, such as grand fir, Douglas-fir, lodgepole pine, hemlock, and to a lesser degree cedar, would decrease in abundance. Combined, these species would decrease from dominating approximately 80% of the project area now, to approximately 74%. These affects would be heading toward the desired conditions listed in Table 3-9 and toward a forest that is more resistant and resilient to wildfires and other disturbance events.

Table 3-9. Percentage of the project area within each of the forest cover types groups. The existing condition is shown as well as the conditions that would result from implementing Alternatve 2 and the desired future condition.

Forest Cover Type Group	***Percent of forested lands within each forest cover type in the project area***		
	Existing Condition	Alternative 2	Desired Future Condition
Western white pine and western larch	12	16	40-80
Ponderosa pine	<1	1	3-5
Douglas-fir, grand fir, western hemlock and western redcedar	64	61	25-45
Lodgepole pine	16	13	3-5
Englemann spruce, subalpine fir	<1	<1	<1
Quaking aspen/cottonwood	<1	<1[19]	<1

Forest Structure: The proposed action would increase the amount (by approximately 1%) of forest stands in the young, small size class, and would decrease the percentage of area dominated by medium and large size trees (also by approximately 1% each). Although these are relatively small changes, as illustrated in Table 3-10 below, these affects are trends toward the desired future conditions. These changes to the forest structure classes is due to some of the stands within the medium and large size classes in the project area, being regenerated and becoming the young, small stands in the shrub/seedling/sapling class.

[19] Alternative 2 would increase quaking aspen forest type by approximately 30 acres. However, because of the large size of the project area the % of quaking aspen/cottonwood forest type is still less than 1%.

Table 3-10. Percentage of the project area within each of the forest structure classes. The existing condition is shown as well as the conditions that would result from implementing Alternatve 2 and the desired future condition.

Forest Structure Classes	***Percent of forested lands within each forest structure class within the project area***		
	Existing Condition	Alternative 2	Desired Future Condition
Shrub/seedling/sapling	16	17	15-29
Pole/small	8	8	8-16
Immature/medium	45	44	13-27
Mature/large	24	23	14-26
Old growth	4	4	17-35

Forest Landscape Pattern: The proposed action would have beneficial effects on the landscape pattern of forest stands. As discussed earlier, the desire is to decrease the size of the patches of forest stands that are dominated by immature/medium structural stages (and to a lesser degree, the mature/large stage) and increase the patch size in the shrub/seedling/sapling structural stage. The reasons for this desire were discussed earlier, but in summary, the forest landscape pattern is probably outside of the historic range of variability and this has many ecological implications. In addition, in regards to fire hazard, the specific concern is that there are relatively large areas within the project area that are dominated by stands in the immature/medium structural stage. It is within this stage that if left untreated, that the forest fuels have often developed into very hazardous conditions. Surface fuels have often built up as a result of heavy competition between crowded trees and frequently, there are heavy ladder fuels as a result of shade tolerant trees growing in the understory, and lastly, in this structural class, a dense upper story tree canopy often exits.

The proposed action would “break-up” the large areas that are dominated by stand in the immature/medium structural stage by regenerating some of these stands that are in an unhealthy and hazardous condition, and establishing young forests. Specifically, most of this would occur on the north side of Lakeview Mountain and on the south side of Nickleplate Mountain.

In addition, in order to try and increase the patch size of the shrub/seedling/sapling structural stages as desired, the areas proposed for regeneration treatments and creation of openings, were not limited to usual 40-acre size limit.

Forest Ecosystem Function: The proposed action, by having some beneficial effects on the composition, structure and pattern of the forest in the project area, would also likely have some beneficial affects to important ecosystem functions and processes. A discussed earlier, some forest processes and ecosystem functions (such as nutrient recycling and decomposition, photosynthesis, growth) have likely been affected by the severe reduction of the western white pine in this ecosystem and the changes that have resulted in forest composition and structure. While the proposed action would not make a dramatic improvement in shifting the composition back towards the historic range, the proposed activities would make some modest gains.

Cumulative Effects

Similar to the no-action alternative, there are four ongoing or foreseeable future actions that that could be expected to reasonably occur in the analysis area in the future, and that could have some potential to effect forest health. These are: future large wildfires, future fire suppression activities, ongoing and future timber management on private lands, and ongoing and future insect/disease disturbances. As discussed above, the proposed action would make improvements to forest health conditions within the project area. However, depending upon specific conditions, the four ongoing or foreseeable future actions noted above could have negative effects, very little effect or a neutral effect on forest health. Therefore, it is difficult to clearly indicate what the cumulative effects would be. For example, as mentioned earlier, generally timber harvesting on private property leads to less healthy forest conditions (at least in the fashion that we have defined forest health). However, because we don not know how much of the private property in the project area will be harvested in the future and how it will be done, it is difficult to more clearly describe or quantify the effects. As discussed earlier under the cumulative effects section of the no-action alternative, the effects that large wildfires and/or fire suppression efforts would have upon forest health would also be difficult to quantify as it would depend upon the specific conditions under which these events occurred (e.g., the large wildfire) and good knowledge of what would have transpired had an action (e.g. fire suppression) not occurred.

Old Growth

Direct and Indirect Effects

The proposed action would not treat or otherwise directly impact any forest stands that meet old growth criteria. None of the proposed fuel treatment areas occurs within old growth stands and the roads that are proposed for construction do not occur within any of these stands either. Indirectly, the proposed action could have a benefit to the old growth by an overall fire hazard reduction in the project area. As discussed above in the old growth section for the no-action alternative, the fuel reduction activities associated with the proposed are anticipated to lower the risk of a large intense fire burning in the project area and therefore, the risk is lower that old growth stands might be detrimentally impacted by a fire. As disclosed in the fire and fuels analysis, the combined influence of the fuel treatments on the spread rate of a large fire is that the wildfire would likely slow down as it moved across the landscape. This gives the firefighting efforts a greater chance of slowing or stopping the fire and less chance that an old growth stand is heavily burned.

Cumulative Effects

Most of the ongoing or foreseeable future activities (across all ownerships) which are anticipated to occur within the old growth analysis area are not likely to affect the old growth stands that occur on National Forest lands. Therefore, there are no additional cumulative effects beyond the direct/indirect effects disclosed above.

Forest Openings

Direct and Indirect Effects

The proposed action would create openings in the forest wherever regeneration treatments are proposed. As discussed in more detail in Chapter 2, the proposed regeneration treatments would occur over 1,173 acres and would be a combination of irregular shelterwood treatments and seedtree treatments. While these treatments would not create complete openings (as would a clearcut for example) in the forest stands, they would open up the stands substantially over their current condition. As discussed in several places in this report, these types of treatments are necessary in some of the stands in order to effectively treat the fuels and meet the purpose and need for conducting the project.

The proposed action would create eight openings on National Forest lands that are larger than 40 acres in size. A detailed list and map of these proposed openings is located in the project files (PF-VEG-9).

Cumulative Effects

Within the project area, there are some existing openings that occur on national forest lands as well as private lands. In addition, there are foreseeable future openings planned on private lands in the project area. These openings are listed and mapped in the project file (PF-VEG-9). These existing and foreseeable future openings, were considered along with the openings that are proposed in Alternative 2, would create a total of nine openings larger than 40 acres in size. A map of those openings, as well as a description of their size and condition, is included in the project file (PF-VEG-9).

Compliance with the Forest Plan and Other Regulatory Direction

In the beginning of this report, the forest plan and other regulatory direction that was relevant to the management of forest vegetation for this project was presented. The following section will summarize whether or not the alternatives would be consistent with this direction.

Forest-Wide Goals and Objectives

1. **Manage the forest resources to protect against insect and disease damage (Forest Plan, p. II-2).**

2. **Timber management activities will be the primary process used to minimize the hazards of insects and diseases and will be accomplished primarily by maintaining stand vigor and diversity of plant communities and tree species (Forest Plan, p. II-8).**

As discussed in this report, the proposed action (Alternative 2) would help meet the two forest plan goals listed above, while the no-action alternative (Alternative 1) would not. The proposed action includes conducting intermediate treatments that would favor the more insect and disease resistant species and would provide the leave trees with more growing space, therefore improving their growth and vigor. In stands proposed for regeneration treatments, the trees that are left would generally be species that are relatively resistant to insect and disease agents, as would the tree species that would be planted in the openings. In the regeneration treatments, in general, the trees that would be cut are those that have poor vigor and growth, while the young trees that are planted would grow rapidly once they become established.

3. **Management activities will promote programs that provide a sustained yield of forest products consistent with the multiple use goals established in the Forest Plan (Forest Plan II-8).**

In the process of conducting the fuel treatments associated with the proposed action, merchantable forest products would be removed. The production of these products would help meet the management intent for the project area. As indicated in the beginning of report, most of the land within the Lakeview-Reeder project area was designated in the Forest Plan as being either management area (MA) 1 or 4. The primary purpose of MA 1 lands as designated in the forest plan is "… for timber production for the long-term growth and production of commercially valuable wood products…". As for MA 4, the Forest Plan indicates that these areas "…consists of lands designated for timber production within big game winter range". In producing these forest products, the proposed action would be consistent with this direction while the no-action alternative would not.

4. **Protection of timber stands from insect and disease problems will center on the silvicultural treatments prescribed for timber management activities. These include establishing rotation ages that direct the harvesting of stands before diseases such as root diseases and heart rots become a serious threat to the susceptible stands. Regenerating to species combinations that are the least susceptible to root rot diseases is the primary protection objective for the root rot**

diseases. Regeneration and culture of multi-species stands will be used to reduce the threat of epidemic outbreaks of harmful insects (Forest Plan, p. II-10 and II-11).

As indicated above under the second forest plan goal and objective listed, the proposed action would help to protect against negative impacts to the timber resource by insects and diseases. The regeneration treatments would involve planting tree species such as western larch, western white pine (blister rust resistant seedlings), and on the drier sites, ponderosa pine. Of the ten native conifers that are relatively common in the project area, those three species are generally considered the most insect and disease resistant. In addition, in both the stands proposed for regeneration, as well as those proposed for intermediate treatments, the proposed action would create and culture multi-species stands (rather than "monocultures" which can be prone to more substantial insect and disease damage).

5. **To help provide for a diversity of plant and animal communities, habitats, and species, standards for old growth maintenance will be established. Approximately 10 percent of the Forest will be maintained in old growth as needed to provide for viable populations of old-growth dependent and management indicator species (Forest Plan, p. II-5).**

As indicated in more detail below, both the proposed action and the no action alternative are consistent with this goal.

Forest Plan Standards for Old Growth

Old Growth Standard 10a: A definition for old growth has been developed by a Regional Task Force and is being used by the Forest (Green et al., 1992).
This standard applies to two landscape scales; the old growth management unit (OGMU) scale (for this resource area includes OGMU's #9, 20, 21, 22, 23, 24) and the IPNF scale. Allocation of old growth within the Lakeview-Reeder project area and the related old growth management units is based on current and widely accepted science and follows current old growth definitions from the Forest Plan, the Regional Task Force Report including "Old Growth Forest Types of the Northern Region"(Green et al., 1992, PF-VEG-4) and Forest Supervisor letters of direction for implementing Forest Plan old growth standards (PF-VEG-4). This standard is fully met under both the no-action and the proposed action alternatives.

Old Growth Standard 10b: Maintain at least 10 percent of the forested portion of the IPNF as old growth.
The 2005/2006 Forest Plan Monitoring and Evaluation Report (PF-VEG-4) discloses that the IPNF total allocated old growth is 283,727 acres (12.3% of IPNF forested acres). The IPNF Forest Plan old growth allocation of 10% (231,000 acres) was distributed among the districts as documented in the Forest Supervisor's May 7, 1991 letter regarding the "Forest Plan Explanation: Implementing Old Growth Standards" (PF-VEG-4). The Priest Lake Ranger District was responsible for allocating 38,000 acres of old growth. The 2005/2006 monitoring plan indicates that 48,150 acres has actually been allocated on the District. Therefore, the Forest Supervisor's allocation was actually exceeded on the District.

The 2005/2006 Forest Plan Monitoring and Evaluation Report also discuss the use of a multi-scale approach on the IPNF to monitor old growth based on two separate, independent tools:

1) Forest Inventory and Analysis (FIA) data is used to calculate forest-wide and mid-scale old growth percentages; and

2) An IPNF stand map displays all stands allocated for old growth management, with old growth data recorded in the TSMRS database.

Based on the monitoring plan, the IPNF proportion of old growth is 11.8% (with 90% confidence intervals of 9.6% to 14.0%). This is according to the FIA data. As discussed above, the amount of

allocated old growth based on the IPNF stand map and recorded in TSMRS is 12.3%. Together, these two monitoring tools offer compelling evidence that the IPNF is meeting Forest Plan standards for the amount of old growth to be retained.

Full discussion of the multi-scale approach (including statistics) to assess old growth on the IPNF is found in monitoring plan (PF-VEG-4). In addition, there are numerous other reports in the project file that are related to this old growth issue (PF-VEG-4).

In 2006 several wildfires burned in areas of allocated old growth on the IPNF. These fires burned in mosaics which resulted in areas of total overstory/understory mortality, as well as areas of underburning with variable amounts of overstory/understory mortality. The effects of these fires to allocated old growth cannot yet be fully assessed. Field observations of areas burned in 2006 indicate that some of the allocated old growth within fire perimeters likely will still meet old growth definitions. However, given the worst case scenario that all areas of old growth within the fire perimeters could no longer be allocated as old growth, the 2005/2006 Forest Plan Monitoring and Evaluation Report level of IPNF allocated old growth of 12.3% would drop to 12.1%. Even given this worst case scenario, this Forest Plan standard would still be fully met.

Neither the proposed action nor the no-action alternative would conduct treatments in allocated old growth. Both alternatives are consistent with this Forest Plan standard.

Old Growth Standard 10c: Select and maintain at least five percent of the forested portion of those old growth units that have five percent or more of existing old growth.
This standard applies at the Old Growth Management Unit (OGMU) scale only. As displayed in Table 3-4, four of the six OGMU's that occur within (or a portion of them occurs within) the project area have more than 5% allocated as old growth. However, within OGMU #9 and 20, the amount of allocated old growth is less (1% and 3% respectively) than 5%. Within those OGMU's, there simply are no additional stands that meet old growth criteria that could be allocated. The wildfire history, and to a smaller degree, the old harvesting, has been such that the other stands are too young to meet the old growth criteria. Therefore, this standard would be met regardless of which alternative is selected.

Old Growth Standard 10d: Existing old growth stands may be harvested when there is more than 5% in an old growth unit, and the Forest total is more than 10%.
Neither alternative would harvest in stands that meet old growth criteria. Therefore, this stand is not applicable to this project.

Old Growth Standard 10e: Old growth stands should reflect approximately the same habitat types series distribution as found on the IPNF.

The habitat type series distribution of the allocated old growth on the IPNF reflects approximately the same habitat types series distribution on the IPNF. The 2005/2006 Forest Plan Monitoring report supports this finding (PF-VEG-4).

Old Growth Standard 10f: One or more old growth stands per old growth unit should be 300 acres or larger. Preferences should be given to a contiguous stand; however the stand may be subdivided into stands of 100 acres or larger if the stands are within one mile. The remaining old growth management stands should be at least 25 acres in size. Preferred size is 80 plus acres.

When allocating old growth stands within this project area and elsewhere, there was a concerted effort to follow the direction listed above for standard 10f. However, in some instances, the OGMU's simply did not have enough, or large enough, old growth stands to meet the size criteria above. In the six OGMU's that overlap the Lakeview-Reeder project area, some of the criteria were met and some could not be. For example, OGMU's 9 and 20, did not have any old growth stands (or contiguous blocks of stands) as large

as 300 acres, and some stands were allocated in those OGMU's that were smaller than 25 acres in size. As for the other OGMU's, They either had contiguous blocks of old growth stands larger than 300 acres, or they had blocks of old growth stands that were adjacent to other OGMU's, that when combined, produced blocks of old growth stands that were 300 acres or larger. However, even these OGMU's have some stands allocated in them that are smaller than 25 acres. Despite the fact that some of the OGMU's do not have stands as large as 300 acres, or that some of them are smaller than 25 acres, the intent of the standard was adhered to. The largest old growth stands were generally allocated in all of the OGMU's, an attempt was made to allocate stands larger than 25 acres (versus allocating the smaller, scattered old growth stands), and a preference was given to stands 80 acres or less. More information is provided in the project file (PF-VEG-4) regarding the sizes of the stands that were allocated in the OGMU's that occur in the Lakeview-Reeder old growth analysis area. Because the old growth allocation process followed the intent of the forest plan standard listed above, both alternatives would meet the standard.

Old Growth Standard 10g: Roads should be planned to avoid old growth management stands to maintain unit size criteria.

If implemented, the proposed action would construct some temporary as well as permanent roads. However, none of these roads would occur in stands meeting old growth criteria. Therefore, both the proposed action and no-action alternatives would be consistent with this standard.

Old Growth Standard 10h: A long-term objective should be to minimize or exclude domestic grazing within old growth stands.

The proposed activities would not include any new domestic grazing allotments. Only one of the six OGMU's that overlap the Lakeview-Reeder project area has any grazing within it on National Forest lands, OGMU #24. However, there are no old growth stands within that OGMU that occur within the grazing allotment, therefore, this standard is not relevant to this Lakeview-Reeder project.

Old Growth Standard 10i: Goals for lands to be managed as old growth within those lands suitable for timber production are identified in the management area prescriptions.

The 2005/2006 Forest Plan Monitoring report includes a table showing the Forest Plan management areas that have acre goals associated with them for old growth allocation (PR-VEG-4). The table also shows the existing amounts of allocated old growth for those same areas. Current old growth allocations meet and far exceed those Forest Plan goals. Therefore, this standard has been met.

Forest Plan Standards for Timber

Timber Standard 1. Both even-aged and uneven-aged silvicultural systems will be employed on the IPNF and will meet resource and vegetation management objectives identified in the Forest Plan. Even-aged silvicultural systems will be applicable over most areas. Uneven-aged systems may be used to achieve special management objectives as determined by the ID Team during project analysis.

Uneven-aged silvicultural systems would not be used under any of the action alternatives. There were no special management objectives identified by the ID Team that necessitated using this system. Therefore, this standard would be met under any alternative.

Timber Standard 2. Timber stands that are substantially damaged by fire, wind throw, insect or disease attack, or other catastrophe may be harvested where this salvage is consistent with silvicultural and environmental standards. All management areas are open to this potential salvage activity except Management Areas 11 and 14.

No salvage treatments are being proposed with this project to respond to damage agents that have substantial damaged timber stands. Therefore, this standard is not applicable to this project.

Timber Standard 3. Recommended changes in timber resource land suitability from the approved Forest Plan will be based upon the criteria contained in 36 CFR 219.14(a). Changes from suitability classification will be done in accordance with the procedures outlined in Appendix M.

There are no recommended changes in land suitability associated with project. Therefore, this standard is not applicable.

Timber Standard 4. Reforestation will normally feature seral tree species, with a mixture of species usually present. Silvicultural practices will promote stand structure and species mix that reduce susceptibility to insect and disease damage.

The proposed action would implement reforestation activities on all of the treatments that are proposed for regeneration treatments. In these areas, seedlings would be planted from a site-adapted species/seed source. Mixtures of seral tree species such as white pine, larch and ponderosa pine would be planted. These species are generally some of the most insect and disease resistant species in the region. To the extent that they are present and healthy, the intermediate treatments (the areas that would not be regenerated) would retain the long-lived seral species. Therefore, the proposed action is consistent with this standard. Because the no-action alternative would not conduct reforestation activities, this standard is not applicable to that alternative.

Timber Standard 5. Project design will provide for site preparation and slash hazard reduction practices that meet reforestation needs of the area.

For stands that would be regenerated under the proposed alternatives, the site preparation/fuel treatment methods that are proposed were identified based upon meeting the necessary site conditions for reforestation. Therefore, this standard would be met with the proposed action. Because the no-action alternative would not conduct site preparation or slash hazard reduction practices, this standard is not applicable to that alternative.

Timber Standard 6. Timber harvest schedules and access will be coordinated with intermingled landowners where applicable.

Current access to private property in the project area would be maintained under all alternatives. This was one of the items considered when the Roads Analysis Process was conducted for this project. This standard would be met under the proposed action and because the no-action alternative would not conduct harvesting, this standard is not applicable to that alternative.

Timber Standard 7. Openings created by even-aged silviculture will be shaped and blended to forms of the natural terrain to the extent practicable; in most situations they will be limited to 40 acres. Creation of larger openings must conform to current Regional guidelines regarding public notification, environmental analysis and approval.

As discussed earlier in this report, the proposed action would create openings that are larger than 40 acres. As compared to smaller, more numerous openings, larger openings would generally be more effective in modifying the potential behavior of a large, intense fire while giving suppression resources a safer, more effective area to work from when attempting to control and contain a wildfire. In addition, relative to smaller and more numerous openings, larger ones generally lead to less fragmentation of the forest. As described earlier, larger openings would contribute to the desire to increase the patch sizes of young forests. As required, the public will be informed in this DEIS that the proposed action would lead to openings larger than 40 acres. Approval to exceed the 40-acre opening size limitation is being sought from the Regional Forester prior to the final EIS. Proposed harvest openings greater than 40 acres are

identified in the project file (PF-VEG-9). Timber standard 7 would be met under the proposed action, and because the no-action alternative would not create any forest openings, this standard is not applicable to that alternative.

Timber Standard 8. An area of National Forest land will no longer be considered an opening when vegetation meets management goals established for the management area in accordance with FSM 2471.1. Lands in other ownership within or adjacent to National Forest land will be included in the analysis when planning openings.

The prescription for all stands includes provisions for restocking and openings that are created for regeneration. In most cases, the restocking will be accomplished by planting desirable, native tree species at appropriate densities to ensure their ability to dominate the sites. As illustrated in the project file (PF-VEG-9) and discussed in the cumulative effects discussion above, lands in other ownership within or adjacent to the National Forest land were included in the analysis of planned openings. Timber standard 8 would be met under the proposed action, and because the no-action alternative would not create any forest openings, this standard is not applicable to that alternative.

Timber Standard 9. The silvicultural prescription for each stand will establish the level of management intensity compatible with the management area goals. Preferred species management as identified in the silvicultural prescription will consider both biological and economic criteria.

All vegetative treatments would have silvicultural prescriptions approved by a certified Silviculturist. Prescriptions would consider site-specific factors (such as physical site, soils, climate, habitat type, and current vegetative composition and conditions) as well as interdisciplinary objectives and Forest Plan goals, objectives and standards. This standard would be met under the proposed action, and because the no-action alternative would not treat any stands, this standard is not applicable to that alternative.

Forest Plan Standards for Forest Protection

Forest Protection Standard 1. Use integrated pest management methods that provide protection of forest resources with the least hazard to humans, wildlife and the environment.

Forest Protection Standard 2. Use silvicultural methods and schedule practices that reduce the development and/or perpetuation of pest problems.

As described in detail in this report, the composition of the forests in the Priest River Subbasin and project area has shifted from being dominated by long-lived, seral species that were fairly resistant to native insects/diseases, to species that tend to be more susceptible to these agents. Because of this shift, as well as the introduction of the non-native white pine blister rust, the insects/diseases have taken on a different and/or more significant role in the forests than they did historically. One objective of this project is to modify the tree composition and structure in the forest stands to be more resistant and resilient to disturbances, including insects and diseases. The vegetative treatments that are part of the proposed action would make progress towards meeting this objective. The proposed regeneration treatments would convert stands that are dominated by the more insect/disease susceptible species to the more resistant species. The intermediate treatments would favor the species that are more insect/disease resistant. Therefore, the proposed action would be consistent with these two standards. However, because the no-action alternative would not address this need, that alternative is not consistent with this standard.

Forest Protection Standard 3. Vegetation management will favor the use of fire, hand treatment, natural control, or mechanical methods wherever feasible and cost effective. Direct control methods, such as chemical or mechanical, may be used when other methods are inadequate to achieve control.

Proposed vegetative treatments would utilize a combination of fire, hand treatment and natural and mechanical methods. Forest vegetative treatment using chemicals is not proposed under any alternatives. This standard would be met with the proposed action. Because the no-action alternative does not propose any vegetation management, this standard is not applicable to that alternative.

Consistency with the National Forest Management Act

Vegetation Manipulation (36 CFR 219.27(b)[1]. Assure that technology and knowledge exists to adequately restock lands within fire years after final harvest.

The IPNF Forest Plan Monitoring and Evaluation Report, 2002 , page 10, states that "over the last 16 years of monitoring, our reforestation success rate has averaged 88 percent". Regeneration success on the Priest Lake Ranger District is 99.8 percent overall for the period 1976 to 1996 with 79 percent within 5 years of regeneration harvest (PF-VEG-11). Therefore, technology and knowledge does exist to comply with this requirement for the proposed action, this Alternative 2 is consistent with this requirement. Because the no-action alternative does not propose doing any vegetation treatments, this requirement is not relevant to that alternative.

Vegetation Manipulation (36 CFR 219.27(b)[1]. Be chosen after considering potential effects on residual trees and adjacent stands.

The analysis considered the effects on residual trees and adjacent stands. This was one of the factors considered during the development of the silvicultural diagnosis for the timber stands. Therefore, the proposed action is consistent with this requirement. Because the no-action alternative does not propose any treatments, this requirement is not applicable to that alternative.

Silvicultural Practices (36 CFR 219.27(c): No timber harvest, other than salvage sales or sales to protect other multiple-use values, shall occur on lands not suitable for timber production.

Guidelines for determining suitability are found in the Forest Plan and FSH 2409.13. All of the lands proposed for treatments in the proposed action are suitable for timber production, thus Alternative 2 is consistent with this requirement. Because the no-action alternative does not propose timber harvest, this requirement is not applicable to that alternative.

Even-aged Management (36 CFR 219.27(d): When timber is to be harvested using an even-aged management system, a determination that the system is appropriate to meet the objectives and requirements of the Forest Plan must be made. Where clearcutting is to be used, it must be determined to be the optimum harvest method.

No clearcutting is planned under any alternative. Even-aged silvicultural systems would be used in the proposed action and are appropriate to meet the project goals and objectives discussed in Chapter 1 of this DEIS, and the timber and vegetation management practices outlined in the Forest Plan goals, objectives and management area direction. Because the no-action alternative would not conduct vegetation treatments of any kind, this requirement is not applicable to that alternative.

3.2 Fire and Fuels

Reducing fire hazard is identified as a key issue in this project, for both the agency and the public; specifically, designing treatments to effectively reduce the threat to the values at risk. Table 3-11 describes the issue, indicators and units of measure used in the following fire and fuels analysis.

Table 3-11. Fire hazard issue indicators and measures

Issue	*Indicators*	*Measurements*
Effects of the project on wildfire hazard.	**Potential Fire Behavior** – Fire behavior is measured by: potential flame length (which is related to fuel loading and fuel arrangement) to determine the surface fire behavior potential; rate of spread to determine how fast a fire would be moving across the landscape; amount of potential crown fire and crowning and torching index to determine potential crown fire activity. **Fire Regime Condition Class** – Fire Regime Condition Class is a methodology which analyzes historic fire regimes with current fire conditions. The result is a value which determines if the current potential fire behavior and effects are within historic variation. Three Condition Classes are used to describe if the landscape is: within historic regimes (Condition Class 1), moderately departed from the historic regimes (Condition Class 2), or having a high departure from historic regimes (Condition Class 3).	• Flame Length in feet • Rate of Spread in chains per hour • Crown Fire Activity in acres as well as the torching and crowning index • Condition Class Level

Regulatory Framework

Four guiding documents establish direction and provide the framework for fire management. These documents provide specific goals, standards, and objectives for implementing a fire management program. Additional guidance and purpose for the Lakeview Reeder Project is recommended by the Bonner County Community Wildfire Protection Plan (discussed further in this section). Fire handbooks, guides, research, and technical papers provide further direction.

Guiding Documents	*Direction*
The IPNF Forest Plan	Provides standards and goals that Management Plans need to address on the Forest as well as provides Forest-wide and Management Area guidelines that define land uses.
The Forest Service Manual	Mandates all National Forests and lists objectives for fuels management.
Federal Wildland Fire Policy	Establishes standardized procedures and policies for Federal wildland fire management agencies.
National Fire Plan	Directs a comprehensive approach to the management of wildland fire, hazardous fuels, and ecosystem restoration on Federal and adjacent State, tribal, and private forest and range lands.

The IPNF Forest Plan (PF Doc. FF-1) objective is to implement efficient fire protection and fire use programs based on management objectives, site-specific conditions, and expected fire occurrence and behavior. Management area standards and goals provide direction for appropriate response. The following are the key standards currently guiding the IPNF fire management plan:

- *Human life and property will be protected.*
- *The appropriate suppression response for designated old growth stands in all management areas, except in wilderness, will result in prevention of old growth loss.*
- *Activity fuels will be treated to reduce their potential rate of spread and fire intensity so the planned initial attack organization can meet initial attack objectives.*

The Forest Plan management areas (MA1, MA4, MA9, and MA14) within the Lakeview Reeder project area include goals to manage for timber production, provide winter forage for big game, manage existing improvements, and management of existing and proposed Research Natural Areas. The fire protection standard to satisfy these goals is to use the most appropriate management response (confine, contain, and control) to achieve the best benefit based on commercial timber values and improvement values, and where appropriate, big-game winter range values. Prescribed fire is to be used as needed to meet silvicultural objectives and the objectives of the management area.

The Idaho Panhandle National Forests Fire Management Plan defines a program to manage wildland and prescribed fires and documents the fire management program in the approved IPNF Forest Plan. It is a detailed program of action to carry out the fire management and fire protection objectives identified in the Forest Plan. In the IPNF Fire Management Plan Fire, Management Units (FMUs) have been developed to assist in organizing information about complex landscapes. The FMUs have both strategic and tactical utility and they allow managers to specify general land management direction and to set overall fire management objectives for an area of land (IPNF Fire Management Plan p. 30). The Lakeview Reeder project falls within two FMUs and their description from the IPNF Fire Management Plan is summarized below:

Wildland Urban Interface (WUI) – Highest Priority Protection Response - All wildland fires in this FMU, regardless of cause, are unwanted events and will be managed as suppression events. The goal of suppression is full control using sufficient resources and direct management actions to contain the fire to as small an area and with little damage or loss to resource values as possible. Per national policies the WUI FMU is the highest priority for suppression and fuels treatment to provide the greatest protection for the public and communities at risk from wildfire. Approximately 27,489 acres (93%) of the project area falls within this FMU. All of the proposed treatments are within this FMU.

General Forest Zone – Protection response based on Values at Risk – This represents the developed forest zone between the Wildland Urban Interface and the Roadless FMUs (as described in the IPNF Forest Plan). This FMU has relatively high road densities providing good access for fire and fuels management activities. In this FMU the values to be protected from fire may allow managers to implement a conditional suppression response that does not include an expectation of full containment and control through direct management actions. Forest Plan Management Area direction is to use suppression strategies appropriate to achieve the best benefit-cost ratio based on timber values and/or appropriate wildlife or other identified resource values. Approximately 1,962 acres (7%) of the project area falls within this FMU. None of the proposed treatments are within this FMU.

Forest Service Manual (FSM) 5150 (PF Doc FF-2) defines fuel as combustible wildland vegetative materials, living or dead. The objective of fuel management as stated by FSM 5150.2 is to identify, develop, and maintain fuel profiles that contribute to the most cost-efficient fire protection and use program in support of land and resource management direction in the Forest Plan. Methods used for

controlling the flammability and intensity of a fire may include mechanical, chemical, biological, or manual means, including the use of prescribed fire and wildland fire use (FSM 5150).

The "Federal Wildland Fire Management Policy and Program Review" was chartered by the Secretaries of the Interior and Agriculture in 1995 to examine the need for modification of and addition to federal fire policy. Fire suppression policy from the early 1900s until the late 1970s has been one of total suppression. Only recently has fire policy been modified to recognize the importance of fire in balancing vegetation cycles within temperate forests. The review recommended a set of consistent policies for all federal wildland fire management agencies.

In January 2001, six federal agencies revisited the Federal Wildland Fire Management Policy driven by the fire season of the year 2000. This review and update of the 1995 policy highlighted several principal conclusions that are appropriate to emphasize in this Fire and Fuels analysis. One such conclusion states: "*as a result of fire exclusion, the condition of fire-adapted ecosystems continues to deteriorate; the fire hazard situation in these areas is worse than previously understood"* (referring to the conditions in 1995 when the parent document was published). The review continues with a conclusion that *"the fire hazard situation in the wildland-urban interface is more complex and extensive than understood in 1995."*

In adopting the policy, the federal agencies recognized the role of wildland fire as an essential ecological process and natural change agent that will be incorporated into the planning process. The severe wildfire seasons in recent years throughout the country have made it clear that fire cannot be excluded from fire-dependent ecosystems. On the other hand, because of developed areas, and commercial forests, fire cannot be fully restored to its historic character without severe consequences to humans, except perhaps in a few of the largest wilderness areas (Brown et al. 1994, in Hardy and Arno 1996, PF Doc FF-22).

The National Fire Plan (NFP; USDA and USDI 2000, PF Doc FF-24) originated after the record-breaking wildfire season of 2000; President Bush requested a national strategy for preventing the loss of life, natural resources, private property, and livelihoods in the wildland-urban interface. Working with Congress, the Secretaries of Agriculture and Interior jointly developed the National Fire Plan (www.fireplan.gov) to respond to severe wildland fires, reduce their impacts on communities, and assure sufficient firefighting capabilities for the future. The National Fire Plan (2000) includes five key points:

- firefighting/ preparedness
- rehabilitation and restoration of burned areas
- reduction of hazardous fuels
- community assistance
- accountability

The NFP is a long-term commitment based on cooperation and communication among federal agencies, states, local governments, tribes, and interested publics. The federal wildland fire management agencies worked closely with these partners to prepare a 10-Year Comprehensive Strategy (USDA and USDI 2001, PF Doc FF-24). The four goals of the 10-Year Comprehensive Strategy are to:

- improve fire prevention and suppression
- reduce hazardous fuels
- restore fire-adapted ecosystems
- promote community assistance

In response to a goal of the 10-Year Comprehensive Strategy (PF Doc FF-24) to promote community assistance, Bonner County initiated a contract to develop a fire mitigation plan (Community Wildfire Protection Plan) to aid in the protection of the communities within the county (Bonner County 2004, PF Doc FF-3). The goal of the Bonner County Community Wildfire Protection Plan is to:

Reduce the risk to life and property, increase firefighter and public safety, and reduce suppression costs through forest fuels modification (PF Doc FF-3).

The fire mitigation plan describes portions of the project area as being at high risk to wildfire loss. Since the year 2002, Bonner County has been receiving National Fire Plan grant funding for hazardous fuel reduction treatments within the Priest Lake Community as well as within the Lakeview Reeder project area. The emphasis of the hazardous fuel reduction work is to create defensible space around homes and create fuelbreaks to protect the rural communities.

The Bonner County Community Wildfire Protection Plan states:

> *The creation of defensible space around individual homes is only a part of a strategy necessary to ensure adequate protection from wildfire. It is necessary to do hazardous fuels treatment (HFT) beyond defensible space within the wildland-urban interface in order to more completely address the threat from wildfire.*

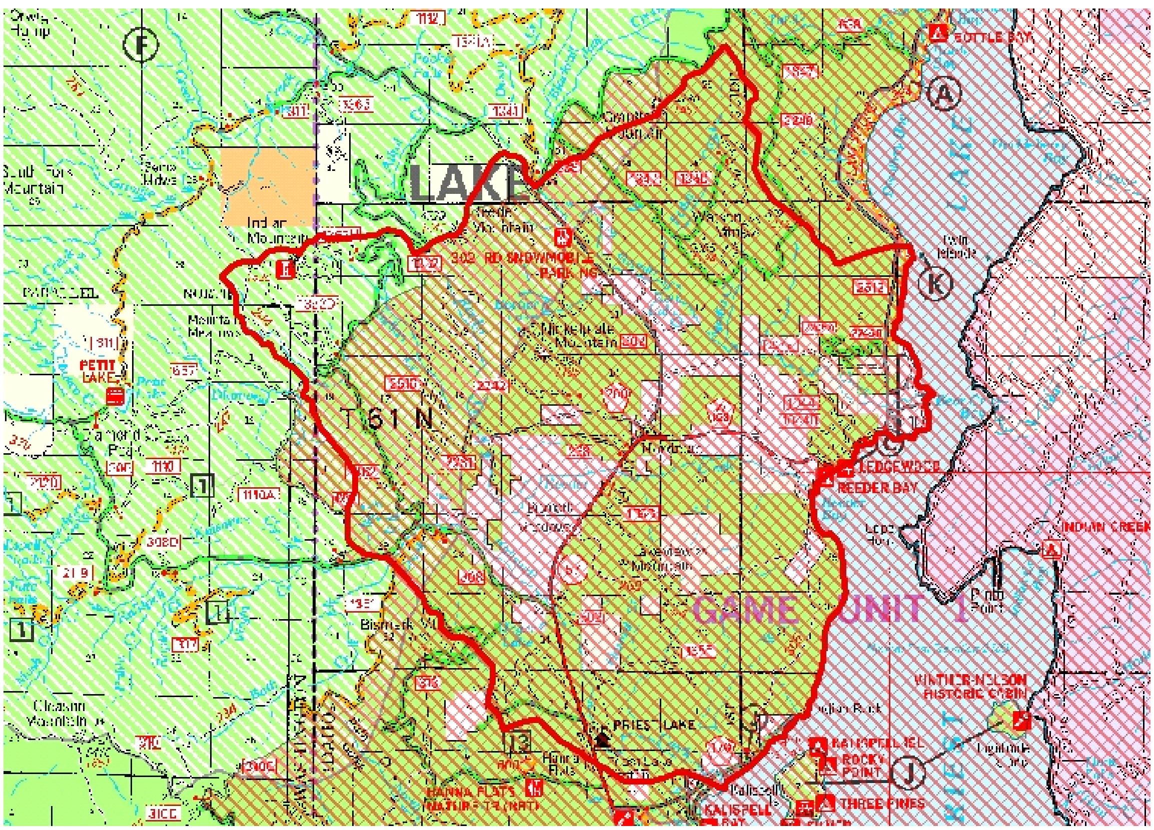


Figure 3-18. Wildland Urban Interface as defined by Bonner County. WUI is in red cross-hatch while the project boundary is outlined in red.

The Healthy Forests Restoration Act of 2003 defines the term wildland-urban interface (WUI) as an area within or adjacent to an at-risk community that is identified in recommendations to the Secretary in a community wildfire protection plan. The wildland-urban interface is defined by the Bonner County Community Wildfire Protection Plan as being any wildland area within two miles of dwellings used for

human habitation and/or infrastructure that serves these points of habitation. The Lakeview Reeder Project lies within the wildland-urban interface and dovetails with the County's goals of protecting life and property from intense wildfire. The Lakeview Reeder Project can be found in Appendix H of the Bonner County Community Wildfire Protection plan (in 2004 version project is listed as Granite Reeder and Kalispell) as being a high priority for protection of the rural residences near Nordman, Idaho. The proposed treatments of the Lakeview Reeder Project meet the intent of both the Healthy Forests Restoration Act (2003) and the Bonner County Community Wildfire Protection Plan in terms of reducing fire intensities in the WUI.

Homes and other structures continue to be constructed near and around lands managed as National Forests. When wildland fires occur, these structures within the wildland-urban interface are vulnerable to destruction from fire, floods, and damage to natural resources. As people, homes, and structures continue to occupy the wildland-urban interface and as hazardous fuels continue to accumulate, a high risk and volatile situation needs to be addressed. The proposed activities in the Lakeview Reeder project area are designed to restore fire-adapted ecosystems and reduce potential fire intensities near the communities and rural residences. The project is designed to capture all of the principles from guiding documents as well as the strategies of the NFP to reduce fire intensities in the urban-interface and restore fire-adapted ecosystems.

Issues

The key issue for the fire and fuels analysis for the Lakeview Reeder project area is the effect of changing forest structure characteristics and spatial arrangement of treatments on the landscape to protect resources in the wildland-urban interface from the effects of intense wildfire. This issue has been identified through public concerns as a key issue of the project and is of sufficient concern to drive the development of an alternative (Chapter 2, Issues). Unacceptable fire effects in the WUI are defined as loss of life and property, reduction of scenic and recreational values, loss of forest resources and threatened ecosystem components and compromised safety to the public and firefighters.

Suppression of all wildfires in the Lakeview Reeder project area has been ongoing for nearly a century. Fire exclusion, has caused a substantial change in stand conditions and related fire behavior. Increases in surface, ladder, and crown fuels have resulted in the potential for increased fire intensity and burn severity should a fire start. The arrangement and amount of fuel could carry a fire into the crowns of trees, resulting in fires of an intensity and severity outside of the historic fire regime. These intense fires are difficult to suppress, threaten human life and property, and can result in the loss of key ecosystem components (tree species such as ponderosa pine, white pine, and western larch). Erratic fire behavior of this nature within close proximity to urban residences can endanger lives and disrupt communities.

As stated in Chapter 1 there are two goals that relate to the Purpose and Need for this project:

1. *Reduce hazardous forest fuels within the project area to decrease the threat of a wildfire negatively impacting the communities in the project area, public and firefighter safety, public infrastructure, private and National Forest System lands and resource values*

As part of this goal there are two fire and fuels objectives that have been identified:

1. Decrease threat to values	Reduce potential fire behavior immediately adjacent to private land by reducing surface fuels and providing canopy breaks to reduce crown fire potential	
	Reduce potential fire behavior near private boundaries by reducing surface fuels and providing canopy breaks to reduce crown fire potential while increasing firefighter and public safety.	
2. Decrease fire hazard	Alter fire behavior	Reduce crown fire risk.
		Lower potential flame lengths and ROS
		Break up continuity of hazardous fuels
	Provide for firefighter safety	
	Maintain adequate suppression access	

2. *Restore, enhance and protect forest ecosystem components to improve forest health, increase biological diversity, as well as reduce threats from stand replacing wildfire and insect and disease infestations.*

As part of this goal there is one fire and fuels objective that has been identified:

1. Reduce risk of loss of key ecosystem components	Trend landscape towards Fire Regime Condition Class 1.

The key component in meeting the first goal is reducing the potential fire behavior. This would not eliminate fire from the landscape but would create conditions that are safer for firefighters and have a higher likelihood of being able to take suppression action near values. In order to analyze, three fire behavior indicators are tracked throughout this section.

The second goal is looking at forest ecosystem components across the project area. The Fire Regime Condition Class is a methodology which compares historic fire regimes with current fire conditions and compares historic vegetative structure with existing vegetative structure. The result is a value which describes if the current potential fire behavior and effects as well as the vegetative structure are within historic variation. Three Condition Classes are used to describe if the landscape is within the natural range of variability (Condition Class 1), moderately departed from the natural range of variability (Condition Class 2), or having a high departure from the natural range of variability (Condition Class 3).

The Fire and Fuels section tracks the following fire behavior indicators throughout this analysis:

1. The potential **flame length** (which is related to fuel loading and fuel arrangement) was used to determine the surface fire behavior potential. Suppression tactics are directly related to flame lengths.

2. **Rate of spread** was used to determine how fast a fire would be moving across the landscape. Fast moving fires result in larger area burned and more suppression resources are required to safely attack the fire. This is measured by using a spread rate threshold of 5 chains/hour to display the effects of the alternatives on the landscape and the travel times of fires to key locations within the landscape.

3. The potential **crown fire activity** was used to determine crown fire potential. Crown fires create fast moving intense fires that burn with high severity. Crown fires are also likely sources of fire brands that can ignite homes and structures during wildfires (Cohen and Stratton 2003, PF Doc FF-27; Graham 2004, PF Doc FF-28). Acres of crown fire activity as well as the torching and crowning index are used to evaluate effectiveness.

The fire behavior indicators were used to describe how the alternatives could affect a wildfire burning on the landscape. For this analysis the potential threat of a large fire (i.e. a fire thousands of acres in size) moving across the landscape is one way many people and values could be affected. Another potential way people and values could be affected is by smaller fires (fires that may be tens of acres or smaller) that may affect only a few individuals. Even though the fires may vary in size significantly, the impact of a fire large or small adjacent to individual homes and values could have negative impacts to those values.

What the Fire Behavior Indicators mean

As stated above, there are three Fire Behavior Indicators being used throughout this analysis. They relate to the overall fire hazard of an area and can be measured across the landscape to give an idea of potential fire behavior and subsequent fire potential.

Potential flame length (which is related to fuel loading, among other factors) was used to determine the surface fire behavior potential, as well as the trend over time. Suppression tactics are directly related to flame length which is directly related to the fire intensity. As fire intensity increases the flame length also increases. For this reason the use of flame length was used as an indicator because of its ability to display the potential of local firefighting resources in safely suppressing wildfires and the safe escape of the public. For example, flame lengths less than four feet can be effectively attacked using hand crews constructing direct fireline, while flame lengths larger than four feet will likely have to be attacked using dozers, engines, and retardant aircraft (NWCG 1993, PF Doc FF-29).

The second indicator used to compare alternatives was **rate of spread**. The rate of spread describes how fast a fire is moving across the landscape. As the rate of spread increases the fire size increases as well as the need for additional firefighting resources. For the analysis a spread rate threshold of 5 chains/hour was used to display the effects of the alternatives on the landscape. The Fireline Handbook (2004, p A-31, PF Doc FF-30) displays the sustained line construction rates by 20 person crews in the brush and timber types as 4-6 chains per hour and engine crews can build line at a rate of 3-12 chains per hour depending on access. Fires moving less than 5 chains/hour would have a higher likelihood of containment than faster moving fires based on the suppression resources capability and availability. Fire predictions done in Behave Plus also demonstrate that fires that are moving greater than 5 chains per hour would escape initial attack after one hour (PF Doc FF-4).

Crown fire activity is another indicator used to compare the alternatives. According to Cohen and Stratton (2003, PF Doc FF-27) and Graham (2004, PF Doc FF-28), losses of homes during wildfires are predominately due to fire brands igniting the structures and the fire behavior that creates fire brands is crowning fire. Measuring the crown fire potential, is a good indicator for evaluating changes in risk of property loss due to wildfire by alternative actions. It also projects fire-caused tree mortality which is the primary scenic and recreational detriment of undesirable wildfire. In addition, once a fire begins crowning

both the flame length and rate of spread increases to several times faster than that of a surface fire (Scott and Reinhardt 2001, PF Doc FF-31).

There are three methods the crown fire activity was measured. The first was modeling potential crown fire activity across the project area using FlamMap (Finney 2006, PF Doc FF-64). This model predicted surface fire and crown fire for a landscape. A comparison of acres with potential crown fire activity is used to compare the alternatives. In addition the torching index and crowning index are both analyzed for selected stands to evaluate effectiveness of individual treatments.

The torching index is the 20 foot wind speed at which crown fire is expected to initiate, and it was used to describe a stand's potential for passive crown fire behavior, which is also called torching or candling. Torching occurs when individual or small groups of trees torch out, but solid flame is not consistently maintained in the canopy. Passive crowning encompasses a wide range of fire behavior, from the occasional tree torching out to a nearly active crown fire. Embers lofted during passive crowning can start new fires downwind, which make containment more difficult and increase the overall rate of fire growth. The torching index reflects both the surface fuel loading and amount of ladder fuels within a stand. A lower torching index means that the stand can exhibit passive crown fire at lower wind speeds; a lower torching index means a higher fire hazard.

Figure 3-19. Passive (torching) and active crown fire behavior.

The third indicator of crown fire hazard used to compare alternatives was the crowning index. The crowning index is the wind speed, 20 feet above the canopy, at which active crowning is possible (Scott and Reinhardt 2001, PF Doc FF-31). The crowning index reflects the density of canopy fuels. Active crown fire, also called a running or continuous crown fire, is one in which the entire surface/canopy fuel complex becomes involved, but the crowning phase remains dependent on heat from the surface fuels for continued spread. Active crown fires are characterized by a solid wall of flame extending from the fuel bed surface through the top of the canopy (Scott and Reinhardt 2001, PF Doc FF-31). Because active crown fires consume the crowns of trees, they result in complete mortality of the overstory. Sites that can initiate or sustain a crown fire at lower wind speeds are more prone to crown fire. Critical open wind speeds for crown fire initiation and active spread are stand-specific indicators of crown fire hazard. Although critical wind speeds were used as indices, the site conditions (surface and canopy fuels, slope steepness), not the weather, are being rated (Scott and Reinhardt 2001, PF Doc FF-31).

The crowning index describes the point at which active crowning is possible, not necessarily the point at which a crown fire can be initiated. Conventional wisdom is that a surface fire must first go through a passive crown fire phase before becoming active as burning conditions worsen. A passive crown fire phase is a phase in which individual or small groups of trees torch out, but solid flame is not consistently maintained in the canopy. This wisdom also suggests that any stand not capable of initiating a crown fire would not support an active crown fire under the same conditions (Scott and Reinhardt 2001, page 21). However, it is possible to have an active crown fire in a stand that would not easily initiate an active crown fire, depending on the type of originating fire (Scott and Reinhardt 2001, page 22). For example, although there may not be enough ladder fuels in a particular stand to initiate a crown fire until the winds reach 75 miles per hour, if a crown fire enters that same stand from another area, it could sustain the crown fire at a much lower wind speed, perhaps 20 miles per hour. For this reason, stands that are considered safe from crown fire initiation cannot necessarily be relied upon to cause crown fire cessation (Scott and Reinhardt 2001, PF Doc FF-31). The spatial variability of fuel conditions in the Lakeview Reeder area (and beyond) could lead to crown fires initiating elsewhere and entering the stands targeted with this project.

Air Quality

Sources of smoke from wildland fire are generated from incomplete combustion of fuel. Fuel consumption and smoke production are influenced by pre-burn fuel loading categories (such as grasses, shrubs, woody fuels, litter, moss, duff, and live vegetation), condition of the fuel (live, dead, sound, rotten); fuel moisture; fuel arrangement; and fuel continuity (Ottmar 2001, PF Doc FF-65). Fire behavior, fire size, and consumption of these fuels will dictate the amount of emissions from a wildland fire. Smoke emissions include carbon dioxide and water, carbon monoxide, hydrocarbons, nitrogen oxides, and particulate matter. Carbon Monoxide and PM2.5 (particles less than 2.5 µm) are two major pollutants of concern emitted from biomass burning. PM2.5 is inhalable and respirable and it has a long residence time in the atmosphere. It also reduces visibility and absorbs harmful gases. The Environmental Protection Agency exempts smoke from wildfire or wildland fire use because they are deemed as “natural events”. In addition, extreme fire behavior (where a lot of smoke is emitted into the atmosphere) generally occurs due to heavy fuels, fuels that may smolder for a prolonged period of time, emitting more smoke over a period of days or weeks.

Direction for fire management actions are provided in the Idaho Panhandle National Forests (IPNF) Fire Management Plan (FMP) and defined in the IPNF Land and Resource Management Plan (LRMP – Forest Plan. Appendix F, Table 10; F-3) and Forest Service Manual (FSM) 5100. Wildland fire use and protection standards included in all management areas include a development of prescribed fire objectives, which comply with the requirements of the Clean Air Act.

Methodology for Analysis

Fire Regime and Condition Class (FRCC)

FRCC was calculated using the Standard Landscape Worksheet Application Software with direction provided by the Interagency Fire Regime Condition Class Guidebook and Fire Regime and Condition Class Field Software User Guide (Hann, et al., 2003, PF Doc FF-32). The 29,412 acre project area was selected as the analysis area for the FRCC assessment because it is a large enough landscape to encompass a variation of the natural fire regimes. Biophysical Settings (BpS) and fire history were the basis for the analysis.

Fire Archives and Research

Several sources of information were used to assess the existing conditions in the Lakeview Reeder project area. The fire history of the Priest Lake Ranger District, including the Lakeview Reeder project area, has

been recorded and mapped by the Forest Service since its inception and large fires were documented and mapped going back to 1889. Fires were initially mapped with colored pencil on a district map, but are now digitized and placed in GIS (geographic information system) coverage. A map of the recorded fire history for the Lakeview Reeder Area was used to make assumptions as to when effective fire suppression began (PF Doc. FF-6). Additionally, a fire history study of the Idaho Panhandle National Forests was conducted by Zack and Morgan (1994; PF Doc. FF-33) while Arno and Davis (1980, PF Doc FF-34) conducted a fire history study in the Goose Creek drainage approximately 10 miles southwest of the Lakeview Reeder project. The information gathered by these studies and the subsequent conclusions drawn from them are relevant to north Idaho and were used to help characterize the existing condition of the area.

Records of fire ignitions are compiled by the Forest Service (1940 to 2006) and kept in a national database. These records include the year, size, location, and cause of each fire reported. Records for fire ignitions in the Lakeview Reeder Project Area were used in this analysis (PF Doc FF-6).

Fire scars from within and adjacent to the project area were looked at to get an idea of fire history prior to the District's fire records. The results of this were used to support the fire research and give a better feel of fires burning in the project area prior to 1889. This documentation is located in the Fire and Fuels project file (PF Doc FF-7).

Fire Behavior Computer Modeling

Fire behavior was analyzed using several computer models to display the effects of the alternatives and to assess the three fire behavior indicators (flame length, rate of spread, crown fire activity). Flammap (Finney 1998, PF Doc FF-35; Finney 2006, PF Doc FF-64) and Farsite are fire models that predict landscape level fire behavior which incorporate fuel structure, weather variables, and topographical influences. Farsite grows a fire over a time period and allows the user to analyze fire size, shape and proximity to points of concern. Flammap uses the same basic inputs as Farsite but looks at potential fire behavior across the landscape at a single point in time. This allows the user to assess the potential fire behavior across the entire landscape. In order to assess the three fire behavior indicators (flame length, rate of spread, crown fire activity) Flammap was run and acres of each fire behavior indicator were determined for the existing condition and proposed action in the entire project area (PF Doc FF-8). In addition the acres of fire behavior type were analyzed adjacent to identified values at risk in order to assess the effectiveness of the treatments close to these values. These values (Figure 3-20) are egress routes, private land boundaries, Priest Lake Ranger Station administrative site, special use sites (i.e. recreation residences, Indian Mountain lookout, Lakeview Mountain telecommunications site), and power lines (PF Doc FF-9).

The inputs for Farsite and Flammap include 30-meter pixel resolution raster maps of elevation, slope, aspect, fuel model, canopy cover, stand height, canopy base height, and canopy bulk density. These raster maps were combined to produce a single "landscape file." Both programs require local wind and weather files spanning several days and initial dead fuel moistures. Severe weather conditions were used for the analysis and are defined by the National Fire Danger Rating System (NFDRS) as the 97th percentile for the Energy Release Component (ERC) and equate to Very High to Extreme fire danger. This represents very dry conditions but not necessarily record setting extreme conditions. These conditions were in place during the summers of 1994, 2003, and 2007. Also used was a moderate weather condition to compare effectiveness of treatments at conditions found at the peak of the average fire season. This equates to the 75th-80th percentile range. These conditions are found most every year (PF Doc FF-10).

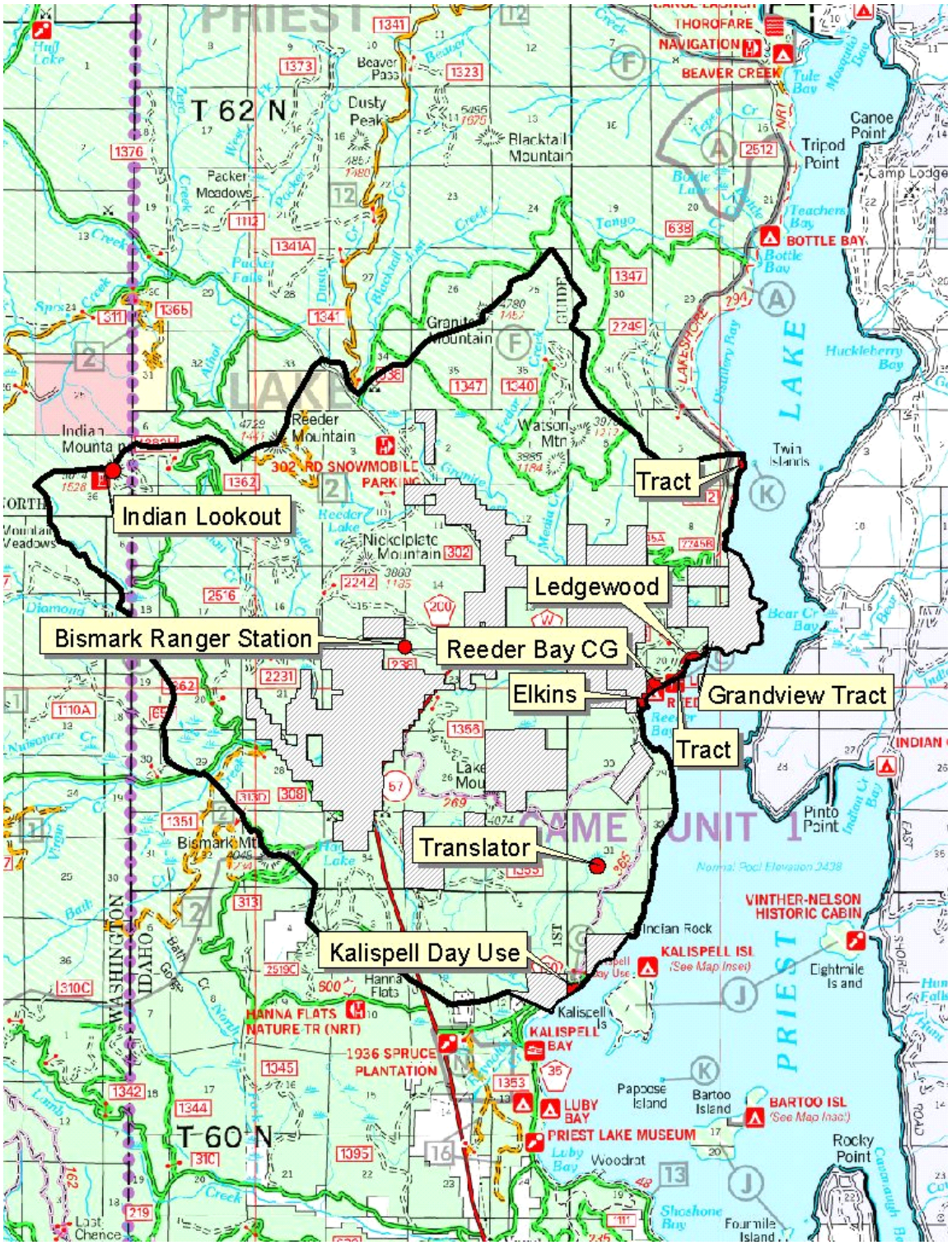


Figure 3-20. Map displaying values used in the analysis (Private lands are shaded in gray)

ERC is the total available energy (BTU's) per unit area within the flaming front at the head of a fire. ERC indicates how hot a fire could burn. Weather data from the Priest Lake Weather station (100204) as reported from the NOAA WIMS database for the years 1985-2006 was compiled and averaged using Fire

Family Plus software. This weather station is located in the southern portion of the project area (PF Doc FF-10).

Behave Plus was utilized to determine stand level fire behavior for both pre and post treatment stands. Behave Plus requires the inputting of fuel model, fuel moistures and slope to determine basic fire behavior outputs. Behave Plus is one of the "standard" fire behavior models used by Fire Behavior Analysts and uses the same algorithms as Farsite, Flammap and Nexus.

Nexus is a fire model that links otherwise separate models of surface and crown fire behavior to compute indices of crown fire potential, and simulate surface and crown fire behavior at the stand level. This model uses a description of the fuel model, fuel moisture, wind speed, and slope as inputs for estimating fire intensity. Nexus is used in this analysis to determine the relative susceptibility of different stands to crown fire and to determine the relative effects of surface and canopy fuel treatments to mitigate crown fire potential. Assessing Crown Fire Potential by Linking Models of Surface and Crown Fire Behavior (Scott and Reinhardt 2000; PF Doc FF-36) is the scientific documentation that Nexus was based on.

Fire Regime Condition Class (FRCC) was analyzed using the Fire Regime Condition Class software and direction outlined in the Interagency Fire Regime Condition Class Guidebook (PF Doc. FF). FRCC was assessed at the landscape scale within the Lakeview Reeder area.. Of primary concern to fuels management is the long-term fuel loading increase and subsequent changes in fire intensity and severity that may occur. The Forest Vegetation Simulator (FVS), which is widely used by forest managers throughout the United States and Canada to predict the effects of various vegetation management actions on future forest conditions, was used for this additional analysis. The Fire and Fuels Extension to FVS (FFE-FVS) integrates FVS with elements from existing models of fire behavior and fire severity. Model output displays fuels, stand structure, snags, and potential fire behavior over time and provides a basis for comparing proposed fuel treatments (Reinhardt and Crookston 2003; PF Doc. FF-38). FFE-FVS was used in this analysis to describe the existing conditions of the forest stands in the Lakeview Reeder Project Area, as well as to compare the effects of proposed treatments within each alternative.

Information about existing vegetation was obtained from an existing database (Field Sampled Vegetation or FSVeg) that was developed from stand exam information, historical records and aerial photo interpretation. This information was used in the Fire and Fuels Extension (FFE) to the Forest Vegetation Simulator (FVS), which was developed to assess the risk, behavior, and impact of fire in forest ecosystems (Beukema et al. 1999; page 1; PF Doc. FF-39). The Fire and Fuels Extension was created in order to link the changes in forest vegetation due to growth, natural or fire-based mortality, and management, with changes in fire behavior, using existing models and information wherever possible (Beukema et al. 1999, page 1; PF Doc. FF-39).

FFE-FVS was used to assess the risk of fire to a stand with indicators such as potential flame length, the type of fire (e.g. surface fire or crown fire), and the critical wind speeds required to initiate and sustain a crown fire. This model is not intended to predict the probability of fire or the spread of fire between stands (Reinhardt and Crookston 2003, page 12; PF Doc. FF-38). It is used solely to assess the potential fire behavior and fire effects possible considering current and future stand conditions.

Area of Analysis

The Lakeview Reeder project area boundary encompasses 29,450 acres within the lower ends of Granite Creek and Kalispell Creek as well as the entire Reeder Creek drainage. Historically large wildfires were up to tens of thousands of acres in size and burned in this area as evidenced by the fire records. The project area also surrounds the Nordman and Reeder Bay communities and provides an appropriate scale to determine fire behavior of large fires moving across the landscape and threatening the values associated with the communities.

Direct, indirect, and cumulative effects with regards to fire, fuels, and air quality were analyzed for the project area. The entire project area was evaluated for the Fire Regime Condition Class (FRCC) and potential fire behavior at the landscape level. Fire behavior was also evaluated at a smaller scale adjacent to the identified values at risk to determine project effectiveness closer to the values.

Air quality effects were evaluated for any proposed burning treatments as directed by the Montana/Idaho Airshed Group and as outlined in the Smoke Management Guide for Prescribed and Wildland Fire 2001 Edition (National Wildfire Coordinating Group PMS 420-2; PF Doc FF).

Existing Condition

Fire Regime Condition Class

Fire Regime Condition Class (FRCC) is a tool that categorizes a landscape's potential degree of departure from or similarity to its historic fire and vegetative characteristics, which is an indicator of the health of fire-dependent or fire-adapted ecosystems (Hann, et al, 2003; PF Doc FF-37). References to historic characteristics describe typical ecological conditions that existed before use by Europeans and before organized fire suppression, which provide a basis to determine the degree of human influence. For the Lakeview-Reeder Project area the reference time period is before 1900.

FRCC uses a Fire Regime Classification system of five broadly defined Fire Regimes to help define the landscape (Table 3-12). A fire regime describes the basic character of fire for a given vegetation type. Although fire frequency and severity are the most commonly used descriptors, many other aspects have been studied, such as fire spread patterns, fire seasonality, and post-fire patch dynamics.

Table 3-12. Fire regime classification

Fire Regime	*Definition*
I	0-35 year frequency and low (surface) fire most common to mixed severity (less than 75% of the dominant overstory vegetation replaced.
II	0-35 year frequency and high (stand replacement) severity (greater that 75% of the dominant overstory vegetation replaced.
III	35-100+ year frequency and mixed severity (less than 75% of the dominant overstory vegetation replaced)
IV	35-100+ year frequency and high (stand replacement) severity (greater than 75% of the dominant overstory vegetation replaced)
V	200+ year frequency and high (stand replacement) severity

FRCC uses three condition classes to classify the degree of departure from the historic fire regime. A description of these conditions classes is found in Table 3-13 below.

Table 3-13. Condition class descriptions and potential risks

Condition Class	*Description*	*Potential Risks*
FRCC 1 – low departure	Vegetation composition, structure, and fuels are similar to those of the historic regime. Wildland fires are characteristic of the historic fire regime behavior, severity, and patterns. Disturbance agents, native species habitats, and hydrologic functions are within the historic natural range of variability.	Risk of loss of key ecosystem components (e.g. native species, large trees, and soil) is low.
FRCC 2 – moderate departure	Vegetation composition, structure, and fuels have moderate departure from the historic regime. Wildland fires are moderately uncharacteristic compared to the historic fire regime behavior, severity, and patterns. Disturbance agents, native species habitats, and hydrologic functions are outside the historic natural range of variability. An example may include a "high-graded" forest composition and structure (e.g. large trees removed when they would have lived in a frequent surface fire regime).	Risk of loss of key ecosystem components is moderate.
FRCC 3 – high departure	Vegetation composition, structure, and fuels have high departure from the historic regime. Wildland fires are highly uncharacteristic compared to the historic fire regime behavior, severity, and patterns. Disturbance agents, native species habitats, and hydrologic functions are substantially outside the historic natural range of variability. An example may include invasive species (e.g. weeds, insects, and diseases).	Risk of loss of key ecosystem components is high.

The degree of departure is based on the deviation from the central tendency of the historic fire regime. The central tendency is a composite estimate of: 1) vegetation characteristics (species composition, structural stages, stand age, canopy closure, and mosaic pattern); 2) fuel composition; 3) fire frequency, severity, and pattern; and 4) other associated disturbances (e.g. insect and disease mortality, drought, or wind events).

Ultimately, FRCC analysis provides managers with a scientifically accepted method of quantifying an area that may be at risk for uncharacteristic or undesirable fire effects. Forests and grasslands in condition class 2 and 3 are likely to experience uncharacteristic and undesirable fire effects, including the loss of key ecosystem components.

FRCC was calculated using the Standard Landscape Worksheet Application Software with direction provided by the Interagency Fire Regime Condition Class Guidebook and Fire Regime and Condition Class Field Software User Guide (Hann, et.al, 2003; PF Doc FF-32). The 29,412 acre project area was

selected as the analysis area for the FRCC assessment because it is a large enough landscape to encompass a variation of the natural fire regimes. Biophysical Settings (BPSs) and fire history were the basis for the analysis.

Using a process developed for Region 1 that delineates habitat types determined from stand exams into groups that crosswalk to the BpSs (PF-FRCC-5), two BpSs were delineated into separate strata for the analysis area (PF-FRCC-4): R0GFDF (grand fir/Douglas-fir/larch mix) and R0MCCH (mixed conifer-upland cedar/hemlock). These BpSs were selected because the geographic range, vegetation characteristics, and historic disturbance regime fit best with the characteristics of the analysis area landscape. R0MCCH encompasses 90 percent of the analysis area with the remaining 10 percent in R0GFDF (PF-FRCC-7).

The values from the summary tables for each BpS were used for the historic or reference condition fire frequency. The reference condition fire frequencies for R0GFDF and R0MCCH were 43 and 150 years respectively (PF-FRCC-4).

Current fire frequency was estimated using district fire records (PF-FRCC-6) and forest vegetation records for stands in which prescribed fire was used as the site preparation method. Although, fire history information exists back to 1889, thorough record keeping did not begin until 1940. Prior to 1940, only the very large fire events were recorded. No information was recorded for small or moderately sized fires. Therefore, fire records from 1940 to 2006 were used for this analysis because they are the most accurate.

The vegetation-fuel characteristics are displayed in detail in the FRCC reports (PF-FRCC-1). The largest difference in the reference and current vegetation-fuel classes occurs in the mixed conifer-upland cedar/hemlock forest types, which represent 90 percent of the analysis area.

Table 3-14 displays the results of the FRCC assessment for the existing condition strata. The analysis area landscape is a Fire Regime III Condition Class 3 with an FRCC departure of 69 percent from the historic fire and vegetative characteristics. Fire Regime Group III has a 35-100+ year frequency meaning that disturbance occurs less often, allowing vegetative density to increase and fuels to accumulate, resulting in more severe fires of greater intensity than Fire Regimes I and II. Generally, larger areas of mortality result creating more diversity in age and size classes on the landscape. However, with a current landscape-level Condition Class rating of 3, wildfires would likely be even larger, more intense, more severe, and have altered burn patterns than that expected historically.

For the grand fir/Douglas-fir/larch mixed forest types the decreased fire frequency has the largest influence on FRCC departure, which is mostly due to fire exclusion. For the mixed conifer-upland cedar/hemlock forest types the vegetation composition/structure and fuel characteristics have the largest influence on FRCC departure, which is mostly due to the loss of the western white pine. Reducing fuels, moderating future fire behavior potential and restoring the vegetation composition and structure would make a marked improvement in the landscape FRCC.

Table 3-14. Fire regime condition class summary information for the existing condition

	Mixed Conifer Cedar - Hemlock	***Grand Fir – Douglas Fir***
Reference Fire Frequency	150 years	43 years
Current Fire Frequency	840 years	2442 years
FRCC Departure	75%	49%
Condition Class	3 (67 – 100%)	2 (34 – 66%)
Fire Regime	III	III

% of difference between current and reference conditions

Broad Scale Fire History

Fire is the major disturbance factor that produces vegetation changes in our ecosystems (Spur and Barnes 1980; PF Doc FF-41). If the role of fire is altered or removed, this will produce substantial changes in the ecosystem. Fire has burned in nearly every ecosystem and nearly every square meter of the coniferous forests and summer-dry mountainous forests of northern Idaho, western Montana, eastern Washington, and adjacent portions of Canada. Fire was responsible for the widespread occurrence and even the existence of western larch, lodgepole pine, and western white pine. Fire maintained ponderosa pine on sites throughout its range at the lower elevations and killed ever-invading Douglas-fir and grand fir (Spurr and Barnes 1980; PF Doc FF-41). Many ecosystems are regularly recycled by fire; life for many forest species literally begins and ends with fire.

The types of fires that occur in forested ecosystems (Zack and Morgan 1994; PF Doc FF-33) include:

- **Nonlethal Fires** – These fires kill 10 percent or less of the dominant tree canopy. A much larger percentage of small understory trees, shrubs and forbs may be burned back to the ground line. These are commonly low-severity surface and understory fires, often with short fire return intervals (a few decades).
- **Mixed-severity Fires** – These fires kill more than 10 percent, but less than 90 percent of the dominant tree canopy. These fires are commonly patchy, irregular burns, producing a mosaic of different burn severities. Return intervals on mixed severity fires may be quite variable.
- **Lethal Fires** – These fires kill 90 percent or more of the dominant tree canopy. These are often called "stand-replacing" fires and they often burn with high severity. They are commonly crown fires. In general, lethal fires have long return intervals (140-250+ years apart), but affect large areas when they do occur. Local examples of these types of fires include the Sundance and Trapper Peak fires of 1967 that burned over 80,000 acres in a relatively short time during late summer drought conditions.

The Lakeview Reeder project area has had a variable fire regime characterized by both infrequent, large, lethal (stand-replacing) fires and more frequent, shorter interval, nonlethal and mixed-severity fires (Zack and Morgan 1994, PF Doc FF-33; Arno and Davis 1980, PF Doc FF-34). The variability of wildland fire severity and intensity shaped forest structures throughout the landscape. Zack and Morgan (1994, PF Doc FF-33) found that lower severity fires structure how the landscape responds when a lethal fire occurs. Lower severity fires increase the proportion of the landscape that contain big trees and open canopies, maintaining conditions that will not sustain a crown fire.

Severity refers to the degree to which a site may be altered or disrupted by a fire, which is often determined by the degree of soil heating.
Fire intensity is the energy release rate per unit length of fire line and is a physical parameter related to flame length.

The interaction of fire throughout the Lakeview Reeder landscape was historically influenced by several different ignition methods, including but not limited to lightning and human ignitions. The number of lightning fires regularly experienced in northern Idaho is more than adequate to account for a disturbance regime that includes regular major wildfires (Zack and Morgan 1994, PF Doc FF-33). Arno and Davis (1980, PF Doc FF-34) state that the frequency of Native American ignited fires was of a minor role when compared to the probable historic lightning ignited fires. Fire suppression efforts have been effectively excluding fire from the ecosystem since the 1930s, subsequently eliminating underburns and mixed-severity fires. Such fires served as the thinning agents that favored dry habitat type legacy trees like larch and ponderosa pine. The changes that have occurred to western warm-dry forests have been well documented (Keane et al. 1990, PF Doc FF-42; Harvey 1994, PF Doc FF-43).

Lakeview-Reeder Project Area Fire History

The Lakeview Reeder project area has had an active fire history particularly in the late 1800s and early 1900s. Fire records have documented fires going back to 1890 and include significant fire years as 1890, 1917, 1918, 1925, and 1926. Prior to 1890 fire scar sampling has indicated the presence of other fires during the 1700s and 1800s with several sampled trees showing evidence of 3-4 fires (PF Doc FF-7).

Table 3-15. Fire history for the Lakeview-Reeder project area (Prior to 1940 the number of fires was unrecorded)

Year	*Number of Fires*	*Acreage Burned*
1890		19,309
1917		989
1918		1,145
1925		891
1926		9,657
1940-2006	144	76
Total		**32,067**

It should be noted that the above acreages (Table 3-15) do not represent the actual fire sizes but represent the actual area burned within the Lakeview Reeder project area. Both 1890 and 1926 were significant fire seasons as large fires burned large areas across the District. These fires would have been historically mixed severity with areas of stand replacement crown fires to areas with low intensity underburns and even areas left unburned.

Fires would have burned for weeks and over the course of a summer many fires would have eventually burned together. On July 12, 1926 several hundred fires were ignited by a lightning storm in the Priest Lake area. The following morning Monumental Lookout (located 7 miles west of the project area) reported seeing 240 separate fires burning. Many of these burned together and burned portions of the project area (USDA Forest Service 1976, PF Doc FF-44).

The period 1890 to 1926 was a very active fire period and several areas within the project area burned more than once. A total of 31,991 acres burned within the project area during this time period. Of this total, 6,850 acres burned twice, and 1,031 acres burned three times.

The result of these fires would have been a mosaic pattern of burn severity. These mosaic patterns were also likely created by variations in fuel structure, and site-specific variability with wind and weather events and corresponding fuel moistures. Arno and Davis (1980, PF Doc FF-34) state that fires in moist habitat types burned under variable intensities, ranging from light ground fires that did little direct damage, to crown fires that covered hundreds of acres in a major run. Overall, Arno and Davis (1980) conclude that presettlement fire history in moist habitat types left a patchy pattern of complete stand-replacement, partially killed overstory, underburning with little overstory mortality, and unburned forest.

Since accurate records have been kept beginning in 1940 and with the advent of effective fire suppression beginning in the 1930s the fire history has changed significantly. Since 1940 a total of 144 fires have burned within the project area for a total of 76 acres (PF Doc FF-6). Of these 144 fires, 85 (59 percent) are from lightning and 59 (41 percent) are from human starts. The incidence of human starts is higher here than found on the entire Priest Lake Ranger District as a whole due to the high level of human activity found within the Wildland Urban Interface in the project area. Since 1940 one fire grew to 40 acres with the rest generally less than 0.25 acres. From this ignition history data (Figure FF-4), it would be reasonable to assume that this recent fire history would have been adequate to maintain the historic fire regimes that this ecosystem naturally adapted with if fire suppression activities had not taken place.

Nevertheless, it is clear that fire has played a major role in shaping the ecosystem in the Lakeview Reeder project area.

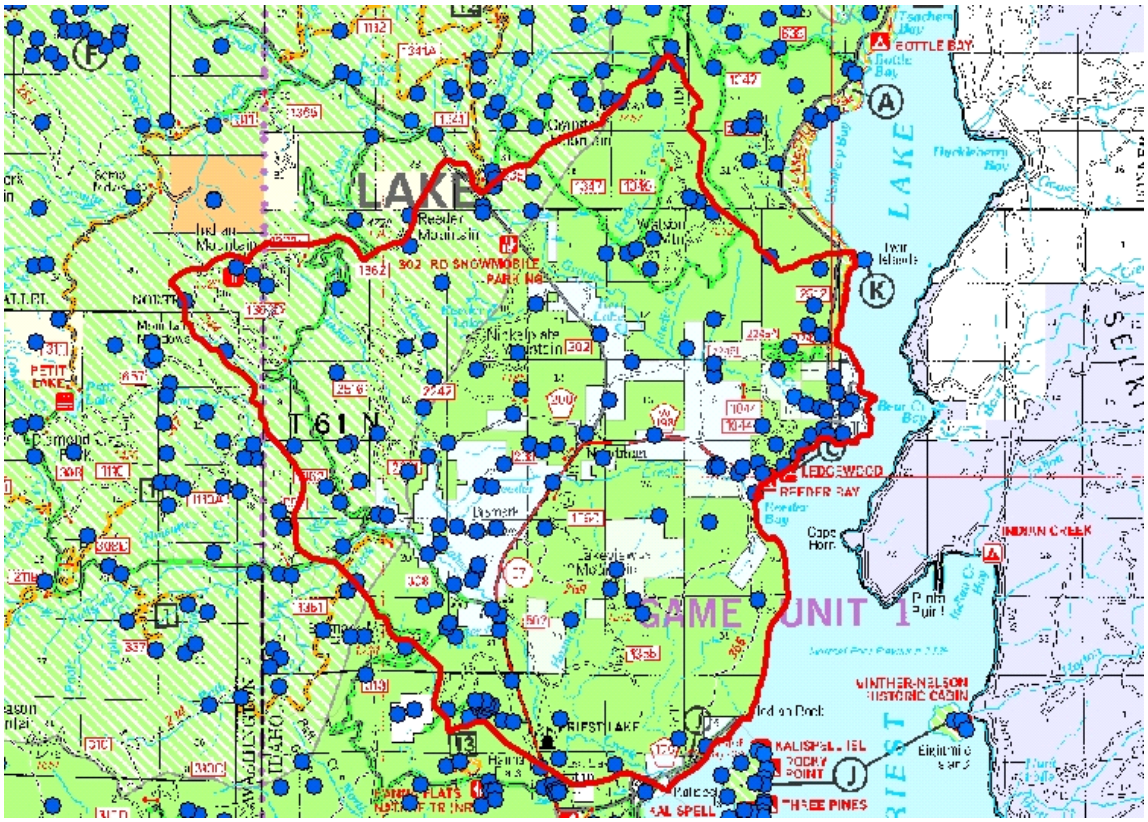


Figure 3-21. Map of project area (outlined in red) showing fire locations for the period 1940-2006

Air Quality

Air quality within the Lakeview Reeder area is generally excellent with limited local emission sources and consistent wind dispersion during much of the year. Existing sources of emissions include residential wood burning, debris burning, road dust, vehicles, camp fires and wildfire. Emissions are limited much of the year with fall being the period with the greatest emission production due to debris burning. This is because October 20 is the start of "open burning" in which there are no permits required to burn. Occasional inversions develop during the summer and winter months. However, the West to East orientation and the predominately South, Southwest wind allows for very good dispersal during the majority of the time. The nearest non-attainment area is Sandpoint, for PM10, 28 miles to the South East. With the general wind pattern from the SSW this area should not be affected.

Environmental Consequences

The actions being considered with this project would directly and indirectly affect Flame Length, Rate of Spread, Crown Fire Activity, and Fire Regime Condition Class. These key indicators were selected for their ability to measure a changed condition relevant to the purpose and need for the project including the need for fire regime restoration across the landscape and reduction of unacceptable fire effects in the WUI.

There are measurable difference in effects between the proposed action alternative and the no-action. For the purposes of this discussion, no-action is defined by status quo management projected 5-10 years into the future, which is the same time frame that the actions would be accomplished if selected for

implementation. However using FFE-FVS modeling to predict potential site specific conditions, timeframes of 100 years have been used to compare flame length trends over time with regards to a particular treatment type.

For purposes of the fire behavior indicators (flame length, rate of spread, crown fire activity) the analysis focuses on the severe conditions found at the 97th percentile. Fire behavior runs were made for moderate conditions (which correspond to the peak of the average summer, generally the 75th-80th percentile) and these outputs were analyzed. However fire behavior modeling and local experience show that at the moderate conditions fires do not exhibit much growth or fire behavior (PF Doc FF-8). The effects of the proposed action do have a beneficial effect regarding fire behavior during moderate conditions but the effect is more pronounced during severe conditions. Therefore the analysis shows the effects of the severe conditions scenario since this is when a fire would spread and have effects. The results of the entire analysis are found within the project file.

Fire Regime Condition Class

The project goal with respect to FRCC is to lower the landscape-level classification, towards Condition Class 1. Given the change in vegetation and fuel due to past fire suppression, agriculture and grazing, logging, residential development and the introduction of exotic weed species, it is unlikely that the reintroduction of fire using natural ignitions would result in desirable fire effects. Therefore, those actions involving the use of prescribed fire, as well as the treatment of uncharacteristic vegetation and fuels would address the FRCC reduction goal without the negative effects of wildland fire.

Flame Length

Flame length is a commonly used prediction of fire intensity and is a basic measure used by initial attack firefighters to predict effectiveness of strategies and tactics. Flame lengths must be less than 4 feet to be safely attacked directly by hand crews. Once flame lengths surpass this mark, other suppression tactics must be employed. These could include using dozers and air tankers as well as indirect attack. Indirect attack means that suppression forces would retreat to a safe and defensible place where they believe the fire can be stopped, and attempt to hold the fire at that location. Use of this tactic often results in more acreage burned (NWCG 1993, PF Doc FF-29). In addition, as surface fuels and flame lengths increase across the landscape, the likelihood is greater that the fire will climb into the canopy and become a crown fire. Crown fires have the largest immediate and long-term ecological effects and the greatest potential to threaten human settlements near wildland areas (Graham et al. 2004, PF Doc FF-29).

Figure 3-22. Area in Indian Creek drainage with heavy down fuels that would burn with greater than 4-foot flame lengths

A comparison by Alternative of the effects of the treatments on flame length in the project area is displayed in Table 3-16. This was derived using Flammap to determine potential flame lengths for severe fuel conditions and moderately breezy conditions.

Table 3-16. Acres of potential flame length burning under severe conditions for both alternatives.

Alternative	*Flame Length < 4 ft*	*Flame Length > 4 ft*
No Action Alternative	13,449 ac (46%)	16,002 ac (55%)
Proposed Action Alternative	16,171 ac (54%)	13,279 ac (45%)

FFE-FVS was used to model fire behavior over time and to show the efficacy of the potential treatments (PF Doc FF-11). Figure 3-23 and Figure 3-24 display the results of the flame length analysis for different fuel treatments under the Proposed Action alternative.

Figure 3-23. Flame length over time. Under the No-Action Alternative, flame lengths in this stand would surpass the four-foot mark in 10 years and remain higher than the Proposed Action Alternative. Under the Proposed Action, flame lengths would increase slightly as slash is created from harvest operations, then subside after slash is treated. Activities under the Proposed Action would reduce surface fuels and the associated flame lengths. Although flame lengths vary widely among the stands in the project area, they all exhibit the same trend shown in this graph, of increasing flame lengths over time as surface fuels build. This effect persists through the modeling period.

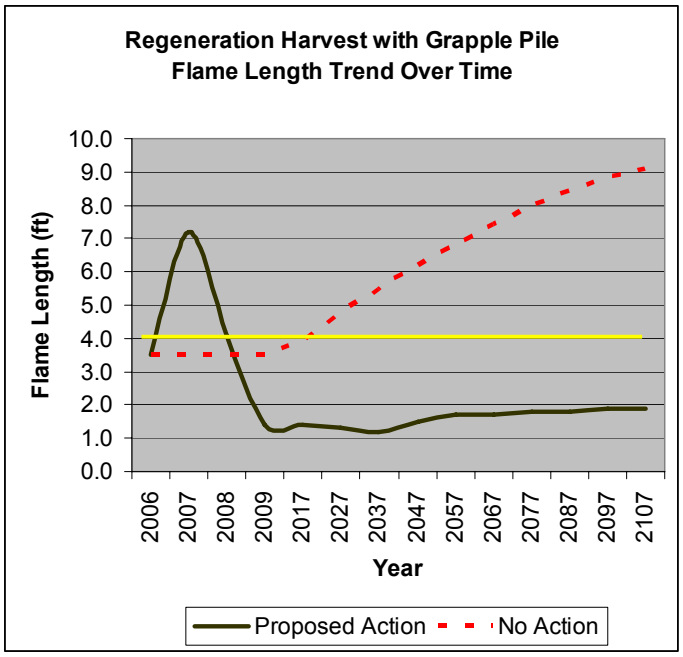
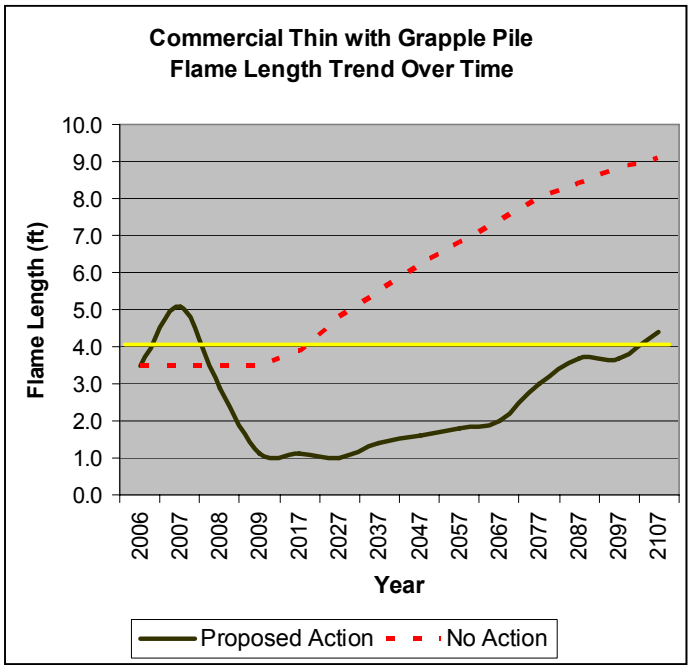


Figure 3-24. Flame length over time. Under the No Action Alternative, flame lengths in this stand would surpass the four-foot mark in 10 years and remain higher than the Proposed Action Alternative. Under the Proposed Action, flame lengths would increase slightly as slash is created from harvest operations, then subside after slash is treated. Activities under the Proposed Action would reduce surface fuels and the associated flame lengths. Note that the thinned stand increases the flame length over time but stays below the four-foot mark until 2107.



In addition to the acres of potential flame length for the entire project area the acres of potential flame length adjacent to several values were also determined (PF Doc FF-12). These values analyzed include primary egress routes (Highway 57), secondary egress routes (Reeder Bay Road, Kalispell Bay Road, Kalispell Creek Road, Reeder Creek Road, and Road 302 north of Nordman), private land boundaries, Ranger Station Administrative Site, Special Use sites (campgrounds, recreation residences, Elkin's Resort, Lakeview Mountain telecommunications site, and Bismark Ranger Station site), and powerlines (Figure FF-4a). These areas were buffered by ¼ mile and ½ mile and analyzed for flame lengths. Table FF-6 shows the acreages of flame lengths within a ¼ mile of each identified value. The acreage of each ¼ mile or ½ mile buffer for all lands (private and USFS) was used in the analysis.

Table 3-17. Acres of potential flame length less than 4 feet burning under severe conditions within ¼ mile of the identified value. Figures in parenthesis represent the percentage of the ¼ mile buffer around each value for both private and USFS land.

Value	*Acres of Flame Length < 4 ft No Action*	*Acres of Flame Length < 4 ft Proposed Action*
Primary Egress	861 (50%)	894 (52%)
Secondary Egress	3330 (66%)	3554 (70%)
Private Land Boundary	7156 (54%)	8109 (61%)
Administrative Site	267 (72%)	267 (72%)
Special Uses	718 (60%)	735 (61%)
Powerlines	3727 (63%)	3955 (66%)

Rate of Spread

Similar to Flame Length, the Rate of Spread (ROS) of a surface fire is another basic measure used by initial attack firefighters and fire resource planners to predict effectiveness of fire suppression strategies and tactics. This is especially important with respect to the pre-positioning of personnel and equipment prior to fires. If adequate resources are not available to suppress fires in their initial stages the amount and type of firefighting resources required greatly increases as well as the potential for unwanted fire effects. For the analysis a spread rate threshold of 5 chains/hour was used to display the effects of the alternatives on the landscape. Fires moving less than 5 chains/hour would have a higher likelihood of containment than faster moving fires based on the suppression resources capability and availability. Fire predictions done in Behave Plus also demonstrate fires that are moving greater than 5 chains per hour would escape initial attack after one hour (PF Doc FF-4).

Rate of Spread in Chains per Hour

- **A chain is the standard measure used in firefighting for measuring distance**
- **1 chain = 66 feet**
- **80 chains = 1 mile**

A comparison by Alternative of the effects of the treatments on Rate of Spread in the project area is displayed in Table 3-18. This was derived using Flammap to determine potential rate of spread for severe fuel conditions and moderately breezy conditions.

Table 3-18. Acres of potential rate of spread burning under severe conditions within the Lakeview Reeder project area for both alternatives.

Alternative	*ROS < 5 chains/hour*	*ROS > 5 chains/hour*
No Action Alternative	12,904 ac (44%)	16,547 ac (56%)
Proposed Action Alternative	14,719 ac (50%)	14,731 ac (50%)

In addition to the acres of potential rate of spread for the entire project area the acres of potential rate of spread adjacent to several values were also determined (PF Doc FF-12). These areas were buffered by ¼ mile and ½ mile and analyzed for flame lengths. Table 3-19 shows the acreages of rate of spread less than the 5 chain/hour threshold for the ¼ mile buffer for each value.

Table 3-19. Acres of potential rate of spread of less than 5 chains/hour burning under severe conditions within ¼ mile of the identified value. Figures in parenthesis represent the percentage of the ¼ mile buffer around each value for both private and USFS land.

Value	*Acres of ROS < 5 chains/hour No Action*	*Acres of ROS < 5 chains/hour Proposed Action*
Primary Egress	848 (50%)	885 (52%)
Secondary Egress	3205 (63%)	3484 (69%)
Private Land Boundary	6823 (51%)	7888 (61%)
Administrative Site	267 (71%)	267 (71%)
Special Uses	654 (54%)	674 (56%)
Powerlines	3668 (62%)	3887 (65%)

Also used to compare the proposed action with the no action alternative was the Minimum Travel Time (MTT) analysis from Flammap (PF Doc FF-13). Five points within the project area were selected to evaluate the minimum travel time from three different ignitions. This allowed the comparison of the theoretical time it would take a fire burning under the input weather conditions to travel from the ignition to any point on the landscape. Conducting this analysis for pre-treatment and again for post-treatment provides a useful tool to compare what the effects are of treating areas across a landscape. Five points of concern (Figure 3-25) were identified with high values nearby to use as a reference in order to compare the effectiveness of the treatments. These are:

1. Reeder Creek Road northwest of Bismark Meadow
2. Nordman
3. Highway 57 at Kalispell Creek
4. Elkin's Resort
5. Road 302 northwest of Kerr Lake in residential area.

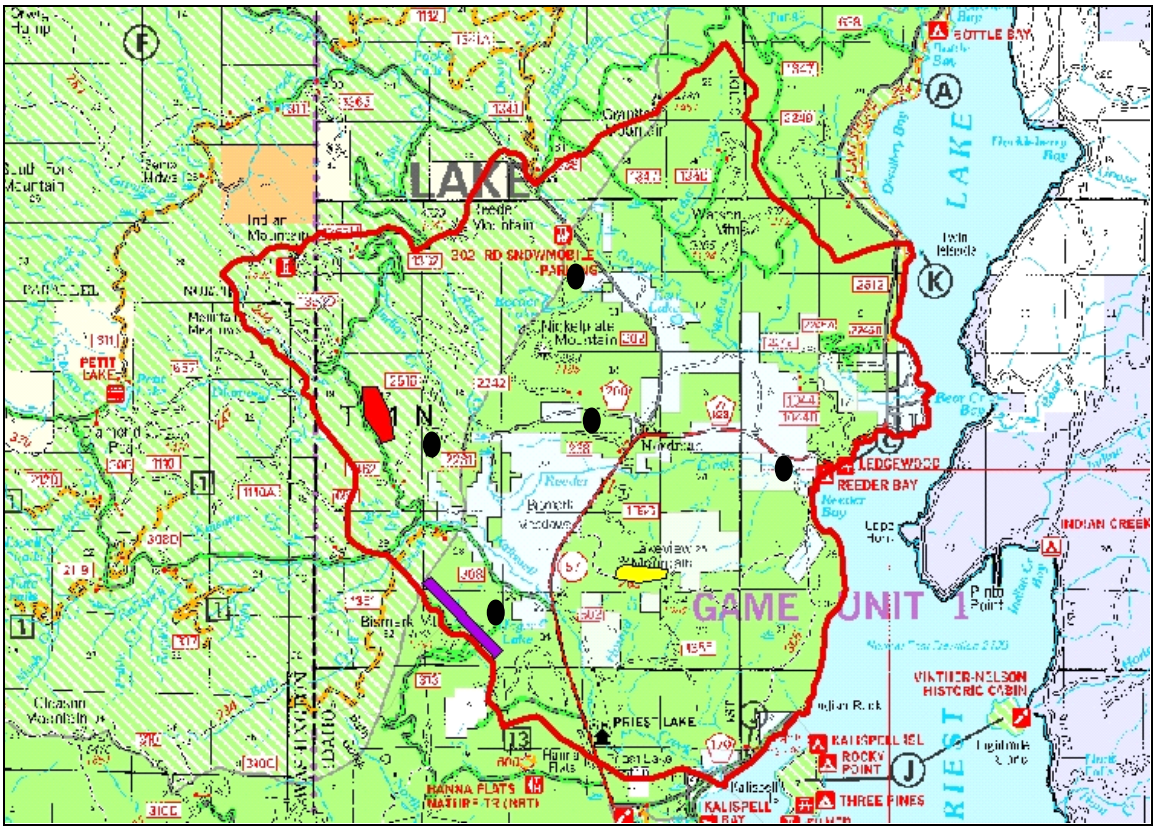


Figure 3-25. Locations of ignitions and points used for Minimum Travel Time analysis in Flammap. Bismark ignition is shown in purple, Indian Creek ignition is shown in red, and Lakeview Mountain ignition is shown in yellow. Points of concern are shown with a black oval.

The three ignitions used were:

1. Top of Bismark Mountain
2. Along Indian Creek northwest of Bismark Meadow
3. Top of Lakeview Mountain

This analysis uses ignitions on the landscape to simulate a theoretical travel time to any point on the landscape. This is useful to compare the effects of alternatives on theoretical travel time. While the acreages of rate of spread were analyzed near the identified values above, the effect of a fire traveling across the landscape and the disruption of fire movement is best analyzed using the Minimum Travel Time (Figure 3-26). All simulations increased the travel time, when compared to No Action, except the Bismark ignition traveling to Kalispell Creek which had no change in time. This was due to the fact that no proposed treatments were in the path of the fire resulting in no change to the travel time.

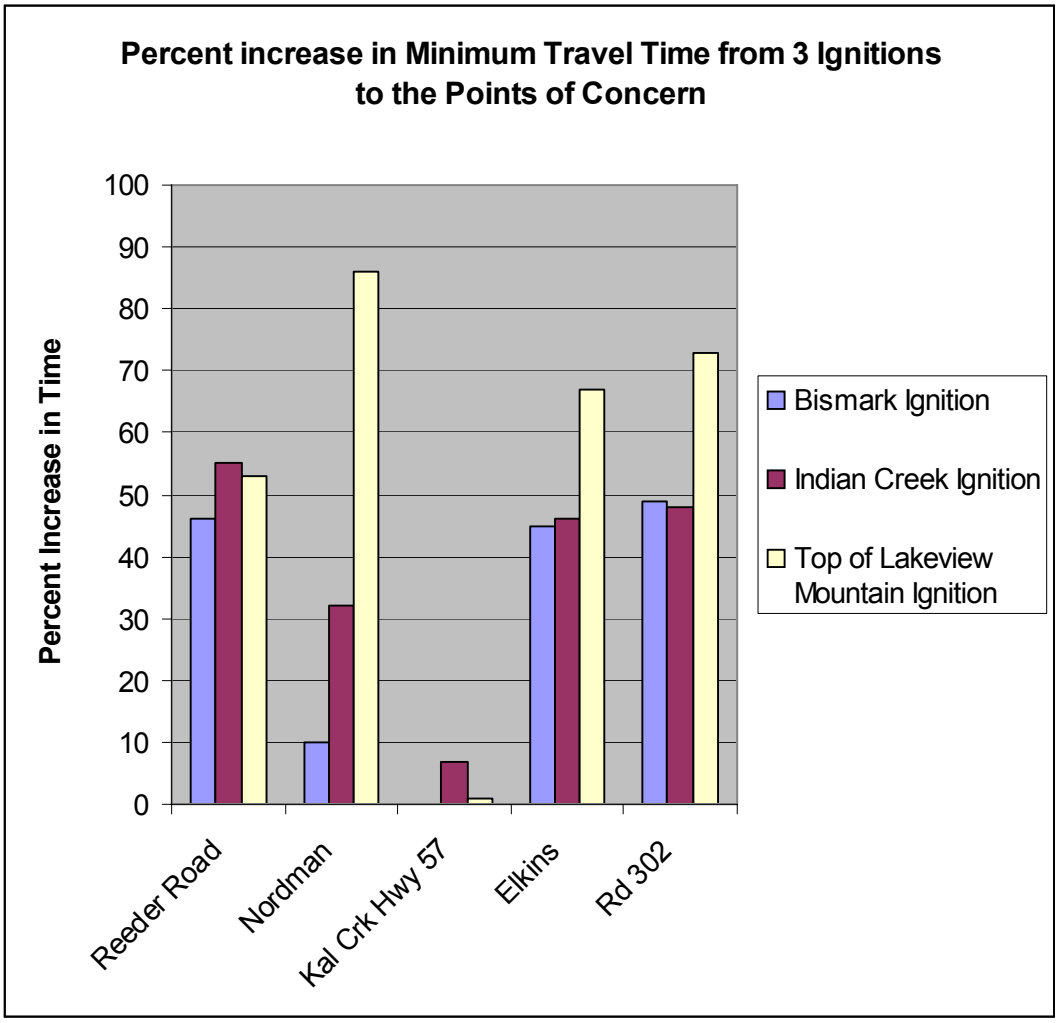


Figure 3-26. Percent increase in Minimum Travel Time with the Proposed Action from ignitions on Bismark Mountain, Indian Creek, and top of Lakeview Mountain. (*MTT was run in Flammap and this represents the percent increase in time for a fire to travel when comparing the No Action and Proposed Action Alternatives.*)

Crown Fire Activity

Much has been written on the importance of crown fire in protecting values in the WUI. In general scientists agree that reducing the potential for crown fire in the WUI is a necessity to reduce risk of unwanted fire effects such as loss of property and scenic value (Cohen 2003, PF Doc FF-47; Graham 2004, PF Doc FF-28). Reducing the risk of crown fires requires the reduction of Canopy Bulk Density and an increase in Canopy Base Height in addition to surface fuel reduction to reduce rate of spread and intensity (Scott and Reinhardt 2001, PF Doc FF-31; Alexander 1987, PF Doc FF-48).

As stated previously crown fire activity represents problems for fire managers (Rothermel 1983, PF Doc FF-49) and the public since their fast rates of spread and extremely high intensity place values at risk and limit firefighting tactics due to firefighter safety. As an example, a fire that is burning only surface fuels in a typical heavy fuel load found within the project area would burn with 4 foot flame lengths and have a rate of spread of 4-5 chains per hour. This would be at the limit of safe and effective direct attack by hand crews. If the fire were to transition to a crown fire the flame lengths would increase to 34 feet in length and would move at 55 chains per hour which is well beyond the limits of direct suppression tactics (PF Doc FF-14). In addition, spotting and increased radiation make structures more difficult to defend from

crown fire than surface fire (Cohen and Butler 1998 in Scott and Reinhardt 2001, PF Doc FF-36). This faster moving fire places more values at risk in a shorter time period, grows exponentially when compared to a surface fire, and limits the use of safe suppression tactics.

Flammap was used to evaluate the crown fire activity across the project area and to determine the amount of acreage that could see potential crown fire under severe fuel conditions and moderately breezy winds. Table 3-20 shows the results of the Flammap output for each alternative.

Table 3-20. Acres of potential crown fire activity burning under severe conditions within the Lakeview Reeder project area for both alternatives.

Alternative	*Acres of Surface Fire*	*Acres of Crown Fire*
No Action Alternative	13231 ac (45%)	16145 ac (55%)
Proposed Action Alternative	16389 ac (56%)	12986 ac (44%)

FFE-FVS was used to compare the effectiveness of the alternatives over time with regards to crown fire activity. The indicators used were the Torching Index and Crowning Index. As discussed earlier, the Torching Index is the 20-foot windspeed necessary to initiate a crown fire. It is a function of surface fuel characteristics, fuel moisture contents, canopy base height, slope steepness, and wind sheltering effect from the canopy (Scott and Reinhardt 2001, PF Doc FF-36). The Crowning Index is the 20-foot windspeed at which active crown fire is possible and reflects the density of canopy fuels, slope steepness and fuel moisture content. A lower Torching Index and Crowning Index means that crown fire could be initiated and/or sustained at a lower windspeed. A lower index means a higher hazard.

Figure 3-27 shows the results of the Torching Index over time for both alternatives for a regeneration harvest followed by underburning and Figure 3-28 shows the results of a commercial thin followed by grapple piling (PF Doc FF-11).

Figure 3-27. Torching Index over time for a regeneration harvest and underburn. Under the No-Action Alternative, the Torching Index remains under 30 mph and lowers to near 0 mph by the year 2047. This means a high risk of crown fire initiation due to the lower wind speed necessary to initiate the crowning. Under the Proposed Action, the Torching Index increases to well over 100m ph until 2037 when regenerating trees in the stand would lower the canopy base height. It then remains at 20-40 mph for the remainder of the simulation which is higher than the No Action alternative. Although the Torching Index varies widely among the stands in the project area, they all exhibit the same trend shown in this graph, of increasing Torching Index followed by decrease once trees begin regenerating and lower the canopy base height.

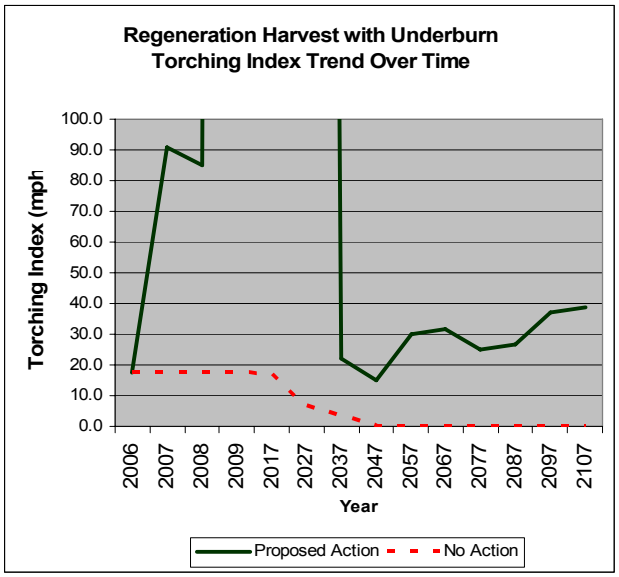


Figure 3-28. Torching Index over time for a commercial thin and grapple piling. Under the No-Action Alternative, the Torching Index remains under 30 mph and lowers to near 0 mph by the year 2047. This means a high risk of crown fire initiation due to the lower wind speed necessary to initiate the crowning. Under the Proposed Action, the Torching Index increases to well over 100m ph until 2047 when regenerating trees in the stand would lower the canopy base height. It then remains under 20 mph for the remainder of the simulation and catches up with the No Action alternative by 2077. Although the Torching Index varies widely among the stands in the project area, they all exhibit the same trend shown in this graph, of increasing Torching Index followed by decrease once trees begin regenerating and lower the canopy base height.

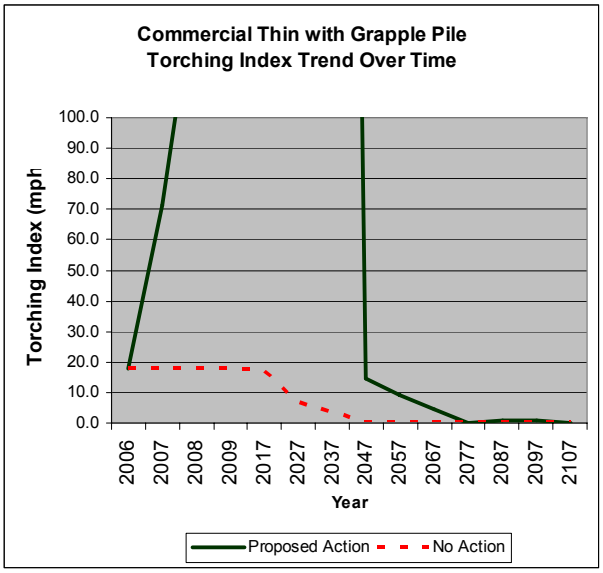
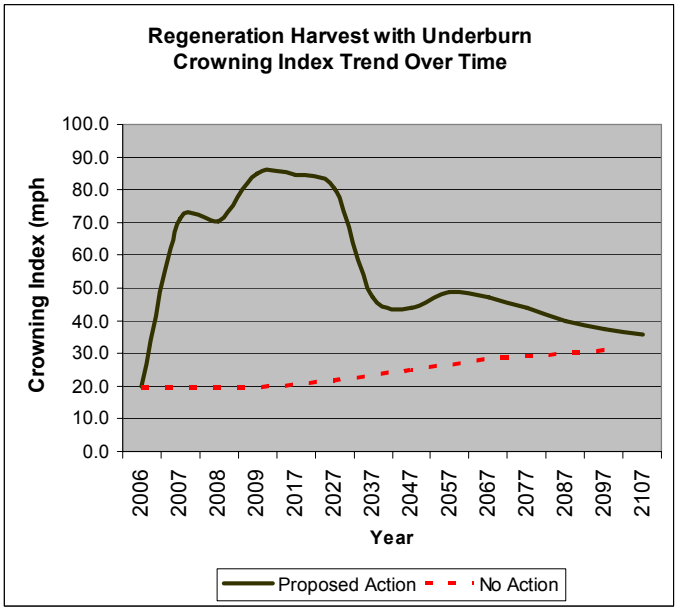


Figure 3-29 shows the results of the Crowning Index over time for both alternatives for a regeneration harvest followed by underburning and Figure 3-30 shows the results of a commercial thin followed by grapple piling (PF Doc FF-11).

Figure 3-29. Crowning Index over time for a regeneration harvest and underburn. Under the No-Action Alternative, the Crowning Index remains between 20 and 30 mph. This means a high risk of crown fire initiation due to the lower wind speed necessary to initiate active crowning. Even though the Crowning Index increases slightly over time the windspeed necessary for active crowning is relatively low. Under the Proposed Action, the Crowning Index increases to near 90 m ph until 2037 when denser canopy conditions in the stand would lower the Crowning Index. It then remains at 35-50 mph for the remainder of the simulation which is higher than the No Action alternative. Although the Crowning Index varies widely among the stands in the project area, they all exhibit the same trend shown in this graph, of increasing Crowning Index followed by a decrease once the canopy becomes dense as the stand matures.



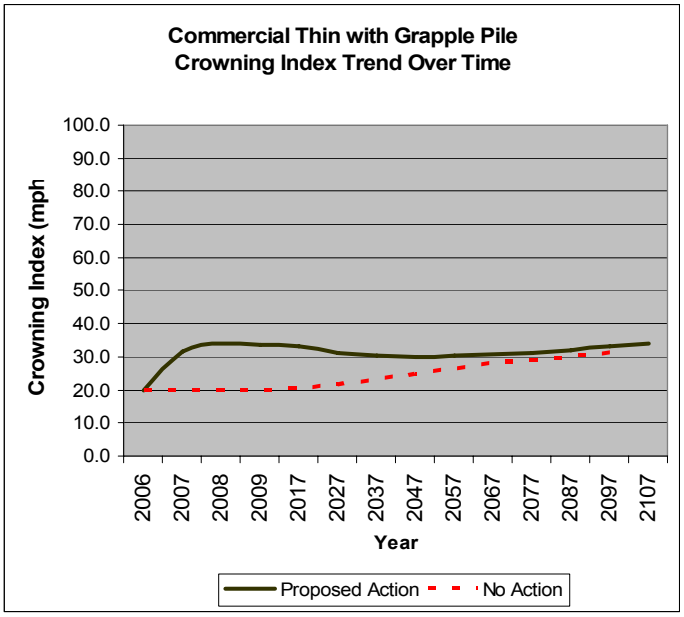


Figure 3-30. Crowning Index over time for a commercial thin and grapple pile. Under the No-Action Alternative, the Crowning Index remains between 20 and 30 mph. This means a high risk of crown fire initiation due to the lower wind speed necessary to initiate active crowning. Even though the Crowning Index increases slightly over time the windspeed necessary for active crowning is relatively low. Under the Proposed Action, the Crowning Index increases to 34 mph and stays near 30 mph for the duration of the simulation. The effect of a commercial thin leaves a relatively dense canopy which is still susceptible to active crown fire. However the Torching Index remains high (Figure 11) which means it would be extremely difficult to initiate a crown fire in this stand. Although the Crowning Index varies widely among the stands in the project area, they all exhibit the same trend shown in this graph, of slightly increasing Crowning Index followed by a decrease once the canopy becomes dense as the stand matures.

As was done with the flame length and rate of spread analysis the amount of potential crown fire acreage adjacent to the identified values was also analyzed within ¼ mile and ½ mile of the values. The analysis used the Flammap outputs for crown fire activity and GIS was utilized to determine the acreage within each buffered value (PF Doc FF-12). The results are shown in Table 3-21 which displays the acreage of crown fire within ¼ mile of each identified value.

Table 3-21. Acres of potential crown fire burning under severe conditions within ¼ mile of the identified value. Figures in parenthesis represent the percentage of the ¼ mile buffer around each value for both private and USFS land.

Value	*Acres of Crown Fire Activity No Action*	*Acres of Crown Fire Activity Proposed Action*
Primary Egress	536 ac (31%)	533 ac (31%)
Secondary Egress	1735 ac (34%)	1521 ac (30%)
Private Land Boundary	5345 (40%)	4422 ac (33%)
Administrative Site	105 ac (28%)	105 ac (28%)
Special Uses	543 ac (45%)	526 (44%)
Powerlines	1800 ac (30%)	1618 ac (27%)

No Action Alternative

Direct Effects and Indirect Effects - No Action

Fire Regime Condition Class

Relative to the Proposed Action, implementation of this alternative would not result in change to the degree of departure or Condition Class of analysis area (Table 3-24). Vegetation and fuel characteristics would remain highly departed from the historic regime. The behavior, severity, and pattern of large scale wildland fires would be highly uncharacteristic compared to the historic fire regime. Disturbance agents, native species habitats, and hydrologic functions would remain substantially outside the historic natural range of variability. Consequently, there would continue to be a high risk of losing key ecosystem components.

Flame Length

Without treatment in these stands, the shade-tolerant understory vegetation would continue to grow and replace the overstory. As it dies and falls down, it causes an accumulation of surface fuels and an increase in potential flame lengths greater than 4 feet (PF Doc FF-11). The existing condition shows that with environmental conditions at or above the 97th weather percentile, flame lengths surpass the 4-foot threshold over 55 percent of the project area (Table FF-6). There would also be no reduction in the flame lengths closer to the identified values and the number of acres adjacent to the values of flame length greater than 4 feet in the future would most likely increase based on the analysis of the FFE-FVS simulations. This means more acres could burn with higher intensities closer to those values as several stands continue to accumulate fuel. No action would allow the stands to continue in succession until some disturbance process takes place; if fire continues to be successfully excluded, forest insects and disease would assume the primary disturbance process of the stands. The accumulation of biomass on the forest floor would contribute to greater flame lengths and subsequently greater fire intensities in the event of a wildfire (Figure 3-23and Figure 3-24). In all prescriptions modeled, the increase in flame length to the 4 foot threshold happens earlier in time by decades when compared to the Proposed Action (PF Doc FF-11).

As more area becomes susceptible to increased flame lengths the ability of firefighting crews to directly attack spreading wildfires safely decreases and the risk of a fire escaping initial attack grows.

Rate of Spread

Using the rate of spread threshold of 5 chains per hour shows that less than half of the project area (44 percent) would expect to have slower moving wildfires that would be able to be suppressed by initial attack crews within the first few hours after discovery (Table 3-18) under severe conditions. As successional processes continue and more of the area becomes susceptible to faster moving fires the expected area that would have slower moving fires would decrease as well. This places more values at risk since there would be a higher likelihood that a fire would escape initial attack and threaten those values.

With No Action there would be no reduction in the rate of spread on Forest Service managed lands near the identified values. Over time the accumulation of fuels due to succession and the potential increase in crown fire activity would lead to faster moving fires thus place more of the values at risk in a shorter time period.

Crown Fire Activity

The fuel buildup over time in the Lakeview Reeder project area would most likely lead to an increased probability of a large, uncontrollable wildfire due to increased fire intensity associated with higher fuel loads, which would hamper fire suppression efforts. Along with changes in surface fuels, crown fuels would also change over time without management intervention. Table 3-20 shows the acres of potential crown fire activity under severe conditions as potentially covering 55 percent of the project area. Within ¼ mile of the identified values there would be no reduction in the potential acres of crown fire activity as 40 percent of the area within ¼ mile of the private land boundary with the Forest Service could see crown fire (Table 3-21).

Figure 3-31. Surface fire transitioning to torching at the Priest River Experimental Forest in 2006.

Analyzing the Torching and Crowning Indices shows the potential for crown fire remains relatively high due to the lower wind speeds necessary to initiate crowning and sustain active crown fire. This is due to the lower denser crowns that would be left over the landscape which are more susceptible to crown fire. Figure 3-27 and Figure 3-28 show the Torching Index over time and after another 30 years the Torching Index drops to near 0 mph which means that very little to no wind would be required to initiate crowning. The Crowning Index (Figure 3-29 and Figure 3-30) remains low (between 20-30 mph) for the simulation period and while it shows a slight increase in the index (thus lowering the risk) the increase is not significant overall.

Summary of the Fire Behavior Indicators

In order to analyze the effects of potential fire behavior the three fire behavior indicators also need to be addressed as a whole due to their interaction. Fire behavior is driven by many factors and decisions on strategies and tactics as well as potential spread of fires is not adequately addressed by only one indicator.

Not treating the landscape would result in potential fire behavior over many areas that would be beyond the ability of initial attack crews under severe conditions. The primary indicator for this is the 4-foot flame length threshold which would primarily be from high fuel loadings. However, those stands with low dense crowns would also be susceptible to crown fires. Rothermel (1983, PF Doc FF-49) describes that crown fires are more difficult to control than surface fires and that their rate of spread is several times faster than surface fires. Spotting is more frequent and can occur over long distances. As an example the Sundance Fire of 1967 burning on the east side of Priest Lake under severe fuel conditions and extreme winds had spot fires 10 miles in advance of the main fire front (USDA Forest Service 1968, PF Doc FF-50). In a sample stand with moderately low dense crowns the flame length and rate of spread if the fire remains on the ground is 4 feet and 5 chains per hour. If the fire jumps to the crowns then the flame length increases to 34 feet and 55 chains per hour (PF Doc FF-14). Just the fire beginning its transition to the tree crowns results in a situation that would be at the limit of safe direct attack and creates a situation that is well beyond direct suppression tactics.

With more of the landscape at risk for a higher intensity fire this puts more firefighting resources at risk. A fire manager's decision to commit firefighting resources is driven by firefighter safety. If initial attack crews can not safely attack the fire other tactics must be employed such as using other resources (i.e. aircraft, heavy equipment). The availability of resources must also be considered as there is high competition for specialized resources during active fire seasons. In cases of fast moving intense fires as described above, the use of aircraft and heavy equipment would be used in an indirect attack mode which

would give up more acres to the fire while attempting to utilize some other effective control line away from the fire front. This can work but its success is often less than that of direct attack tactics. (Mark Grant 2008, PF Doc FF-51).

In attacking wildfires, firefighters must identify Escape Routes and Safety Zones. If an adequate escape route does not exist to a safety zone or an adequate safety zone does not exist a decision must be made as to whether or not the fire would be engaged. Table 3-22 shows the safety zone area from Behave Plus (PF Doc FF-15) that would be required for fires burning with different flame lengths for a 20-person hand crew and one engine.

Table 3-22. Safety Zone minimum size for different fire intensities.

Flame Length (Feet)	*Safety Zone Size (Acres)*
2	0.06
4	0.10
8	0.20
40	2.35
80	8.35

For those areas with predicted lower flame lengths the safety zone area required would be relatively small and are currently abundant throughout the project area. If the fire begins crowning with higher flame lengths, a safety zone would have to be several acres in size which limits the number of areas that would adequately serve as a safety zone in the project area.

Ingress and egress would also be an issue during an on-going wildfire that would require travel routes to be used for emergency vehicles entering the area and the public evacuating the area. If the fire behavior increases to an intense fast moving fire the public would be at risk and evacuations are possible. Under the No Action there would be no treatment of the primary or secondary egress routes (Highway 57 and County Roads) along Forest Service lands. This puts the egress route under higher risk of intense fire blocking the road.

Without treating further away from the values more area is likely to have an intense fire which means higher flame lengths, faster rates of spread, and more crown fires. This leads to less options for direct attack and requires adequate safety zones and escape routes before firefighters can engage the fire with direct attack. If indirect tactics must fall back to defensible positions the fire would become larger and have the potential to burn more area with more intensity thus placing more of the values, public, and firefighters at risk. The West Priest Lake Fire Department which has protection responsibilities within the majority of the Project Area would also be further at risk during fire suppression operations. Without treatment and no reduction in the potential fire behavior the West Priest Lake Fire Department would be more likely to have more structures to defend during a wildfire event since more of the area adjacent to the private lands would be at a higher risk for an intense fast moving fire.

Air Quality

The No Action Alternative would have the least impact to air quality. There may be smoke from wildfires in or out of the project area and from adjacent forest land that may have a negative affect on air quality. Smoke impact from wildfires is usually much more severe than smoke from prescribed fire. Wildfire smoke is generally more concentrated (higher levels of PM2.5 and PM10) and can last for a much longer period of time (weeks and months). However, it is difficult to assess in a quantitative manner, the effect wildfires have on the environment because of the uncertainty in the size of the burned area and the amount of emitted pollutants (Graham et al. 2004, PF Doc FF-46).

Cumulative Effects- No Action

Fire Regime Condition Class

Each of the ongoing or foreseeable future activities were evaluated to determine those that could potentially influence the vegetation or fuel characteristics within analysis area and have an affect on the Condition Class. The following four activities were identified and are discussed below:

- Fire Suppression –Fire suppression efforts will continue within the analysis area because most of the area is within the wildland urban interface (WUI).
- Large Wildfires – If fire suppression efforts were unsuccessful, a large wildfire burning within the analysis area could substantially effect the vegetative composition and structure resulting in a change in the degree of departure.
- Timber Harvests – Stimson Lumber Company has logging planned on roughly 700 acres in T61N R5W Sections 25 and 35 in 2008 (Warden Pers. Comm., 2007). No other harvests are planned on National Forest System lands within the analysis area. Harvests on other private lands are very minor because…. and would not result in noticeable changes in the overall vegetative composition and structure across the project area
- Insects and Diseases – Douglas-fir bark beetles, fire engraver, mountain and western pine beetles, root diseases, and blister rust are expected to continue to influence the vegetative composition and structure and fuel characteristics within the analysis area.For more information see the Vegetation section.

The burning of 100 acres on the south side of Lakeview Mountain in 2004 allowed for fire to be reintroduced into a mixed brushfield and dry site as well as reduced fuels immediately adjacent to the private boundary.

- effects these harvests had on subsequent regeneration and vegetation development has affected the existing fuel hazard

With continued fire suppression, shifts from earlier seral stages to mid to late seral stages would occur. Compared to Alternative 2, the degree of departure would increase and the Condition Class and risk of loss of key ecosystem components would remain the same.

If a large wildfire was to occur within the analysis area, fire behavior, severity, and pattern would be highly uncharacteristic compared to the historic fire regime because as demonstrated by the Fire Regime Condition Class analysis. Substantial changes in vegetative composition and structure would likely occur with shifts from the mid to late seral stages to the early seral stage of development. Compared to Alternative 2, key ecosystem components would likely be lost.

Timber harvests on 700 acres would result in changes in vegetative composition and structure causing shifts from the mid to late seral stages to the early seral stage of development. In addition, these areas would not be replanted and regeneration would rely on natural seed dispersal and development, which would most likely not allow for the establishment of western white pine because…. Compared to Alternative 2, the Condition Class and risk of loss of key ecosystem components would remain the same.

Generally, root diseases would shift stands from mid to late seral stages to earlier stages. Bark beetles may not create structural shifts but would influence species composition as described in the vegetation section by shifting to lesser desirable fire resistant species. Compared to Alternative 2, the degree of departure would increase and the Condition Class and risk of loss of key ecosystem components would remain the same.

Fire Behavior

Fuel reduction efforts have been implemented that focus on private lands, primarily around structures within the Project Area. These efforts are part of the Bonner County Bonfire Program, a program designed to help homeowners reduce fuels on their property and increase the chances of their home surviving a wildfire. Work includes non-commercial fuel reduction activities such as thinning, pruning, piling and chipping primarily within the home ignition zone (Cohen, PF Doc FF-66). The Bonfire activities have reduced the potential for structure ignition (Cohen 1999, PF Doc. FF-67), even under the No Action Alternative. In addition, roadside fuel reduction completed on both private and National Forest System lands has made access and egress in a wildfire situation safer for both citizens and firefighters.

The project area is expected to see increases in development on private lands and subsequent increases in people using the area. Currently, two subdivision applications have been filed for the Reeder Bay area. This means that more values will be present in the project area. Programs such as the Bonfire program or other defensible space programs would continue to benefit those landowners who implement them. Those landowners who do not would be further at risk since most of the developments would be occurring within close proximity to Forest Service managed land which would not be treated for fuel reduction. Increases in the private land development would also increase potential ignition sources (i.e. debris burning) which could place more values at risk.

Private timber harvests would still occur. The thinning through commercial harvest on private lands would decrease the crown fire potential and if the surface fuels are treated sufficiently to reduce fire intensity the overall fire behavior would be lowered with effects similar to that found on Forest Service treated lands under Alternative 2. Those areas where the surface fuels are not disposed of would result in more intense surface fire for several years to a few decades.

There would be areas on Forest Service managed lands that would have management activities occurring as a result of past management. Pre-commercial thinning of 96 acres in the Distillery Bay area would reduce crown density and allow for a healthier stand condition. Based on similar thinnings on the District, the slashed trees would remain on the ground and would be a fuel hazard for 2-4 years until the fine fuels begin to fall apart. Pruning of stands such as white pine plantations would raise the crown base heights and make it harder for a crown fire to initiate. Existing plantations that have not been thinned and are not scheduled for thinning would have an increased fuel loading over time as the stand would be at higher risk for increased mortality and subsequent fuel loadings as well as having denser and more continuous crowns.

As discussed earlier, fire suppression is the primary factor in determining the cumulative effects of this project. The No-Action Alternative represents the continuation of current management, which means the effects of over 80 years of fire suppression would continue on their current trend. The No-Action Alternative would allow the continuation of surface fuel accumulation, as well as the changes in fire behavior associated with a change in forest structure and species. When fire is excluded, the fuels that do not burn remain on the landscape and will likely increase through additional vegetation growth stages if other reduction factors (e.g., disease, insects, prescribed fire, mechanical treatments) do not intervene. When fire finally does occur, the potential for the rapid growth of large, difficult-to-control wildfires is increased (Brown et al. 2004, PF Doc FF-52). Successful fire suppression without prescribed fire causes an increase in amount and continuity of the living and the dead material that fuels fires (Saveland 1998, page 4; PF Doc. FF-53). The continued loss of fire-resistant species would continue to lead to forests that are less resilient to fire, meaning that they could experience more pronounced fire effects and an increased amount of mortality associated with a wildfire.

Fire exclusion has many effects that are documented in the publication *Cascading Effects of Fire Exclusion in Rocky Mountain Forests* (Keane et al. 2002, PF Doc. FF-54). Many of these effects have been directly observed in the Lakeview Reeder Project Area. Fire exclusion causes forest composition to

change from early seral, shade-intolerant tree species to late seral, shade-tolerant species, while stand structure changes from single-layer canopies to multiple-layer canopies. An important stand characteristic that changes with advancing succession in the absence of fire is the increase in the amount of dead and live biomass or fuels. Fuels loadings generally increase in the absence of fire because of a myriad of ecological factors. First, long fire-return intervals mean live fuels have longer times to grow and dead fuels have longer periods to accumulate on the ground. Next, crown fuels increase because late seral, shade-tolerant species tend to have more biomass in the forest canopy due to their high leaf areas, and biomass tends to be well distributed over the height of the trees. Because late seral species are shade tolerant, there are many smaller seedlings and saplings present in the understory to take advantage of any gaps in the canopy. So, the greater crown biomass distributed along greater parts of the stem, coupled with high seedling and sapling densities, can create the ladder fuels that allow flames from surface fires to climb into the forest canopy and result in crown fires.

Surface fuel loadings increase as fire is eliminated because the greater crown biomass ultimately results in increased leaf and woody material accumulating on the forest floor because the recycling process of fire is absent. Duff and litter depths generally increase proportionate to the crown closure and leaf area because of the additional needle fall and reduced decomposition. Soil properties change as fires are reduced and succession advances in an ecosystem. Organic matter generally increases with decreased fire frequency, and this improves pore space, water-holding capacity, and aggregation. However, when soils with thick organic horizons are burned, some of the volatilized organic matter moves downward and condenses to form a water repellent layer that impedes infiltration and can cause massive erosion.

In addition to Keane et al. (2002; PF Doc. FF-54), many other researchers have found that landscapes tend to become more homogeneous as fire is removed because succession eventually advances all stands to similar communities dominated by shade-tolerant species (Schoennagel et al. 2004, PF Doc. FF-55; Hessburg 2005, PF Doc. FF-56). The distribution of structural stages in the Lakeview Reeder Project Area indicates this has already happened (see Forest Vegetation section). Even though late seral species may differ across a landscape depending on site, the multi-layer structures of these late seral stands are nearly identical across most biophysical settings. Landscape structure (spatial distribution of patches) also changes with fire exclusion as landscapes generally become less fragmented, have lower patch density, and evolve decreased patch diversity, which often results in more contagion, corridors, and large patches. Larger patches and high homogeneity tend to foster more continuous crown and surface fuels, which can then burn in large fires that create still larger patches and so on in this downward “fire-exclusion” spiral (Keane 2002; PF Doc. FF-54).

Fire exclusion combined with a lack of landscape level fuel-reduction activities as in the No Action Alternative would heighten fire hazards to forest homes as people continue to develop and settle lands along the urban-wildland interface. Multi-layered canopies and dense crowns will increase the chance of crown fires that are difficult to control. This could increase the harm to people who own the property and the firefighters who try to protect it (Keane 2002; PF Doc. FF-54). Brackebusch (1973, PF Doc FF-57) states that during any period of fire exclusion, the hazard usually continues to build and the probability of a disastrous fire increases correspondingly.

The No Action Alternative would not reduce fuels on Forest Service managed lands in the wildland-urban interface of the Lakeview Reeder Area; allowing an increased risk of a more intense, faster spreading fire that could approach nearby developments and threaten lives, homes, infrastructure, and air quality. No-Action allows a greater possibility that severe wildfire would threaten environmental values such as forest cover, wildlife habitat, soil productivity, water quality, and visual quality. The No Action Alternative does not address or respond to the purpose and need to reduce fuels in any way. It allows the existing condition of elevated fuel loadings and increased connectivity of high fuel loadings to persist. No Action would also result in an increased potential for crown fires and an increased likelihood of severe fire behavior with respect to flame length, rate of spread and fireline intensity. The current landscape homogeneity causes

increased contagion or spatial aggregation of vulnerability to severe fire and insect and disease disturbances (Hessburg et al. 2005, PF Doc. FF-56).

The No-Action Alternative does not proactively reduce fuels in the face of fire seasons that have already been proven to be longer, resulting in an increased incidence of large wildfires (Westerling et al. 2006, PF Doc FF-58). Not to mention that virtually all climate-model projections indicate that warmer springs and summers will occur in the west in coming decades (Whitlock et al. 2003, PF Doc FF-59), and that even for a very low-end climatic change scenario, it seems likely that area burned will at least roughly double by the end of this century in most western states (McKenzie et al. 2004, PF Doc FF-60). At high risk in this situation would be isolated stands of older ponderosa pine and Douglas-fir, especially in mesic sites, that have survived past disturbances. The increased fire extent and severity would increase the risk of mortality in these stands (McKenzie et al. 2004, PF Doc. FF-60).

Recreational activities would continue throughout the project area as there would be more people using the area in the future. This increases the probability of a human caused ignition within the area. Most of these would be expected to be found near roads and trails on both private and Forest Service managed lands. Since 1940, 40 percent of the fires in the project area have been human caused ignitions (PF Doc FF-6) and the increase in the potential recreation would increase the likelihood of more human starts. These ignition sources could be from off-road vehicles (motorcycles, ATV's), campfires, smokers, and vehicles on roadways (exhaust or dragging metal) just to name a few. All of these ignitions have caused fires in the past within the project area. The lack of fuel treatments on federal lands increases the probability that a human caused fire would burn larger areas of land and place more values at risk.

Proposed Action Alternative

Direct Effects and Indirect Effects - Proposed Action

Fire Regime Condition Class

Making a positive change in FRCC is dependent on both returning fire and returning characteristic vegetation-fuel to the landscape at a spatial and temporal scale approximating the historic range of variability. In FRCC, a visual dynamics model is used to characterize succession-disturbance states and transitions. This model was given the name "box model" because of the box-like format of the succession and disturbance diagram. Boxes show the characteristic seral structural stages, and arrows show typical direction of succession or disturbance change (PF-FRCC-1). The box model along with the data disclosed below was used to determine the effects of the proposed action.

For the grand fir/Douglas-fir/larch mixed forest types implementation of the proposed action would create shifts away from the reference condition in the mid seral closed and mid seral successional stages. For the mixed conifer-upland cedar/hemlock forest types implementation of the proposed action would create shifts towards the reference condition in the uncharacteristic late seral open and uncharacteristic late seral closed successional stages.

The proposed action would treat about 13 percent of the analysis area landscape. The tables below display the results of the FRCC assessment for the post treatment strata (Table 3-23) and analysis area landscape (Table 3-24). It is most desirable to have a Condition Class of 1 regardless of Fire Regime, meaning that fire and vegetation-fuels characteristics are within the historical range. The analysis area landscape would change to a Condition Class 2 with an FRCC departure of 65 percent from the historic fire and vegetative characteristics.

Although, the departure improves only slightly (4 percent) and the Condition Class drops to 2, which still indicates a risk of loss of key ecosystem components, the implementation of this project would initiate a

positive trend for this analysis area. This is accomplished by reducing uncharacteristic vegetative compositions and structures due to vegetative in-growth, strategically reducing fuel build-up, and restoring fire.

Table 3-23. Strata Fire Regime Condition Class summary information for the post treatment landscape.

	Mixed Conifer Cedar - Hemlock	Grand Fir – Douglas Fir
Reference Fire Frequency	150 years	43 years
Current Fire Frequency	720 years	241 years
Strata FRCC Departure	70%	41%
Strata Condition Class	3 (67 – 100%)	2 (34 – 66%)
Strata Fire Regime	III	III

Table 3-24. Comparison of Alternatives.

	Alternative 1	Alternative 2
Degree of Departure	69%	65%
Change from Existing Condition	0%	-4%
Condition Class	3 (67-100%)	2 (34 – 66%)
Risk of loss of key ecosystem components	High	Moderate

Flame Length

Implementing the proposed action would increase the number of acres of potential flame lengths less than 4-feet, during severe conditions (97th percentile) from the current 46 percent of the project area to 54 percent of the project area post-treatment (Table 3-16). This means that there would be an increase in the number of acres that firefighting crews could directly attack a wildfire. There would be a short-term increase in potential flame lengths between the time slash is on the ground and when it is disposed of. However this increase would last 1-2 seasons until the slash is disposed of either by underburning or piling. The FFE-FVS simulations (Figure 3-23 and Figure 3-24) display the effect of the proposed treatments on flame length over time (PF Doc FF-11).

For those areas with regeneration harvest the flame length would decrease following slash treatment. The slash treatment would consist of underburning the stand with a relatively low intensity burn or by using an excavator to create piles which would be burned in the fall. In both prescriptions there would be a potential increase in the flame length followed by a decrease for several decades when compared to the No Action alternative. This would allow safer conditions for firefighters to utilize direct attack.

Use of commercial thinning would also decrease the potential flame length over time following slash treatment. Following the thinning, slash would be piled using an excavator with the piles burned the following fall. The potential flame length would increase between the thinning and the piling (1-2 seasons) but then decrease well below the No Action alternative and below the 4-foot flame length threshold. The potential flame length would increase over time exceeding the 4-foot threshold in 2107. This would allow safer conditions for firefighters to utilize direct attack.

The brushfield burning would also decrease the potential flame length in the brushfields under drier conditions. The Coeur d'Alene River Ranger District's (IPNF) analysis of the Placer Resource area used FFE-FVS to model potential flame lengths in brushfields without treatment as well as following one and two underburns. That analysis found that under the drier conditions (such as would be found in the 97th

percentile in the Lakeview Reeder Project area) the potential flame length would drop following one underburn and drop even further following a second underburn (PF Doc FF-16).

Piling without harvest by either hand piling or machine piling would also reduce the potential flame length following slash treatment (PF Doc FF-11). Machine piling would decrease the flame length below the No Action and would also stay under the 4-foot threshold until 2067. Hand piling would see an increase in the flame length until the slash is disposed of (generally within a few months) followed by a drop below the 4-foot threshold until 2057.

Under the Proposed Action the acres of potential flame length less than the 4-foot threshold would increase within ¼ mile of the identified values (Table 3-17). This means that flame lengths would be reduced within ¼ mile of the values over a larger area than the No Action and would allow more opportunities for direct attack closer to those values. In particular the acres of flame length less than 4-feet within ¼ mile of private land boundaries would increase from 7,156 acres (54 percent of the area) to 8,109 acres (61 percent of the area).

Rate of Spread

There would be an increase in the number of acres in the project area with a rate of spread less than 5 chains per hour under the Proposed Action following slash treatment (Table 3-19). The number of acres would increase from 12,904 acres (44 percent of the project area) to 14,719 acres (50 percent of the project area). This would result in more area with slower moving fires due to the proposed treatments and leave more acres with potential direct attack across the project area.

Those areas treated with regeneration harvest, commercial thinning, machine piling, hand piling, and prescribed burning would see a decrease in the rate of spread following treatment. Surface fuels would be treated and reduced resulting in fuel models that are slower burning. In addition the crown fuels would be thinned and the canopy base heights raised, thus lowering the crown fire potential. This would also slow down potential rates of spread due to a decrease in the crown fire potential. Areas that are hand piled or machine piled only would see a decrease in the rates of spread due to the surface fuels being treated but the effectiveness of these treatments would not last as long due to the crown fuels not being thinned as much as the more intensive treatments.

Within ¼ mile of the identified values there would be an increase in the number of acres with slower moving fires of less than 5 chains per hour (Table 3-19). This would result in more area near the values having slower moving fires that would be easier to contain. In particular the amount of land with rates of spread less than 5 chains per hour within ¼ mile of the private land boundary with the USFS would increase from 6,823 acres (51 percent of the project area) to 7,888 acres (61 percent of the project area).

The Flammap analysis of the Minimum Travel Time for a fire traveling from an ignition on Bismark Mountain, Indian Creek or Lakeview Mountain to one of the 5 points of reference shows an increase in the travel time with the Proposed Action (Figure 3-25). In all cases the Proposed Action increases the travel time due to the treatments slowing the fire spread. The only exception is the Bismark Mountain ignition traveling to the Kalispell Creek/Highway 57 junction. There is no change in the travel time due to no Proposed Action treatments between the ignition and the reference point. In the case of the Lakeview Mountain ignition traveling to Nordman, the travel time increased 86 percent with the Proposed Action (PF Doc FF-13). The increased travel times for fires traveling across the landscape means that there would be more time for firefighters to take action on a spreading wildfire and more time for the public to prepare for an evacuation.

The Proposed Action would thin the canopies of the treated areas which would reduce the moderating effect of canopy (sheltering) on wind speed. As a result, surface winds (winds beneath the canopy that affect surface fuels) would increase. Scott and Reinhardt (2001, PF Doc FF-36) discuss how these

increased winds exacerbate surface fire behavior. However they go on to state that properly executed treatments greatly reduce crown fire potential. Graham et al (1999, PF Doc FF-61) state that thinning which decreases crown bulk density and raises crown base height followed by treatment of the slash will decrease fire intensities. A Nexus analysis (Table 3-25) compares the spread rates of an untreated stand with heavy down fuels with a spread rate in a treated stand following slash treatment (PF Doc FF-17).

Table 3-25. Spread rate for a treated and untreated stand. Conditions based on a 25 mph 20-foot windspeed adjusted to a surface (eye-level) wind based on tree crown density.

	Fuel Type	*Rate of Spread (Chains per Hour)*	*25 mph 20 foot wind adjusted for surface*
Untreated – Surface fire Closed canopy	Heavy down dead	4.7	3 mph
Treated – Surface Fire Open canopy	Moderate load conifer litter	3.2	8 mph

This demonstrates that thinning a stand and opening the canopy increases the surface windspeed due to less sheltering from the remaining trees. However, if the surface fuels are treated and the fuel loads redistributed the increased wind speed is off-set by the change in the fuel complex. The table above shows that in a thinned stand with treated fuels the 8 mph wind speed results in a slower moving fire than a dense canopied stand with only a 3 mph wind speed.

Crown Fire Activity

Implementing the Proposed Action would decrease the amount of potential crown fire in the project area (Table 3-20) from 16,145 acres (55 percent of project area) to 12,986 acres (44 percent of the project area). This would result in more areas with lower fire intensity, and lower rates of spread which means more of the project area could be safely attacked using direct attack tactics as well as more area having slower moving fires.

The regeneration and commercial thin treatments would increase the Torching and Crowning Indices (Figure 3-27 through Figure 3-30) which would lower the crown fire potential. This means that a higher windspeed would be needed to initiate or sustain crowning. The Torching Index would decrease once tree regeneration in the treated areas begins to grow back in and become a fuel concern. In the regeneration areas the Torching Index would drop to existing levels in 30 years and would stay between 20 and 40 mph for the remainder of the simulation which is higher than the No Action alternative. In thinned stands the Torching Index would decrease in 2047 due to tree regeneration and lower to near 0 mph by 2077 and follow the No Action for the remainder of the simulation. In all cases the treatments increase the Torching Index above the No Action alternative for several decades.

The Crowning Index would increase in the regeneration harvest stands and stay above the No Action alternative for the duration of the simulation. In 2037 the Crowning Index would begin to drop but would stay in the 35-50 mph range. In the thinned stands there would only be a slight increase in the Crowning Index over the No Action until 2057 when the Crowning Index is the same for both alternatives. This is due to the thinned stands having a denser crown component than the regeneration stands thus the ability to sustain a crown fire entering the stand is higher with a thinned stand when compared to the regeneration treatments. However the key issue is the thinned stands change the surface fuel complex and raise the canopy base height which increases the Torching Index (Jain et al 2006, PF Doc FF-62). This means that it would be extremely difficult to initiate a crown fire in the treated stand and that if the stand were to have a crown fire event it would have to come from an adjoining area.

The prescribed burn treatments (shrubfield and dry-site) would also decrease surface fuels and raise the canopy base heights. This would raise the Crowning and Torching Indices as well.

Within ¼ mile of the identified values the amount of crown fire would decrease due to the Proposed Action's treatments (Table 3-21). This means less intense and slower moving fire near these values than would likely occur with the No Action alternative. Using the private land scenario described previously, the amount of crown fire within ¼ mile of the private land boundary with the USFS would decrease from 40 percent of the area to 30 percent of the area.

Summary of the Fire Behavior Indicators

The combination of reducing potential flame lengths, slowing down potential fire spread, and reducing the potential for crown fire activity changes the overall fire behavior in the project area to a safer environment for firefighters, the values at risk, and the public. The reduction in crown fire potential by altering surface fuels, raising canopy base heights, and reducing crown bulk density will reduce the potential for spotting and will create more areas closer to the identified values where firefighters can safely and effectively attack a wildfire. Safety zones would generally need to be smaller and more would be available as most of the treated areas could serve as safety zones. The resistance to control efforts would be less than the No Action as the fire intensity would be lower over more areas.

Untreated areas would still exist and intense fast moving fires are still possible in these areas. However the disruption of the fuel complex would create areas where the fire behavior would change from high intensity fast moving fires to lower intensity and slower moving fires (Graham et al 2004, PF Doc FF-46; Graham et al 1999, PF Doc FF-61). This disruption in the fuel complex would create areas where firefighters could safely take action on the fire and increases the likelihood of success of containment as well as protecting many of the values in the area.

Ingress and egress would also be improved with the Proposed Action. Treating near the egress routes reduces the likelihood of a travel route being blocked during an emergency. With slower moving fires on the landscape and higher chances of containment success, there is a smaller chance of emergency evacuations being required.

The design of the proposed treatments on the landscape would slow down the spread of fires particularly near the identified values. Further away from the values within the project area (where no treatment is proposed) fires would continue to have more area where intense fast moving fires are possible. Firefighters would be less likely to directly attack spreading fires under severe conditions in these areas. If a fire develops here and grows to a large fire, the time for it to travel to the values increases with the Proposed Action due to the location of treatments near the values. While the potential still exists for the fire to spread to these values (via untreated areas or treated areas where the fire will move slower) the time for firefighters and the public to prepare for the fire increases. In addition the treated areas would alter fire behavior and create better conditions and more locations for firefighters to take safe action before the fires reach the values. The creation of larger treatment areas (greater than 40 acres in size) also creates larger areas where the fire behavior would be modified and results in safer and more effective conditions for firefighters.

Access for firefighters will increase slightly with the road improvements on Lakeview Mountain. This will allow for faster response times and better access with equipment such as engines. If firefighters can utilize equipment such as engines and hose lays the potential fire size is reduced due to more effective suppression tactics. The West Priest Lake Fire Department would also realize safer conditions for fighting wildfires as more of the area would likely have reduced fire behavior. In the event of a wildfire this would allow the West Priest Lake Fire Department to provide better protection of structures since less area would have severe fire behavior.

Air Quality

A total of 3,865 acres are prescribed for burning under this alternative. The proposed activities would occur over a 7 + year period. The burning would occur throughout the spring and fall depending on weather and fuel conditions. Typically the ecosystem burning would be done in the spring, pile burning in the fall and the under burning in both spring and fall. On average 100 acres of pile burning can be accomplished on a given day and fewer acres would be burned daily when burning the hand pile units. Tables AQ-1 summarizes the amount of expected emissions from different wildfire sizes and durations and Table AQ-2 estimates the prescribed fire emissions based on the average number of burning days for a spring and fall season and the estimated emissions produced using Consume 2.1 and Fofem 5. Comparing these two tables demonstrates that smaller wildfires would produce more particulate matter over a shorter period of time than would prescribed burning over a burn season. Impacts on air quality will be of short duration and should not contribute to the significant deterioration of air quality. Prescribed fire activities are planned and implemented on days when wind currents and atmospheric instability will dissipate smoke so as not to negatively impact air quality and visibility. Any smoke created from burning activities would be noticeable to the public and the general and local winds would create the potential for decreased visibility due to smoke for a short period of time. Prolonged combustion of heavy fuels would perpetuate the duration of smoke and emissions of potentially harmful particulates, therefore decreasing the amount of fuels available to burn would decrease the impacts to local communities from smoke. Prescribed fire behavior can be manipulated by ignition pattern and the rate at which the fuels are ignited – both can affect the amount of smoke into the atmosphere at a given time. Following the restrictions of the Idaho DEQ and the Montana/Idaho Airshed Group will mean that prescribed fire activities occur on days when smoke dispersion is greatest and conditions are favorable. The Montana/Idaho Airshed Group regulates how much and where the Priest Lake Ranger District can burn on any given day. By treating the 3,865 acres included in the proposed treatment area, the amount of surface, ladder, and aerial fuels would be reduced, thus combustion time would likely decrease during a wildfire as compared to untreated. However, treating the fuels does not protect the area from a wildfire ignition; it alters the fuels to reduce the intensity and severity in the case of a wildfire. Smoke would still be produced; however the flaming and smoldering phases of combustion would be lessened due to a decrease in the amount of fuel (PF Doc FF-18). If biomass removal is used as an alternate to prescribed fire on portions of the project area then emissions would be reduced due to no burning occurring on those acres. The result would be less impacts to air quality overall.

Table AQ-1 Estimated Wildfire Emissions. Expected tonnage of particulate matter to be emitted into the atmosphere based on fire size and duration. **(Source Consume 2.1)**

	PM 10 Tons	**PM 2.5 Tons**
250 acres for 5 days	204	192
50 acres for 5 days	41	38
10 acres for 5 days	8	8
1 acre for 5 days	.8	.75
Total	253.8	238.75

PM_{10} and $PM_{2.5}$ refer to particulate matter that is, respectively, less than 10 micrometers, or 2.5 micrometers in size. Fine particles from fuel combustion are often called respirable particles because they are efficient at penetrating the lungs (Smoke Management Guide, 2001).

Table AQ-2. Estimated Prescribed Fire Emissions by Burn Season. Expected tonnage of particulate matter to be emitted into the atmosphere based on acres of expected prescribed burning by burn type.

Spring burn season:

Treatment	# of Days	Acres/Day	Acres	PM 10 (tons)	PM2.5 (tons)
Underburn	3	30	90	181	154
Hand Pile Burn	1	10	10	.5	.4
Eco Burn	2	150	300	21	18

Fall Burn Season:

Treatment	# of Days	Acres/Day	Acres	PM 10 (tons)	PM 2.5 (tons)
Underburn	5	30	150	302	256
Pile Burn	5	100	500	135	115
Eco Burn	0	0	0	0	0

Cumulative Effects- Proposed Action

Cumulative effects are those that would result from the Proposed-Action Alternative in addition to the incremental impacts of past, ongoing and reasonable foreseeable actions. Fire suppression is the primary action to be considered when evaluating cumulative impacts in the fire/fuels analysis, and the past effects of fire suppression are the same as those described in detail under the Cumulative Effects of the No Action Alternative. Since wildland fire use is not a reasonable foreseeable activity in the Lakeview Reeder Project Area, only the Proposed Action Alternative disrupts the “fire exclusion spiral” (Keane 2002; PF Doc. FF-54). The Proposed-Action Alternative would take steps to counteract the effects of fire exclusion as summarized previously in this section. The trend of fire behavior away from historical conditions would be interrupted, since early seral, less dense canopies would be promoted. In addition to disrupting the “fire exclusion spiral” by reducing hazardous fuels, improving species composition and improving stand and landscape structure, the Proposed Action Alternative slows fire movement at the landscape scale, reducing the threat of an uncontrolled fire approaching nearby developments and values.

It is almost impossible to separate indirect effects from cumulative effects when fire suppression is considered. Fire suppression has been effective in the Lakeview Reeder Project Area for nearly 80 years, and the incremental effect of suppressing each small fire in the watershed would have over time promoted late seral species rather than early seral species, and changed the structure of those forests, which in turn would change the way they responded to fires (Zack and Morgan 1994, page 32; PF Doc. FF-33).

With continued fire suppression, shifts from earlier seral stages to mid to late seral stages would occur, the degree of departure would increase, the Condition Class would shift to 3 and risk of loss of key ecosystem components would become high.

If a large wildfire was to occur within the analysis area, fire behavior, severity, and pattern would be moderately uncharacteristic compared to the historic fire regime because…. Some changes in vegetative composition and structure would likely occur with shifts from the mid to late seral stages to the early seral stage of development. With respect to Alternative 1, some key ecosystem components would likely be lost such as structural and distribution of successional stages..

Timber harvests on 700 acres would result in changes in vegetative composition and structure causing shifts from the mid to late seral stages to the early seral stage of development. In addition, these areas would not be replanted and regeneration would rely on natural seed dispersal and development, which would most likely not allow for the establishment of western white pine because…. Compared to Alternative 1, the degree of departure, Condition Class and risk of loss of key ecosystem components would likely remain the same.

The burning of 100 acres on the south side of Lakeview Mountain in 2004 allowed for fire to be reintroduced into a mixed brushfield and dry site as well as reduced fuels immediately adjacent to the private boundary.

Generally, root diseases, bark beetles and blister rust would most likely have the same effects as with Alternative 1, but the degree would be less because more of the potential affected area would be treated. Therefore, the degree of departure would shift only slightly, but the Condition Class and risk of loss of key ecosystem components would likely remain the same compared to Alternative 1.

Records show that 1,976 acres of prescribed burning have occurred on National Forest System lands in the past several years in the Lakeview Reeder Project Area. This includes burning of piles (hand, grapple and dozer), underburning, broadcast, wildlife and ecosystem burning. Most of the past prescribed burning in the Project Area is associated with timber sale activities. The historic prescribed burning has reduced activity fuels and helped to maintain more acres of the Project Area in an early seral stage, providing discontinuity to the fuels.

It is neither possible nor desirable to "fireproof" fire-dependent ecosystems, but active land management can reduce potential effects of severe fire. Federal land management agencies can mimic natural disturbances, but it is essential for managers to consider that current conditions may be considerably different from those conditions that occurred historically. Reintroduction of native processes such as fire without modification of structural patterns, fuel loadings, and spatial distributions can produce unpredictable and undesirable effects (Quigley et al. 1996, pages 165 and 184; PF Doc. FF-63). The overall importance of climate in wildfire activity underscores the urgency of ecological restoration and fuels management to reduce wildfire hazards to human communities and to mitigate ecological impacts of climate change in forests that have undergone substantial alterations due to past land uses. (Westerling et al. 2006, PF Doc FF-58).

Activities under the Proposed-Action Alternative would affect the Fire Regime Condition Class by restoring fire effects, vegetation composition/structure, and fuels to more resemble the landscape's natural (historical) range. Treated areas would trend the project area towards Condition Class 1.

On private lands the continued treatment of structures by private landowners and through programs such as Bonfire would continue. To date, approximately one-half dozen homes or businesses within the project area have undergone treatments with the Bonfire program while other homes have conducted treatment on their own. The effect of slowing potential fire spread and lowering potential fire intensity due to the

Proposed Action would further the effectiveness of the private treatments. The combination of treating within the structure ignition zone as well as away from the treatments would create safer conditions for more of the landowners. Those private structures where no treatment has occurred in the structure ignition zone would still be at a higher risk due to untreated fuel conditions in the immediate vicinity of the structure. However, by reducing the potential fire behavior away from the values (by treating the landscape with the Proposed Action) the likelihood of a fire spreading and reaching the value would be reduced.

Private land development would continue to increase with subsequent increases in the numbers of people using the area. More values would be present in the project area. While this project does not treat fuels within the structure ignition zone on private property, programs such as the Bonfire program or other defensible space programs would continue to benefit those landowners who implement them. Increases in private land development would also increase potential ignition sources (i.e. debris burning) which could place more values at risk. However by treating more of the Forest Service managed land to disrupt the fuel complex between a potential ignition source and a value would benefit those future developments by reducing potential fire behavior.

Like the No Action alternative, private timber harvest would still occur. If the surface fuels are adequately treated to reduce fire intensity the overall fire behavior would be lowered. Those areas where the surface fuels are not disposed of would result in more intense surface fires. The combination of the Proposed Action and the private treatments would lower the overall fire behavior potential due to the change in the fuel complex.

Areas on Forest Service managed land that have had past management activities would see future activities. Pre-commercial thinning of 96 acres in the Distillery Bay area would reduce crown density and allow for a healthier stand condition. Based on similar thinnings on the District the slashed trees would remain on the ground and would be a fuel hazard for 2-4 years until the fine fuels begin to fall apart. Pruning of stands such as white pine plantations would raise the crown base heights and make it harder for a crown fire to initiate. Existing plantations that have not been thinned and are not scheduled for thinning would have an increased fuel loading over time as the stand would be at higher risk for increased mortality and subsequent fuel loadings as well as having denser and more continuous crowns. The overall combination of the Proposed Action's treated areas and the treatment of past activities would result in fuel conditions across the landscape that are in different stages of treatment efficacy and prolong the effectiveness of past treatments.

Treating the fuels on Forest Service managed lands in the Wildland Urban Interface would slow the overall spread potential in the project area. There would still be untreated areas where fires could burn through quickly and threaten values. However the reduction of fire behavior potential would place more of the WUI at less risk than the No Action due to the overall changes in the fuel complex. The Proposed Action reduces the amount of potential crown fire in severe conditions in the WUI and decreases the likelihood of severe fire behavior with respect to flame length, rate of spread, and fireline intensity. Treating areas further away from the immediate vicinity of the values would also disrupt potential fire spread and allow firefighters more opportunity to contain the fire before the fire threatens more values. The Minimum Travel Time calculations (Figure FF-12) show that the Proposed Action treats critical areas on the landscape to increase the travel time from the potential ignitions to points within the WUI.

Recreational activities would continue throughout the project area as there would be more people using the area in the future. This increases the probability of a human caused ignition within the area. The Proposed Action would treat fuels on federal lands that would disrupt the fuel complex and place fewer values at risk when compared to the No Action alternative.

Air Quality

Air resources are somewhat unique in that past impacts to air quality are not usually evident or cumulative. The Lakeview Reeder Project emissions would be cumulative only with other local emission sources, wildfires or in conjunction with other burners in Airshed 11. The Idaho/Montana Airshed Group tracks emission inputs and air quality for all of the major burners. There is a finite amount of emissions allowed into each airshed at any one time. The Idaho/Montana Airshed Group has numbers assigned to each prescribed fire unit so management emissions can be tracked. Burn restrictions are based on the amount of inputs and the air quality and dispersion for that particular day. Prescribed fires are cancelled if emissions are too great or the air mass is too stagnant for good smoke dispersal. This system is in place to ensure air quality standards are met in each airshed, and that smoke emissions from many projects will not combine and exceed air quality standards. This project in combination with other projects and local emission sources could have a cumulative affect on air quality; however, air quality standards would not be exceeded. Cumulative effects if they occur under this management system would be limited to local emission sources such as wood burning stoves, the on-going or proposed fuel reduction projects and dependant upon air stability and strength of surface and transport winds.

Compliance with the Forest Plan and Other Regulatory Direction

The Proposed Action Alternative is consistent with direction in the Forest Service Manual (FSM 5100, PF Doc FF-21). The Proposed Action Alternative is designed to help accomplish the goals of the 10-Year Comprehensive Strategy (Strategy) by reducing hazardous fuels and restoring fire-adapted landscapes. One of the guiding principles of the Strategy is to set priorities that emphasize the protection of communities and other high-priority watersheds at risk. The long-term emphasis is to maintain and restore fire prone ecosystems at a landscape scale. The Lakeview Reeder Project Area is mostly within the wildland-urban interface as defined by the Bonner County Fire Mitigation Working Group. (PF Doc. FF-25). The Project Area is in close proximity to communities, and within the WUI. These factors make the Lakeview Reeder Project Area a high priority for hazardous fuel treatment. The No Action Alternative does not address the objectives of fire management (FSM 5140, PF Doc. FF-21), the goals of the Strategy, or the goals of the Bonner County Wildland Urban Interface Fire Mitigation Plan.

The Forest Plan (PF Doc. CR-002, page II-38) identifies two standards regarding fire management.

Forest Plan Fire Management Standard #1

Fire protection and use standards are specified by management area. Cost effective fire protection programs will be developed to implement management direction based on on-site characteristics that effect fire occurrence, fire effects, fire management costs and fire caused changes in values.

Forest Plan Fire Management Standard #2

The Fire Management Action Plan will be guided by the following Forest-wide standards:

a. Management area standards.

b. Human life and property will be protected.

c. Fire will be used to achieve management goals according to direction in management areas. Implementation guides will be prepared for prescribed fire projects and programs identified in Table 10 (Forest Plan Appendix F) using unplanned ignitions.

d. Management area standards will be used in Escaped Fire Situation Analyses as a basis for establishing resource priorities and values.

e. The appropriate suppression response for designated old-growth stands in all management areas except in wilderness will result in preventing the loss of old growth. Fire policy in relation to old growth within wilderness will be provided in specific management direction developed for each wilderness area.

f. Activity fuels will be treated to reduce their potential rate of spread and fire intensity so the planned initial attack organization can meet initial attack objectives.

g. Forest Fuel Management Fund expenditure priorities are:

    1) Natural fuels that pose a threat to human life and property

    2) Unfunded activity fuel projects

    3) Areas where fuels/fire behavior is a threat to management area objectives

Following is a description of how each alternative meets these Forest Plan standards. Forest Plan standards 2d and 2e relate to wildfire suppression policy and requirements that are outside the scope of this project, and therefore compliance with these standards is not described. This project does not determine Forest Fuel Management expenditure priorities, so compliance with standard 2g is not addressed.

No-Action Alternative

The No-Action Alternative would not use prescribed fire to help meet the goals of the management areas within the Project Area. The alternative would not help develop cost-effective fire programs because it would allow far more intense potential fire behavior to exist in stands that, with treatment, would primarily exhibit low intensity, easily controlled fire behavior. Under the No-Action Alternative, severe fire effects, large wildfire management costs, and fire caused changes in values could reasonably be expected; these results could likely be prevented or lessened with action to treat forest fuels.

The No-Action Alternative would not take any preventative steps to protect human life and property within the Resource Area from an uncontrolled wildfire. The continued succession of fuels and vegetation, mortality from insects and disease, and the exclusion of fire would create areas where the trend in fire behavior characteristics would in time be inconsistent with the goals, objectives and standards established in the Forest Plan. No activity fuels would be created under the No-Action Alternative, so there is no need to treat activity fuels, which is consistent with the Forest Plan.

Proposed-Action Alternative

The Proposed-Action Alternative would use prescribed fire to help meet the goals of the management areas within the Resource Area, consistent with the Forest Plan. It would help develop cost-effective fire programs by making substantial progress toward reducing potential intensities of wildfire in areas affected by past fire suppression. By inference, the more area treated to restore and maintain stands toward historical species composition, the better the alternative meets the Forest Plan goals. The Proposed-Action Alternative would best meet the goals, objectives and standards of the Forest Plan because it would reduce the severity of fire effects, the costs of potential wildfire, and fire-caused changes in values on the most acres (3865 acres total). Treatments under the Proposed-Action Alternative would begin to trend stands away from potential fire behavior that could threaten human life and property in and near the resource area. The activity fuels created would be treated in a manner that is consistent with the standards of the Forest Plan.

3.3 Wildlife

Regulatory Framework

Regulatory direction applicable to the management of wildlife resources on the Idaho Panhandle National Forests (IPNF) include:

- The Endangered Species Act of 1973 (ESA), as amended
- Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA)
- National Forest Management Act of 1976 (NFMA)
- The Migratory Bird Treaty Act of 1918
- IPNF Forest Plan (USDA 1987), as amended
- Forest Service Manual (FSM) and Handbook (FSH) direction

Following is a summary of regulatory guidance and its relation to the management of wildlife species and habitats in the Idaho Panhandle National Forests.

Threatened, Endangered, and Proposed Species

The National Forest Management Act requires the Forest Service to "provide for a diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives" (NFMA Sec. 6[g][3][B]). Additional guidance is found in Forest Service Manual direction that states: "identify and prescribe measures to prevent adverse modification or destruction of critical habitat and other habitats essential for the conservation of endangered, threatened and proposed species" (FSM 2670.31 [6]). The IPNF Forest Plan provides additional direction to "manage vertebrate wildlife habitat to maintain viable populations" of wildlife and "to contribute to the conservation and recovery of listed species", in accordance with species recovery or management plans (USDA 1987).

In 2001 the U.S. Fish and Wildlife Service issued an Amended Biological Opinion for the existing Idaho Panhandle National Forests Management Plan. This Biological Opinion identified terms and conditions, which would be required to be implemented in order to meet the requirements of the Endangered Species Act (1973).

The ESA requires the Forest to assist in recovery of threatened, endangered, and proposed (TEP) species and the ecosystems upon which they depend. The Forest is required to consult with the US Fish and Wildlife Service if a proposed activity may affect the population or habitat of a listed species. The direction requires the Forest Service to complete biological assessments to document whether projects would likely have adverse effects on identified habitats or populations of threatened or endangered animals.

On April 9, 2008 the U.S. Fish and Wildlife Service provided the Priest Lake Ranger District with a listing of threatened and endangered species that may be present within the evaluation area (FWS Ref. #1-9-08-SP-0067). These species include woodland caribou (*Rangifer tarandus caribou*), Canada lynx (*Lynx canadensis*) and grizzly bear (*Ursus arctos*), as well as proposed critical habitat for Canada lynx. Although the gray wolf (*Canis lupus*) was removed from the endangered species list in March of 2008, a court ruling on July 18, 2008, imposed a preliminary injunction on the delisting, which reinstated its endangered status in areas north of Interstate 90.

Sensitive Species

The Forest Service Manual also directs the Regional Forester to identify sensitive species for each National Forest where species viability may be a concern. The direction requires the Forest Service to manage the habitat of the species listed in the Regional Sensitive Species List to prevent further declines in populations, which could lead to federal listing under the Endangered Species Act.

On October 28, 2004 the Regional Forester updated the sensitive species list for the Northern Region. Changes from the previous (1999) list include the addition of black swift (*Cypseloides niger*), pygmy nuthatch (*Sitta pygmaea*), and fringed myotis (*Myotis thysanodes*); and removal of black-backed woodpecker (*Picoides arcticus*), northern goshawk (*Accipiter gentilis*), white-headed woodpecker (*Picoides albolarvatus*), and northern leopard frog (*Rana pipiens*). In a letter dated March 31, 2005 the Regional Forester placed black-backed woodpecker and northern goshawk back on the list while further data collection and evaluation were ongoing. After further review, northern goshawk was removed from the R1 Sensitive Species list (letter dated July 17, 2007), although it remains on the list of IPNF Management Indicator Species (MIS). Having been removed from the list of threatened and endangered species, bald eagle was automatically placed on the Regional Sensitive Species List pending status review by the USFS.

Management Indicator Species and Other Wildlife

Management Indicator Species (MIS) are identified in the planning process and used to monitor effects of planned management activities on populations of wildlife and fish, including those that are socially or economically important. MIS relevant to the project area and the Priest Lake Ranger District are American marten, northern goshawk, pileated woodpecker, and white-tailed deer (Federally listed species are addressed separately).

Analysis Methods

Analysis Area

The analysis area for each species can differ due to habitat requirements and extent of effects. The cumulative effects analysis area is described for each species in the Cumulative Effects section.

Species Not Analyzed in Detail

A preliminary analysis was conducted for each potentially affected wildlife species and its habitat to determine the scope of project analysis. The species listed in the following table would not likely be affected by proposed activities: 1) they do not have suitable habitat or are not regularly present or expected to be in or near the project area; or 2) they are affected at a level that does not increase risk to the species, or effects can be adequately mitigated by altering the design of the project. For these reasons, these species were not analyzed in detail. Preliminary analysis information for species not analyzed in detail is located in the Appendix of this document.

Table 3-26. Species not analyzed in detail.

Species	***Rationale for Elimination from Detailed Analysis***	***Preferred Habitat***
Threatened and Endangered Species		
Woodland Caribou (*Rangifer tarandus caribou*)	Outside of Woodland Caribou Recovery Zone. No recent sightings of caribou near proposed activity areas.	Above 4,000 ft. in Engelmann spruce/subalpine fir and western red cedar/western hemlock forests.
Gray Wolf (*Canis lupus*)	No recent wolf pack activity documented within five miles of the project area.	Wide variety of habitats that are generally remote and isolated from human development. Adequate populations of prey species, often wintering concentrations of deer or elk.
Sensitive Species		
Bald Eagle (*Haliaeetus leucocephalus*)	Winter roosting or foraging habitat is present in the project area, but is buffered spatially.	Normally nest and forage near large bodies of water. Winter visitors and yearlong residents of northern Idaho.
American Peregrine Falcon *(Falco peregrinus anatum)*	No suitable habitat exists in the project area for this species.	Open habitats near cliffs and mountains. Nesting cliffs near an adequate prey base.
Black Swift *(Cypseloides niger)*	No impacts to suitable nesting habitat, streamflows or vegetative diversity.	Builds nest behind or next to waterfalls and wet cliffs.
Pygmy Nuthatch *(Sitta pygmaea)*	Suitable habitat is present in the project area for this species. Treated as a guild with flammulated owl.	Ponderosa pine habitat, especially mature and old growth stands.
Common Loon *(Gavia immmer)*	Suitable habitat is present in the project area for this species, but activity areas buffered spatially.	Large, clear lakes below 5,000 ft. in elevation with at least a partially forested shoreline.
Harlequin Duck *(Histrionicus histrionicus)*	Suitable habitat is present in the project area for this species, but activity areas buffered spatially.	Shallow, swift streams in forested areas.
Fringed Myotis *(Myotis thysanodes)*	Suitable habitat is present in the project area for this species. Treated as a guild with flammulated owl.	Caves, mines, and abandoned buildings, large snag habitat.
North American Wolverine *(Gulo gulo)*	No suitable maternal denning habitat within ½ mile of activity areas. No decrease in prey densities or increased access to remote areas.	Far-ranging omnivorous habitat generalist.
Northern Bog Lemming *(Synaptomys borealis)*	No suitable habitat exists in the project area for this species.	Bogs, fens and, wet alpine and sub-alpine meadows.
Coeur d'Alene Salamander *(Plethodon vandykei idahoensis)*	No suitable habitat in the project area for this species	Springs, seeps, spray zones.
Management Indicator Species		
American Marten *(Martes americana)*	Suitable habitat is present in the project area for this species. Treated as a guild with fisher.	Variable mature confer stands with canopy closures greater than 40 percent with abundant large, down woody debris.

Affected Environment

Introduction

Ecological disturbances (e.g. landslides, fire, insect and disease outbreaks) lay the foundation for landscape patterns and strongly influence wildlife populations. Disturbances that arise from natural processes or human actions can alter these landscape patterns and wildlife habitat, influencing wildlife abundance and composition. Wildlife species will occupy their preferred niche on the landscape, and move from place to place as forest structures change and different habitat conditions develop (Clark and Sampson 1995). Consequently, wildlife species will not necessarily persist indefinitely in areas where they are found today because of the dynamic and shifting environments in which they live.

In the absence of disturbance, vegetation follows a gradual and more predictable sequence of change called succession. As vegetation moves through each stage of succession, the composition of wildlife species shifts accordingly. Wildlife species have distinctive successional strategies. Some species are more suited to the early stages of forest succession where grasses, forbs and shrubs dominate the site, while others are better suited for the later stages of forest development (e.g. old growth). Other species are habitat generalists and have adapted to a wide array of vegetation patterns.

Characterization of Habitats

The distribution and abundance of wildlife is primarily a function of habitat conditions (i.e., vegetation type and successional stage). These conditions reflect inherent fixed attributes (as depicted in the description of capable habitat below) as well as disturbance (fire, windthrow, landslide, and insect outbreaks) types and frequencies. In addition to altering habitat due to direct impacts (timber harvest), humans can alter habitat indirectly by influencing natural disturbance patterns. For example, fire suppression results in changes in vegetation composition and structure and subsequent susceptibility to various natural disturbances.

As discussed in the Vegetation Section (Chapter 3), wildfires along with tree harvesting and insect/disease infestations (white pine blister rust in particular) have been the major disturbances shaping wildlife habitat in the Lakeview-Reeder project area. In the absence of periodic, low severity fire, some of the area has been converted from relatively open ponderosa pine/Douglas-fir-dominated stands to denser stands dominated by young Douglas-fir and grand fir trees.

Methodology

The Council on Environmental Quality (40 CFR 1502.2) directs that impacts be discussed in proportion to their significance. Some wildlife require a detailed analysis/discussion to determine effects on a particular species. Others may not be impacted, impacted at a level that is inconsequential, or adequately mitigated through the design of the project. Generally, these elements do not require a detailed discussion and analysis.

The appropriate methodology and level of analysis needed to determine potential effects are influenced by a number of variables including presence of species or habitat, the scope and nature of the activities associated with the proposed action and alternatives, and risk factors that could ultimately result in a meaningful adverse or favorable effect. The screening process tiered to the following documents and used a variety of information including scientific literature, resource inventories, and sighting records:

- Integrated Scientific Assessment for Ecosystem Management in the Interior Columbia Basin
- Idaho Panhandle National Forests Land and Resource Management Plan
- Available Conservation Assessments and Strategies for wildlife species

Species Habitats and Requirements

This section describes the status and distribution of wildlife species analyzed in detail that have been identified as species of concern within the project area and could potentially be affected by proposed activities. It also describes the environmental baseline and relevant habitat components that may or may not be affected by the alternatives. Information presented in this section is based on scientific literature, wildlife databases, professional judgment, recent field surveys, and habitat evaluations.

The resource information provided, especially as it relates to habitat analysis, includes past actions (timber harvesting and road building) that have influenced vegetative changes to what is now part of the existing or baseline condition. For example, the characterization of forest structure from a past regeneration harvest would acknowledge changes that have occurred over the past 30 years, from stand initiation to a mid-seral stage of succession.

An important concept in the condition descriptions and analysis is the difference between capable habitat and suitable habitat. The following definitions are helpful in distinguishing between these two terms and the concepts they are based on:

Capable habitat refers to the inherent potential of a site to produce essential habitat requirements of a species. The vegetative structure and composition on the site may not currently provide the necessary attributes to support a species such as stand age, cover type or stand density, but it has the fixed attributes that would enable it to provide those variables under appropriate conditions. Some examples of fixed attributes are slope, aspect, soil or elevation.

Suitable habitat refers to wildlife habitat that currently has both the fixed and variable stand attributes for a given species' habitat requirements. Variable attributes change over time and may include stand age, cover type, stand density, tree size, or canopy cover.

The IPNF has developed Forest-wide wildlife habitat capability/suitability models, which utilize Timber Stand Management Record System (TSMRS) data, for five Threatened, Sensitive, and MIS wildlife species or species guilds (Canada lynx, flammulated owl/pygmy nuthatch/fringed myotis, fisher/American marten, northern goshawk, and white-tailed deer critical mid-winter range). In order to validate these models, Forest Service personnel conducted site visits of representative capable habitat for these species, with emphasis placed on stands modeled as “currently suitable.” (project file) Any proposed treatment areas that included suitable habitat for one or more species addressed in the model were visited. Capable habitat is determined by habitat type and topographic factors. Since these do not change over time, TSMRS data presumably offer reliable information on habitat capability.

Species Analyzed in Detail

Threatened and Endangered Species

The following table summarizes Threatened and Endangered wildlife species analyzed in detail, the rationale for analysis, and a description of their habitats.

Table 3-27. Threatened and endangered species analyzed in detail

Species	*Rationale for Detailed Analysis*	*Preferred Habitat*
Canada Lynx *(Lynx canadensis*)	Part of project area lies within established Lynx Analysis Unit. Lynx habitat affected. Project area also contains proposed critical habitat.	Higher elevation lodgepole pine and spruce/ fir forests with adequate prey base of snowshoe hares, its primary food.
Grizzly Bear (*Ursus arctos horribilis*)	Project area is within Kalispell-Granite and Lakeshore bear management units and includes area outside of recovery area which receives regular use by grizzly bears	Habitat generalist. Denning areas isolated and remote from human development.

Canada Lynx

Canada lynx is one of the three species of wild cats that occur in the temperate forests of North America. They occur in boreal, sub-boreal and western montane forests and are uncommon or absent from the wet coastal forests of North America. Distribution of lynx is nearly coincident with that of the snowshoe hare, its primary prey. Both snow conditions and vegetation types are important factors to consider in defining lynx habitat. Lynx habitat quality is believed to be lower in the southern periphery of its range. Landscapes are more heterogeneous in terms of topography, climate, and vegetation (Ruediger et al. 2000).

Lynx habitat consists primarily of two structurally different forest types occurring at opposite ends of the stand age gradient, although they also use other habitats. Lynx require early successional forests that contain high numbers of prey (mainly snowshoe hare) for foraging; and late-successional forests that contain cover (especially deadfalls) for kittens and for denning (Koehler and Aubrey 1994). The highest use occurs when these are in close proximity. Like most wild cats, lynx require cover for security and stalking prey and avoid large open areas. Although lynx may cross openings less than 100 meters in width, they generally do not hunt in these areas (Koehler and Aubrey 1994). In north-central Washington, lynx used areas with gentle slopes (less than 10 percent) in winter (McKelvey et al. 2000); and in the southern Rocky Mountains, used moderate to gentle slopes (less than 40 percent) (Apps 2000). In northern Idaho and northwestern Montana, lynx generally occur in moist, cold habitat types above 4,000 feet elevation.

Reference Condition

The Canada lynx was listed as Threatened on March 21, 2000. Lynx populations in Alaska and most of Canada are generally considered stable to slightly dropping. The conservation of lynx populations is the greatest concern in the western mountains of the United States of the peninsular and disjunct distribution of suitable habitat at the southern periphery of the species' range. Both historic and recent lynx records are scarce, which makes identifying range reductions and determining the historical distribution of stable populations difficult (Koehler and Aubrey 1994).

Identified risk factors that can impact lynx populations mainly address alteration of forest habitats. Upon listing, lynx habitat management on Federal lands was guided by the Canada Lynx Conservation Assessment and Strategy (LCAS) (Ruediger et al. 2000). The LCAS directed agencies to delineate Lynx Analysis Units (LAUs) to evaluate and analyze effects of planned and on-going projects on lynx and their habitat, and addressed these risk factors. In order to assure a consistent and effective approach to Canada lynx conservation on Federal lands within the United States, the LCAS provided guidelines for management within identified lynx habitat. However, the IPNF has since adopted the Northern Rockies Lynx Management Direction (NRLMD) (USDA 2007a), which provides lynx management standards and guidelines based on new information. Additionally, the IPNF has remapped lynx habitat on the Forest and subsequently redelineated LAU boundaries.

At the time of Federal listing, Canada lynx primary habitat in North Idaho was broadly characterized to include areas with site potential to produce subalpine fir, mountain hemlock, western hemlock, cedar and moist grand fir climax habitats. Dry forest communities (ponderosa pine and Douglas-fir habitat types) and upper subalpine habitat types (alpine larch and whitebark pine cover types) were considered non-lynx habitat. As the available knowledge of lynx habitat requirements has increased, primary habitat in North Idaho has been more narrowly defined to include only subalpine fir/Engelmann spruce habitats (except on the Priest Lake RD, where moist cedar-hemlock is also considered primary vegetation); with cool/moist habitat types adjacent to primary habitat creating a transition between lynx habitat and non-lynx habitat. The distance agreed upon by the IPNF and the Canada Lynx Biology Team for this transition zone is generally limited to secondary habitat within 200 meters of primary habitat.

To more accurately delineate lynx habitat, the IPNF uses a combination of habitat type data from stand examinations and a vegetation response unit (VRU) model, which incorporates other factors such as soils, hydrologic function, landform, etc. and is a more accurate method of classifying the potential natural vegetation.

Based on additional research and analysis, several standards for vegetation projects from the LCAS were modified, changed to guidelines, or dropped entirely for the NRLMD. However, two vegetation management standards remain essentially the same: 1) if more than 30 percent of the lynx habitat in a LAU is currently in a stand initiation structural stage that does not yet provide winter snowshoe hare habitat (formerly called “unsuitable”), no additional habitat may be regenerated by vegetation management projects, and 2) timber management projects shall not regenerate more than 15 percent of lynx habitat on National Forest System lands within a LAU in a ten year period (there are small exceptions to both of these standards for fuels treatment projects within the wildland/urban interface). Additionally, recent research has stressed the importance of multi-storied mature or late-successional forests to snowshoe hare populations. As a result, vegetation management projects that reduce snowshoe hare habitat in these stands are prohibited, with the exception of fuels treatment projects within the wildland/urban interface. Outside of the wildland/urban interface, precommercial thinning of lynx habitat is only allowed under narrow circumstances. Finally, the LCAS standards regarding protection of denning habitat were changed to a guideline based on the general consensus of lynx researchers that denning habitat, in most cases, is not limiting in lynx habitat.

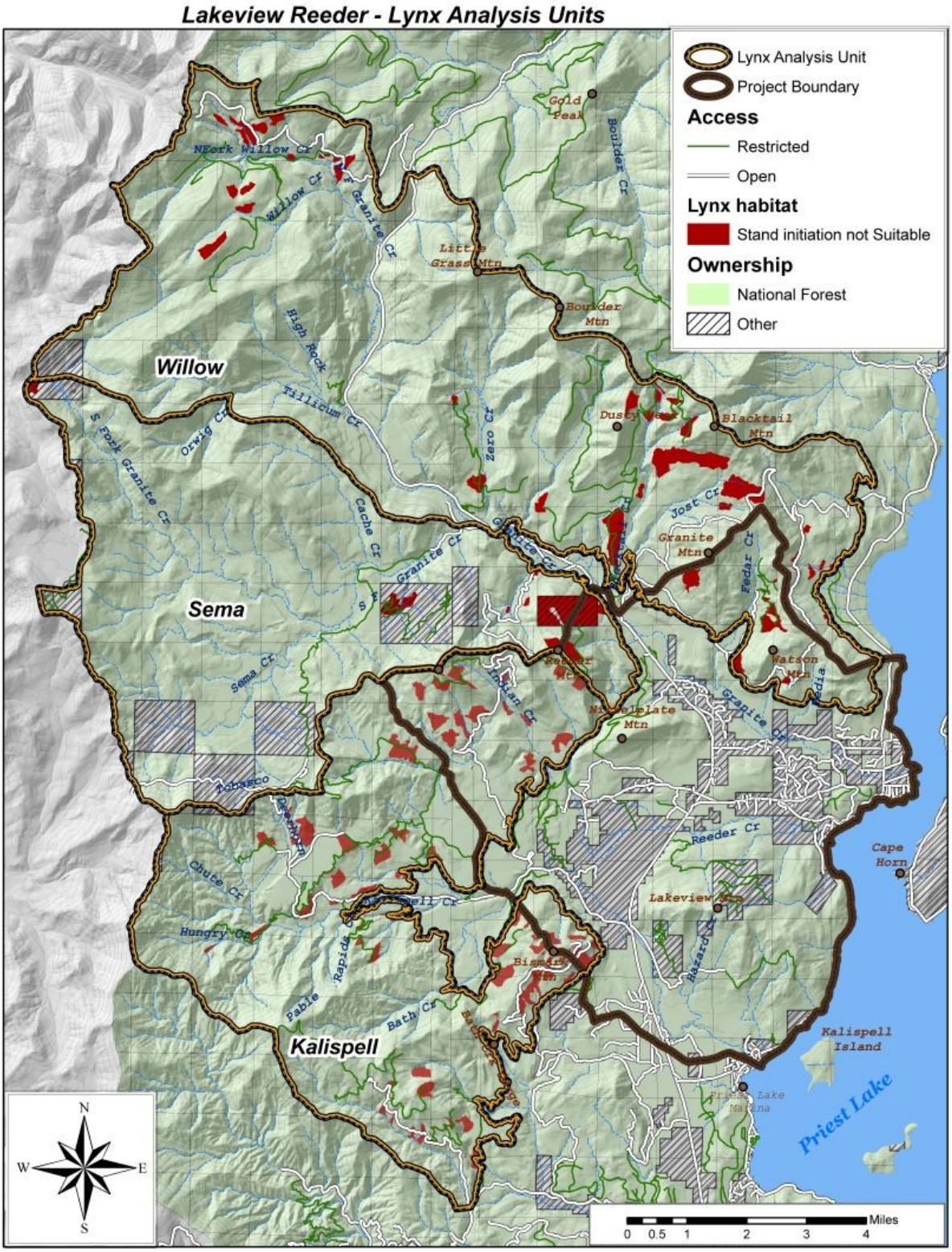
Existing Condition

The IPNF has remapped LAU boundaries based on Lynx Biology Team recommendation for size and elevation. The Lakeview-Reeder project was partly within the Blacktail, Willow, Sema and Kalispell LAUs, but the Blacktail LAU did not meet recommendations for either size (~10,000 acres) or amount of primary habitat (~5,000 acres) after remapping. As a result, lynx habitat in this LAU was absorbed into the Hemlock and Willow LAUs, both of which now meet mapping criteria and are roughly equivalent in size (24,300 acres, 18,967 acres primary habitat).

The IPNF has completed an initial habitat suitability model to predict the amount of lynx habitat present in the project area (Lynx _ project file). As this model was refined and the output verified through aerial photo inspection and field reviews, the acreages were changed to better reflect known conditions. The Kalispell LAU contains approximately 24,734 acres of lynx habitat, with approximately 22,892 acres having the site potential to produce lynx habitat. Within this LAU, 1,717 acres (7.5 percent) are in the stand initiation stage which does not yet provide quality snowshoe hare habitat. The Willow LAU contains approximately 37,068 acres of lynx habitat, with approximately 32,534 acres having the site potential to produce lynx habitat. Within this LAU, 1,235 acres (4 percent) are in the stand initiation stage which does not yet provide quality snowshoe hare habitat. The Sema LAU contains approximately 23,883 acres of lynx habitat, with approximately 19,148 acres having the site potential to produce lynx habitat. Within this LAU, 107 acres (0.5 percent) are in the stand initiation stage which does not yet provide

quality snowshoe hare habitat. Conversely, recently harvested units may require more than 15-20 years before they provide winter snowshoe hare habitat. Potential denning habitat seems to be abundant and well-distributed throughout the LAU.

Figure 3-32. Map of Sema, Kalispell and Willow LAUs within the project area displaying lynx habitat.



Grizzly Bear

Populations of grizzly bears persist in those areas where large expanses of relatively secure habitat exist and where human-caused mortality is low. Grizzly bears are considered habitat generalists, using a broad spectrum of habitats. Use patterns are usually dictated by food distribution and availability combined with a secure environment. Grizzlies commonly choose low elevation riparian areas and wet meadows during the spring and generally are found at higher elevation meadows, ridges, and open brush fields during the summer (Volsen 1994).

Reference Condition

The grizzly bear was listed as Threatened in 1975. It was originally distributed in various habitats throughout western North America. Today, it is confined to less than two percent of its former range and is represented in five or six population centers south of Canada, including the Selkirk Ecosystem which is located in northeastern Washington, northern Idaho and northwestern Montana. Habitat loss and direct and indirect human-caused mortality are related to its decline (USDI 1993).

Grizzly bear numbers are currently estimated at 46 animals in the Selkirk Ecosystem (USDI 2001). Although population trend analyses for this ecosystem have been inconclusive, local biologists consider the Selkirk population to be on the increase based on reported bear sightings, number of sows with twins or triplets, and sightings in areas not previously known to be used by grizzly bears (Wakkinen, pers. comm., 2008). Historic reference of grizzly bear populations within the Selkirks was first noted in accounts written by Kockman (1910), although no reference to population size was noted. Further reference by a naturalist, Merriam (1933), noted that the Priest Lake area was one of the last great strongholds for grizzly bears within the State of Idaho.

In the Grizzly Bear Recovery Plan (USDI 1993), the most important element in grizzly bear recovery is securing adequate effective habitat. This is a reflection of an area's ability to support grizzly bears based on the quality of the habitat and the type/amount of human disturbance imposed on the area. Controlling and directing motorized access is one of the most important tools in achieving habitat effectiveness and managing grizzly bear recovery (USDI 1993). By controlling motorized access, certain objectives can be achieved including minimizing human interactions and potential grizzly bear mortality, reducing displacement from important habitats, and minimizing habituation to humans.

The Idaho Panhandle National Forests Plan (USFS 1987) directs that grizzly bear management emphasize maintaining adequate security while providing seasonal habitat components. The Forest Plan specifies that management for grizzly bear recovery achieve a minimum of 70 square miles of security habitat, or other established threshold within each bear management unit. This is based on a bear management unit of approximately 100 square miles in size (Christensen, 1982). The proportion of security habitat that would be maintained within Kalispell-Granite bear management unit was established at 70 percent as apposed to 70 square miles of the larger size of this bear management unit (USFS 1995).

Both the Kalispell-Granite and Lakeshore bear management units were added to the existing recovery area in 1993 as documented within the revised grizzly bear recovery plan (USFWS 1993). In 1995, a management plan was developed for the Kalispell-Granite bear management unit, which outlined a strategy when implemented would achieve forest plan standards for grizzly bear security habitat. This plan was implemented in 1995 and completed in 1996.

When the Lakeshore bear management unit (BMU) was delineated, it was recognized as atypical since it is significantly smaller than most other BMUs. This bear management unit was originally designed to serve as a buffer between adjacent bear management units to the west and the high human use areas along Priest Lake to the east. When it was established, the Lakeshore bear management unit was designated as part IGBC management situation (MS) 2 and part MS 3 grizzly bear habitat. Approximately 5,900 acres

of this 17, 300 acres bear management units has been designated as MS 3 habitat whereas as the balance is designated as MS 2 grizzly bear habitat. The entire Kalispell-Granite BMU is designated entirely as IGBC management situation 1 grizzly bear habitat.

The management direction for the different designations is summarized as follows.

- MS1 areas are to be managed for grizzly bear maintenance and improvement and the minimization of grizzly-human conflict. Management decision will favor the needs of the grizzly bears when grizzly bear habitat and other land use values compete.
- MS2 areas are where grizzly bear are important but not necessarily the primary use of the area. In some cases, habitat maintenance and improvement may be important management considerations. Minimization of grizzly bear-human conflict potential is a high management priority.
- MS3 areas are where grizzly bear-human conflict minimization is a high priority management consideration. Grizzly bear presence and factors contributing to their presence will be actively discouraged.

A full description of the management situation guidelines and conflict resolution standards may be found in the interagency Grizzly Bear Guidelines (Interagency Grizzly Bear committee 1986).

Based upon the best available science identified within the amended biological opinion to the forest plan (USFWS 2001) terms and conditions were established based on research conducted by Wakkinen and Kassworn (1999). These terms and conditions apply to all BMUs within the Selkirk and Cabinet-Yaak ecosystem. The terms and conditions require that each BMU achieve 55 percent of the BMU core habitat, with no more than 33 percent of the BMU having an open road density greater that 1 mile per square mile; and no more the 26 percent of the BMU with a total open and restricted road density greater than 2 miles per square miles. These terms and conditions were to be achieved by 2007 (USFWS 2001). It was noted in the amended biological opinion (USFWS 2001) that the Lakeshore BMU, although important for grizzly bear recovery serves primarily as a buffer from human activities along Priest Lake.

The Amended Biological Opinion for the Continued Implementation of the Idaho Panhandle National Forests Land and Resource Management Plan (from here forward referenced as the “2001 Biological Opinion”; USDI Fish and Wildlife Service 2001), provided a strategy for minimizing these risks by setting uniform standards for open motorized road density (OMRD), total motorized road density (TMRD) and core habitat within each bear management unit. In 2002, the IPNF produced a forest plan amendment regarding access management within BMUs that revised the standards for core, OMRD and TMRD to implement BMU-specific standards (USDA Forest Service 2002). Based on the specific characteristics of each BMU, in most cases, these standards set a higher standard than those required by the 2001 Biological Opinion. But, due to litigation, the 2002 Forest Plan Motorized Access Amendment is no longer in place.

The IPNF is currently working on a Supplemental Forest Plan Motorized Access Amendment and after its completion, along with the subsequent Biological Opinion from the Fish and Wildlife Service, the standards are expected to be the same, if not more stringent, than those required by the 2002 Forest Plan Motorized Access Amendment. Therefore, while the Forest Service is currently only required to meet the BMU standards of the 2001 Biological Opinion, the IPNF will continue to work toward meeting the standards contained in the 2002 Forest Plan Motorized Access Amendment and the Draft Supplemental Forest Plan Motorized Access Amendment because it affords greater protection for grizzly bears than the standards and guidelines set by previous documents. As a result, it will trend the affected BMUs towards compliance with the likely minimum standards that will be in place upon completion of the Final Supplemental Forest Plan Motorized Access Amendment and associated Biological Opinion.

Existing Condition

The Lakeview-Reeder project area is entirely within a landscape which is extremely important to grizzly bear recovery efforts within the Selkirk Ecosystem. A portion of the project area is within the designated Selkirk Mountain grizzly bear recovery area and a portion outside of the recovery area. The portion of the project area that is within the recovery area is within the Kalispell-Granite and Lakeshore bear management units. The Kalispell-Granite and Lakeshore bear management units are 2 of the 10 grizzly bear managements within the United States portion of this grizzly bear recovery area.

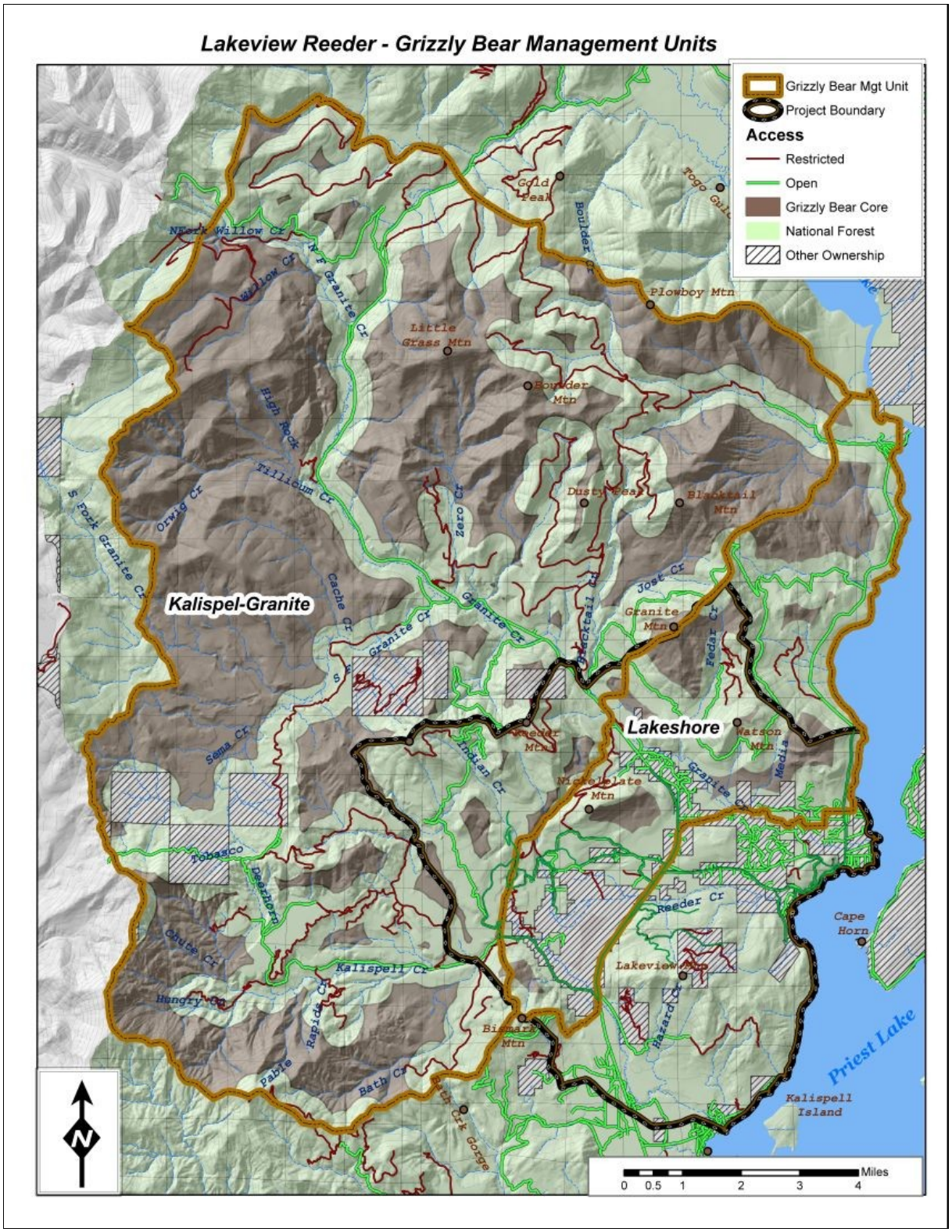
Status

Grizzly bear use within the project area has increased measurably in the past decade. The first documentation of grizzly bear occurrence within the project area was in the early 1980s in and around Bismark Meadows, although it is very likely that grizzly bear use of this area has a longer history. This first report was of an adult grizzly bear feeding on pet food at a residence that was left outdoors. In 1983 when the first grizzly bear in this ecosystem, an adult female, was captured and radio-collared, the Bismark Meadows area was found to be important for this bear as each year she and her cubs frequented this area especially during the spring season. Throughout the1990s reports and documentation of grizzly bears within the Bismark Meadow area persisted. Within the last decade and especially within the past several years, grizzly bear use of the project area has increased considerably and the current thinking is that grizzly bear use of this area is not confined to the spring season. From reports and documented occurrences, it is estimated that as many as 12 different grizzly bears utilized key habitat areas, including Bismark meadows and Granite Creek in 2007, although many of the reports remain unverified.

Grizzly bear mortality remains one of the primary obstacles to achieving recovery within this ecosystem. A total of 53 grizzly bear deaths have been documented within this ecosystem since 1983, with 43 mortalities attributed to humans. Of the 43 human caused grizzly bear mortalities, 10 were management removals directly associated with food conditioned bears. Food conditioning is terminology to describe when a bear becomes habituated to human or unnatural foods such as pet food, wild animal feed, human foods or trash.

Within the project area the food conditioning of grizzly bears and sanitation related instances represents a significant source of both direct and indirect mortality for grizzly bears within this ecosystem. Since late 1980's, more than twenty sanitation related instances of grizzly bears are known to have occurred within the project area, with one grizzly having to be removed form the population via lethal method by Idaho Department of Fish and Game in 2007. Three other grizzly bear are known to have become food conditioned and habituated to humans (loosing natural fear of humans) within the project area. One of these bears was illegally killed as it was returning to the project area after being relocated 25 miles to the north. The other bear is presumed dead after returning to areas where the bear originally gained easy access to human foods. Examples of sanitation instances involving grizzly bears include, grizzly bear feeding at big game feeders, birdfeeders, grizzly bears feeding on clover plantings, big game feed in the form of alfalfa hay, improperly stored trash, open dumpsters and trash cans and human foods left outside and available to bears.

Figure 3-33. Map Kalispell-Granite and Lakeshore bear managements units and the Lakeview Reeder project area displaying grizzly bear core habitat along with open and restricted roads.



Security Habitat

The management of security habitat is perhaps one of the most important aspects of management for grizzly bears (Kassworm and Manley, 1989). Security habitat allows for sufficient space for grizzly bears to roam and allows for effective use of available habitats. By definition, security habitat is an area or space outside or beyond the influence of high levels of human activity. Open roads, timber harvest and high-use recreational features such as trails or camps are examples of activities that result in displacement of bears, reducing the amount of security habitat that is available. To calculate security habitat all open roads, timber harvest activities, high use recreational features are buffered by one-quarter miles. Habitat outside of the buffer is considered security habitat.

The existing direction for grizzly bear habitat management is based on a minimum of 70 square miles of security habitat or other established threshold within each grizzly bear management unit. The 70 square mile management standard was developed from the Cumulative Effects Analysis process outlined by Christensen (1982). This process was adopted by the Idaho Panhandle National Forests during development of the Forest Plan (I.P.N.F. Appendix U, 1987). The process is based on data on the mean home range of 13 adult female grizzly bears greater than 5 years of age. The average home range was determined to be approximately 100 square miles in size. This Grizzly Bear Management Unit measure was felt to represent a viable home range that would meet the spatial needs of a resident female grizzly bear. Identifying a suitable smaller area within the bear unit that would meet the minimal spatial and other needs of an adult female grizzly bear defined the lower limit of a viable home range. This lower limit was established at 70 square miles based on: 70 square miles matched the average home range size for six adult females in the North Fork Flathead drainage and also on professional judgment. The average home range for adult females in the Northern Continental Divide Ecosystem is 72 square miles. Minimum security habitat standards for the Kalispell-Granite Grizzly Bear Management Unit were established at 70 percent of the GBMU (U.S.F.S., 1995).

Security habitat within the Kalispell-Granite BMU currently is managed at 82.43 percent of the bear management unit during the spring season, 76.36 percent during the summer season and 81.92 percent during the fall season. The seasonal variation in the proportion of the bear management units that is within security habitat is a result in the seasonal closures of the FR1341, FR401 and FR1015 road systems. The seasonal closures within this bear management unit are to provide additional security habitat during the critical spring season and to reduce the potential for human caused mortality during the fall hunting seasons.

Security habitat within the Lakeshore bear management unit is currently managed at 37.82 percent within the spring and fall seasons and at 34.82 percent during the summer season. Similar to the Kalispell-Granite BMU the seasonal closures provide additional security habitat during the critical spring season and reduce the potential for human caused mortality during the fall hunting seasons.

Core Habitats

Grizzly bear avoidance of roads and their resulting displacement from nearby habitats has been well documented (Aune and Stivers 1985, McLellan and Mace 1985, Kasworm and Manley 1988, McLellan and Shackleton 1988, Aune and Kasworm 1989, and Fredrick 1991). Recent research has indicated that open road densities such as security habitat calculations alone are not a complete measure of the effects of motorized access on grizzly bear habitat use, since grizzly bears tend to avoid closed roads as well as open roads (Mace et al. 1999, Mace et al. 1996, and Mace and Manley 1993). Preliminary results from studies show that grizzly bear use of an area declines as total road densities (open and closed roads) exceed two miles per square mile and open road densities exceed one mile per square mile (Mace and Manley 1993). In addition, if roads are located in or next to key habitat components such as riparian areas, snow chutes and shrub fields, important resources within these areas are unused by bears of their avoidance behavior, resulting in significant habitat loss.

Wakkinen and Kassworm (1997) found that grizzly bears in the Selkirk and Cabinet-Yaak ecosystem (1) used areas having total road densities greater than two miles per square miles less than expected; (2) used areas having open road densities greater than one miles per square miles less than expected; and (3) used core habitat more than expected, while non-core habitat was used less than expected. Wakkinen and Kassworm found that within six female grizzly bear home ranges: (1) the amount of area having a total road density greater than two miles per square mile averaged 26 percent; (2) the amount of area having a open road density greater than one mile per square mile averaged 33 percent; and (3) the home ranges were comprised of an average 55 percent (range 40 to 71.5 percent) core habitat. The authors did not determine if bears selected home ranges with fewer roads relative to road densities across the entire ecosystem (i.e. second order selection) because a complete access route map for the entire ecosystem was not available during the study period. Instead they determined bear use of areas greater or lesser than expected within existing home ranges relative to access route density (third order selection). The above reference orders are referred to as first and second order, respectively, in Walkinen and Kassworm (1997).

Core habitats are defined as areas of secure habitat within the bear management unit that contain no motorized travel routes or high use non-motorized trails during the non-denning season (April 1 to November 15) and are more than .3 miles (500 meters) from a drivable road. These areas are an important component for adult female grizzly bears that have successfully reared and weaned offspring (IGBC, 1994).

When the Kalispell-Granite bear management unit was first evaluated in 1995, only 31 percent of the bear management unit met the definition of core habitat for grizzly bears. As part of the implementation of this the Kalispell-Granite Grizzly Bear Access Environmental Assessment (USFS 1995), core habitat was increased to 39 percent of the BMU. Between 1995 and present, various road decommissioning and road obliteration projects have increased core habitat to its current level of 48 percent of the bear management unit.

Seasonal Habitats

Grizzly bear avoidance of roads and their resulting displacement from nearby habitats has been well documented (Aune and Stivers 1985, McLellan and Mace 1985, Kasworm and Manley 1988, McLellan and Shackleton 1988, Aune and Kasworm 1989, and Fredrick 1991). Recent research has indicated that open road densities such as security habitat calculations alone are not a complete measure of the effects of motorized access on grizzly bear habitat use, since grizzly bears tend to avoid closed roads as well as open roads (Mace et al. 1999, Mace et al. 1996, and Mace and Manley 1993). Preliminary results from studies show that grizzly bear use of an area declines as total road densities (open and closed roads) exceed two miles per square mile and open road densities exceed one mile per square mile (Mace and Manley 1993). In addition, if roads are located in or next to key habitat components such as riparian areas, snow chutes and shrub fields, important resources within these areas are unused by bears of their avoidance behavior, resulting in significant habitat loss.

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Table 3-28. Grizzly bear habitats (spring, summer, fall) within the Kalispell-Granite and Lakeshore bear management units.

Habitat	*Kalispell- Granite BMU*		*Lakeshore BMU*	
	Within BMU (acres)	*Within Core (acres)*	*Within BMU (acres)*	*Within Core (acres)*
Spring	11,907 (14%)	4,385 (10%)	4,679 (26%)	637 (19%)
Summer	13,799 (16%)	4,168 (10%)	2912 (16%)	438 (13%)
Fall	59,935 (70%)	34,120 (80%)	10,377 (58%)	2,346 (69%)
total	**85,641**	**42,673**	**17,968**	**3,421**

Sensitive Species

The following table summarizes Sensitive wildlife species analyzed in detail, the rationale for analysis, and a description of their habitats.

Table 3-29. Sensitive species analyzed in detail.

Species	*Rationale for Detailed Analysis*	*Preferred Habitat*
Black-backed woodpecker (*Picoides arcticus*)	Habitat is present and potentially impacted in the project area.	Early post-fire or insect-infested forest stands. High densities of small-diameter snags.
Flammulated Owl (*Otus flammeolus*)	Suitable habitat is present and potentially impacted in the project area.	Mature or old growth ponderosa pine, Douglas-fir forest.
Fisher (*Martes pennanti*)	Suitable denning and foraging habitat in the project area and potentially affected.	Mesic mature forest habitats
Townsend's Big-eared Bat (*Corynorhinus townsendii*)	Suitable habitat (e.g. roosting, maternity, hibernation) is present within the project area for this species. Will be buffer spatially.	Caves, mines, and abandoned buildings.
Western Toad (*Bufo boreas*)	Terrestrial and breeding habitat present within the project area.	Adults occur in a variety of uplands. Breed in shallow ponds, lakes, or slow moving streams.

Black-backed Woodpecker

The black-backed woodpecker occurs in montane and pine forests, where it is confined mostly to burned areas (Montana Partners in Flight 2000). In the absence of burns, this woodpecker will forage in areas with diseased trees (Hillis et al. 2002). Black-backed woodpeckers tend to flourish in early post-fire (3-5

years) habitat (Hutto 1995). They are uncommon residents of coniferous forests year-round – naturally occurring at low population levels. Following fire or insect and disease outbreaks that increase populations of wood-boring insects, they experience local population increases and temporary range extensions. Fire suppression and post-fire logging reduce habitat for black-backed woodpeckers by reducing the availability of burned areas and snags (Hutto 1995). In addition to the presence of recently burned areas, key habitat factors for black-backed woodpeckers include the presence of snags and diseased trees for foraging.

This woodpecker nests in a variety of forest types, especially lodgepole pine and western larch. It excavates a nest cavity in a live or dead tree which typically has heart rot or other decay. Unlike most other woodpeckers, this species uses relatively small, hard snags (Saab and Dudley 1997). Nest trees can be as small as 5 inches dbh, and nest selection does not appear to be limited by overstory canopy closure. Research in Oregon found that black-backed woodpeckers' nest sites were located in habitats with more snags per acre than other woodpecker species (Bull et al. 1986), and it is possible that this species requires higher snag densities than other woodpeckers. Black-backed woodpeckers in this study selected pine and western larch nest trees that were less than 20 inches in diameter and were recently (< 5 years) dead for nesting (Bull et al. 1986).

Reference Condition

Historically, ecosystems in north Idaho were shaped by disturbance patterns that altered the size and distribution of forest structures across the landscape. Wildfire, wind damage, insects and disease, and forest succession created snags in areas that ranged in size from individual trees or small patches, to entire drainages (1,000 acres or larger). Consequently, snag densities would vary across the landscape, from areas with low levels of snags to other areas with abundant snags. In the latter case, densities of black-backed woodpeckers temporarily increased in response to an enhanced foraging and nesting opportunities. In western Montana, black-backed woodpeckers are found to be most abundant in recent stand-replacing burns. In far northern Idaho large burns have been mostly absent for the last 40 years, so black-backed woodpeckers are found instead amid bark beetle outbreaks, although at lower densities (Hillis et al. 2002).

During the last century, fire suppression and timber harvest have altered the temporal and spatial distribution of prime black-backed woodpecker habitat. Large wildfires are less frequent and timber harvest often removes trees which are dead, dying or infested with insects. In addition, firewood cutting along open roads can result in a lack of appreciable densities of snags along these corridors. Conversely, fire suppression has resulted in a sharp increase of smaller diameter trees and subsequent small-diameter snag recruitment.

Existing Condition

Suitable black-backed woodpecker habitat exists within the project area as a result a small-scale insect infestations and other tree mortality. There are no recently burned areas of any size in the Lakeview-Reeder project area, although wildfires, which burned within the last several decades likely, provide expanses of suitable habitat within the Priest Lake drainage. While surveys for black-backed woodpeckers have not been conducted within the project area, three reports have been documented within the project area and 5 reports have been documented within the Kalispell and Granite Creek drainages immediately adjacent to the project area.

Flammulated Owl

Flammulated owls are seasonal migrants to northern latitudes during the spring and summer. Primary nesting habitat is comprised of the older forests dominated by ponderosa pine and Douglas-fir with 35-65 percent overstory canopy closure (Goggans 1986, Howie and Ritcey 1987, Reynolds and Linkhart 1992). Reynolds and Linkhart (1992) reported that all published North American records of nesting, except one,

came from forests in which ponderosa pine trees were at least present, if not dominant, in the stand. Flammulated owls depend on pileated woodpeckers and flickers to excavate the cavities in which they nest. Their nest trees are at least 14 inches in diameter (McCallum 1994). Although nesting habitat is thought to be more limiting on the landscape, the flammulated owl's preference for the ponderosa pine/Douglas-fir cover type can also be linked to food availability. Reynolds and Linkhart (1992) noted a stronger correlation between prey availability and this cover type than with other common western conifer cover types.

Flammulated owls appear tolerant of some human disturbances (Hayward and Verner 1994). This species has been known to nest in campgrounds and other areas of human activity with no apparent adverse effects.

Reference Condition

Based on vegetation estimates, ponderosa pine once comprised 9.1 percent of the National Forest lands within the Priest River sub-basin, where the Lakeview-Reeder project is located. Today, only 1.5 percent of the Priest River sub-basin consists of sites that are predominately ponderosa pine (draft NZ Geographic Assessment). This is an 84 percent decrease over time.

Primary factors that have contributed to the loss of older ponderosa pine/Douglas-fir forests include fire suppression and forest management. Fire suppression has led to the advancing succession of species such as Douglas-fir and grand fir that crowd out ponderosa pine. In addition, dry, open-grown forests of ponderosa pine and Douglas-fir were common at lower elevations in areas suitable for human settlement. These areas experienced intensive timber harvest, and the resulting access increased harvest of large snags by firewood cutters.

Existing Condition

Historically, it is estimated that ponderosa pine was the major species on about 15 percent of the analysis area, or about 1,370 acres. Currently, ponderosa pine is the primary species on less than 1 percent (<3 acres) of the forested acres in the area (Chapter 3 – “Forest Composition”). Less than 10 percent of the NFS lands in the Lakeview-Reeder project area represent drier forest habitats associated with flammulated owls. These drier habitats are able to produce older, single strata ponderosa pine/Douglas-fir communities, which in turn provide the necessary habitat attributes for flammulated owls.

Within the project area, approximately 84 percent of the capable habitat is on National Forest System lands, whereas the remainder is found on private lands within the project area. The IPNF has completed a habitat suitability model to predict the amount of flammulated owl nesting habitat present within the project area. National Forest lands within the analysis area encompass approximately 29,400acres. Of these, 2,758 acres are classified as capable habitat for the flammulated owl, with 176 acres modeled as suitable. Only a small portion of the capable flammulated owl habitat is currently unsuitable due to past timber harvest. Historically fire has impact much of the suitable and capable habitat within the planning area

Thirteen surveys for flammulated owls have been conducted within and adjacent to the project area since 1992, with the most recent survey conducted in 2006. Surveys targeted mapped capable and suitable habitat for flammulated owls and also included adjacent habitat that is considered as non-capable. Only one response from a flammulated owl was recorded within the Watson mountain area in 1992. Subsequent surveys in following years failed to detect the presence of flammulated owls within the project area.

Fisher

Fishers are low density forest carnivores, occurring most commonly in landscapes dominated by late-successional forests with high cover, especially in riparian areas (Ruggiero et al. 1994). Fisher habitat in

the Rocky Mountains generally consists of mature and old-growth conifer forests in summer and young, mature, and old-growth forests in winter (Heinemeyer and Jones 1994). Large-diameter snags and logs are used for denning and foraging. The species prefers forests with high canopy closure (greater than 80 percent) and avoids areas with low canopy closure (less than 50 percent) (Powell 1982). Forests within or adjacent to riparian areas appear to be particularly important to fishers (Heinemeyer and Jones 1994). In his study in north-central Idaho, Jones (1991) found that fishers generally preferred grand fir and spruce forests, and avoided dry ponderosa pine and Douglas-fir habitats. However, in winter, fishers also selected stands with relatively high basal areas of Douglas-fir and lodgepole pine. Changes in human access can affect fishers, as the species is easily trapped and over-trapping can jeopardize fisher populations.

Reference Condition

Fishers historically occupied much of the forested habitats in the northern United States (Heinemeyer and Jones 1994). Populations declined in the early 20th century, probably due to habitat loss from human settlement and logging, over-trapping, and poisoning. In the western United States, fishers have remained at low numbers or absent from their former range (Heinemeyer and Jones 1994). Population trend information for fishers in northern Idaho is unavailable, but based on sighting information fishers are currently rare.

Existing Condition

The fisher habitat models indicate that approximately 42,014 acres of capable fisher/marten habitat are present on Federal lands within the fisher analysis area, approximately 8,744 acres of which were identified as currently suitable for denning. Alteration of forest structure due to natural and human-caused disturbances (i.e. fire, timber harvesting) can negatively impact habitat for fisher and marten. However, given the relatively low density of fishers in the region and the high percentage of the analysis area occupied by mature moist forest with relatively high canopy cover and sufficient amounts of coarse woody debris, it is unlikely that habitat limits fisher presence.

Recently, fishers have been documented in several locations on the Priest Lake Ranger District, including Beaver Creek, Granite Creek, and Kalispell Creek. Surveys targeting fisher using DNA capture survey grid were conducted within and adjacent to the project area. However, DNA analysis is incomplete at this time.

Townsend's Big-eared Bat

Townsend's big-eared bats are primarily cave dwelling species. Although they occur in a wide variety of habitats, distribution tends to correlate with the availability of caves, especially old mine workings (Pierson et al. 1999). Their behavior appears, in most cases, to be temperature driven with bats using cooler sites before the young are born and moving to warmer sites after the young are born. In spring and summer, females form maternity colonies in warm parts of caves, mines and buildings. In winter, they prefer relatively cool places for hibernation, often near entrances and in well-ventilated parts of caves and mines (Kunz and Martin 1982).

Reference Condition

Townsend's big-eared bats occur throughout much of the western North America, from British Columbia to Mexico, and eastward to Texas (Pierson et al. 1999). Throughout much of their range they are recognized as species at risk. They are currently listed as a Region 1 Sensitive Species and considered a species of special concern by most western states wildlife management agencies. Records of Townsend's are found throughout the State of Idaho.

The most serious factor in population declines is loss and/or disturbance of suitable roosting habitat. Most notable threats include abandoned mine closures, recreational caving, and renewed mining at historical

sites (Pierson et al. 1999). As the Forest Service closes more mines with bat-accessible gates, human disturbance will decrease and habitat will improve for this species and other bats, which roost in abandoned mines. Bats often will use snags and exfoliated bark on live mature and larger trees for day roosting.

Existing Condition

Townsend's big-eared bats have been documented at only one site on the Priest Lake Ranger District, which is at least twenty miles south of the project area. Natural cave habitat is limited or nonexistent on the Priest Lake Ranger District however, historic mining activities were common within the project area in the early 1900s, and numerous historic mines are located on Nickleplate, Reeder, Cooper and Lakeview Mountains. Surveys for bats have been conducted within the adits on Lakeview, Nickleplate and Cooper Mountain in 1999 and 2002. No Townsend's Big-eared Bats were located but several other species of Myotis were detected, which includes *M. lucifugus, M. evotis* and *M. californicus*. The mine adits on Nickleplate Mountain were closed for safety reasons but the closure devices included bat friendly structures that are intended to retain utility for bats.

Western Toad

Western (boreal) toads are found in a wide variety of habitats including wetlands, forests, and floodplains in the mountains and mountain valleys. Breeding takes place from May to July in shallow areas of large and small lakes, beaver ponds, temporary ponds, slow moving streams, and backwater channels of rivers. After a brief spring breeding season, adult toads leave aquatic habitats and travel to a variety of upland habitats. Adults and juveniles overwinter and shelter in rodent burrows, and less commonly in underground caverns. Adults can remain away from surface water for relatively long periods of time, and juveniles may disperse up to or more than four kilometers from their natal sites (Maxell 2000).

Reference Condition

Survey results combined with incidental observations indicate that this species is found throughout much of northern Idaho. While toads may be widespread across the landscape, it is unknown in what proportion of suitable habitat they occur. Surveys conducted in the northern Rocky Mountains in the 1990s revealed that toads were absent from a large portion of their historic range and occupied only a small proportion of suitable habitat (Maxell 2000). As a result of these findings, the Regional Forester listed the boreal toad as a sensitive species in the Northern Region.

Steep roadcuts can be a barrier to toads moving between seasonal habitats. However, roads can also function as barrier-free travel corridors that become zones of mortality, with juvenile toads vulnerable to motorized vehicles when they are dispersing from their natal ponds (Maxell 2000).

Existing Condition

Western toad presence has been observed at a number of locations on the Priest Lake Ranger District (western toad_project file). They are known to breed from the very lowest elevations within the drainage to all but the highest elevations. There is no evidence of decline on the District; however, it is assumed that numbers were greater in the past based on loss of wetland habitat resulting from although an increase in roading, particularly in developed, low elevation areas, may be a mortality factor.

The primary risk factor for toads is loss of breeding habitat. Indirect effects to breeding habitat have the potential to occur if there is increased sediment delivery to wetlands and waterways as a result of increased roads and tree removal. Within the project area, the best toad breeding habitat is likely Bismark Meadows, Kalispell Creek, Reeder Creek, and Reeder Lakes.

Management Indicator Species

The following table lists Forest MIS and other wildlife species analyzed in detail, the rationale for analysis, and a description of their habitats.

Table 3-30. Management indicator species analyzed in detail.

Species	*Rationale for Detailed Analysis*	*Preferred Habitat*
Northern Goshawk (*Accipiter gentilis*)	Suitable habitat for goshawk nesting and foraging is present and potentially impacted within the project area.	Mature to old growth forest with relatively closed canopies for nesting, variety of forested habitats for foraging.
Pileated woodpecker (*Dryocopus pileatus*)	Suitable habitat exists and is potentially impacted within the project area.	Forests with tall, large diameter dead or defective trees for nesting, variety of forested habitats for foraging.
Moose	Suitable winter range habitat within project area.	Forested habitats, shrubfields preferred during winter.
White-tailed deer *(Odocoileus virginianus*)	Suitable winter range habitat within the project area.	Forested habitats within winter are preferred, winter cover is emphasized.
Forest Land Birds	Habitat impacted in the project area.	Wide variety of forested and non-forested habitats.

Northern Goshawk

The northern goshawk uses a wide variety of forest age classes, structural conditions, and successional stages; inhabiting mixed coniferous forests in much of the northern hemisphere (Reynolds et al. 1992). Throughout North America, goshawk nest sites have consistently been associated with the later stages of succession (mature and old growth trees) with moderate to high tree densities located near the bottom of hillsides on moderate slopes (Hayward and Escano 1989, Squires and Reynolds 1997, Graham et al. 1999). Foraging habitat includes a wider range of forest age classes and structures that provide a relatively open forest environment for unimpeded movement or flight through the understory. Goshawk territories also contain a Post-Fledging Family Area (PFA) surrounding the nest area that is used by the family group from the time the young fledge until they are no longer dependent on the adults for food. The home range (which includes the nest area, PFA and foraging area) contains a more heterogeneous mix of forest age and structural components than the nest area itself (Reynolds et al. 1992).

Reference Condition

Generally, the Priest Lake area once contained a greater proportion of old growth than currently occurs, although the US Fish and Wildlife Service concluded that this species is not dependent upon old-growth, and uses a variety of forest habitats in meeting its life history requirements (USDI 1998). However, mature forest is important for northern goshawks not only for prey species habitat but also for the large trees that provide the substrate for their substantial nest structures.

At least three suitable nest areas, as well as three replacement nest areas, should be present per home range (5,000-6,000 acres) to provide long-term nesting habitat for goshawks on the landscape (Reynolds et al. 1992). In the Northern Region, nest stands should be at least 40 acres in size, surrounded by a mix of younger forest and non-forested openings (Clough 2000). Reynolds et al. (1992) suggest maintaining a mix of structural stages within goshawk home ranges and PFAs of roughly 10 percent each in open (nonforested) and seedling/sapling stands, and 20 percent each of pole-sized, immature sawtimber, mature sawtimber, and old growth.

Existing Condition

Large stand replacing fires, the exclusion of low intensity fire, disease and timber harvest have changed the quantity, quality and distribution the goshawk habitat on the landscape and within the project area.

White pine blister rust and fire exclusion have changed the species composition of stands within the project area. Todays landscape contains only remnant examples of white pine, ponderosa pine and western larch. Douglas-fir, grand fir and lodgepole pine have replaced much of the growing space once occupied by these species. This change in dominance has increased the forest's vulnerability to drought stress, insect and disease infestations, and large, stand-replacing fires (vegetation_project file). This has resulted in unusually high levels of tree mortality, affecting stand structure and subsequent habitat suitability for goshawks. In addition, historic logging often targeted concentrations of large trees capable of providing goshawk nesting habitat.

Nine occupied goshawk territories, some with multiple nests, have been recorded on the Priest Lake Ranger District since 1991 (goshawk_project file). Canopy cover of 40-90 percent has been documented within these nest stands. Nest trees are typically found in live, large diameter (≥14") Douglas-fir, western white pine, western larch, western red cedar, or western hemlock. Live trees are preferred the overstory canopy protects eggs and nestlings from inclement weather and aerial predators.

The Lakeview-Reeder analysis area contains 27,449 acres of capable goshawk nesting habitat of which 3,887 acres has been identified as suitable for nesting. The amount of capable nesting habitat would be considerably less, since steepness of slopes would eliminate much potential habitat in the analysis area. Additionally, 4,756 acres of private lands within the analysis area are mapped as potentially being capable goshawk nesting habitat.

Goshawk surveys have been conducted within and adjacent to the project area since 1991 with the most recent surveys being conducted in 2005 (goshawk project file). While goshawks have been sighted during many of the surveys, no goshawk nest sites have been located.

Pileated Woodpecker

Pileated woodpeckers are relatively common in both cut and uncut mid-elevation forests, and appear to do well in a matrix of forest types (Hutto 1995). They nest in mature and old-growth forests and in previously harvested stands that contain remnant large trees and snags. Dead trees are preferred over live trees for nesting and roosting, with nest trees usually over 25 inches in diameter in stands with at least 60 percent canopy cover (Bull et al. 1990; Bull and Holthausen 1993). Live or dead western larch, and dead ponderosa pine, aspen, or black cottonwood are preferred nest tree species in the Northern Region (Warren 1990). Most foraging occurs in logs and dead trees at least six inches in diameter, although large diameter (i.e., greater than 12 inch) dead wood is used most frequently (Bull et al. 1990). Since foraging habitat occurs in a wider ecological range of forest age structures, nesting habitat is considered the most critical and limiting feature for pileated woodpeckers. The species was selected as an MIS its highest densities occur in old-growth forests and it needs large dead trees for nesting and dead woody material (standing and downed) for foraging (Bull et al. 1990).

Reference Condition

Pileated woodpecker population trends in northern Idaho are unavailable. However, suppression of fire and timber harvest has likely reduced the availability of nesting habitat for the species. Fire suppression has resulted in fewer large snags across the landscape, and historic timber harvest has resulted in fewer acres of old-growth forests.

The change in species composition, along with past harvest practices and firewood collection, has slowly and methodically replaced such species as ponderosa pine, white pine and western larch; further

inhibiting the production and sustainability of large snags. Consequently, snag production is shifting from larger, longer-lived species to smaller, shorter-lived species, which affects the long-term stability and persistence of snag habitat in the Lakeview-Reeder project area. As a result, snag habitat within the project area is generally in decline for species associated with large snags, such as the pileated woodpecker.

Existing Condition

Pileated woodpeckers occur throughout the Priest Lake Ranger District. Many of the proposed treatment acres for the Lakeview-Reeder project contain pileated woodpecker foraging habitat. Nesting habitat is more limited due to the lack of large snags (and live trees) over 25 inches dbh. National Forest System lands within the project area contain approximately 8,093 acres of matureforest (sawtimber or old growth) that may be providing pileated woodpecker nesting habitat (vegetation_project file). The project area contains enough areas of at least 100 acres of contiguous mature/old forest habitat that ten 1,000-acre potential home ranges could be delineated (pileated woodpecker_project file).

Moose

Moose are the largest member of the deer family. Protection from hunting and wolf control programs may have contributed to increased numbers but suppression of forest fires probably is the most important factor, since moose here depend on mature fir forests for winter survival.

Moose breed from early September to November and one to three calves are born in May or June. Calves weigh 25 to 35 pounds at birth but grow rapidly; adult females (cows) weigh up to 800 pounds and males (bulls) up to 1,300 pounds. Bulls are readily identified by their large, palmate antlers, which are shed annually, and their bells, a dewlap of skin and hair that dangles from the throat. Moose live mostly solitary lives, and die from disease, starvation, or predation by wolves and, occasionally, by grizzly bears.

Winter forage includes twigs of balsam fir, poplar, red osier dogwood, birch, willow, and red and striped maples. Moose also eat small amounts of many other trees and shrubs. When food becomes scarce, as it often does toward spring, moose will strip bark from trees, especially poplars. In June and July, moose gather around salt licks, usually low-lying areas of stagnant, mineral rich water. At that season, they are feeding heavily on leaves and other lush plant growth and seem to require supplementary minerals.

Reference Condition

There is very little reference to moose prior to settlement within the Priest Lake drainage or the Kalispell Basin Analysis Area. Moose were first documented within Kalispell Basin in 1956 by the state of Washington. This was the first location of moose with Washington and their occurrence within Kalispell Basin was likely linked to the abundant acreage of high quality browse, which was the product of wildfires which burned through the drainage in the 1920s and 1930s. In 1972, the State of Washington issued the first hunting permits for moose within that state for Kalispell Basin. In 1987 the Kalispell Basin was designated important moose winter range as part of the development of the Idaho Panhandle National Forests plan.

Since 1987, moose populations within the state of Washington have expanded southward as far as Mt Spokane and westward in Ferry County. Kalispell Basin is still considered a focal point for Washington's moose but is no longer considered vital to the perpetuation of the State's moose population (Zender pers comm). Although the Kalispell Basin is still considered important as a moose wintering area for moose populations within the Priest Lake ecosystem, a significant number of moose move south from the northern portion of the District and winter within the basin.

White-Tailed Deer

White-tailed deer are medium-sized ungulates which are found over much of North America with the exception of the northern latitudes. Socially, this species is important beause of sport hunting and viewing opportunities. Many people participate in and enjoy having opportunities to view wildlife species, of which white-tailed deer is a predominant and common species (Pauley 1990). Biologically, this species is important it serves as prey for many forest carnivores and also as carrion for bird species such as the bald eagle and golden eagle. Whitetails were abundant in north Idaho as far back as the early 1800s (Kuck, 1990). By the early 1900s, populations were low, having been exploited for food by trappers, miners, and settlers (ibid).

In many areas, white-tailed deer are generally associated with the early stages of vegetational succession. In the ecosystems found in the northern Rockies, white-tailed deer habitat is strongly influenced by topography and vegetative successional stage. Throughout their range there is a varied habitat association dependent upon vegetative and geographic conditions.

Habitat for white-tailed deer is commonly divided into the seasonal categories winter, spring, summer or fall habitat. Throughout much of the northern portions of its range, winter habitat is the most critical. As the fall season progresses into winter, increased snows force the deer into lower elevations. The deeper snows tend to increase energy demands and decrease the availability of food resources, which forces animals to concentrate on the winter range.

Compared to other seasonal ranges, the winter range is considered most limiting due to its relative small size. Spring, summer, and fall ranges generally have tens of thousands of acres available across the landscape. Winter ranges, on the other hand, can consist of isolated geographic areas which may total as little as a few hundred acres.

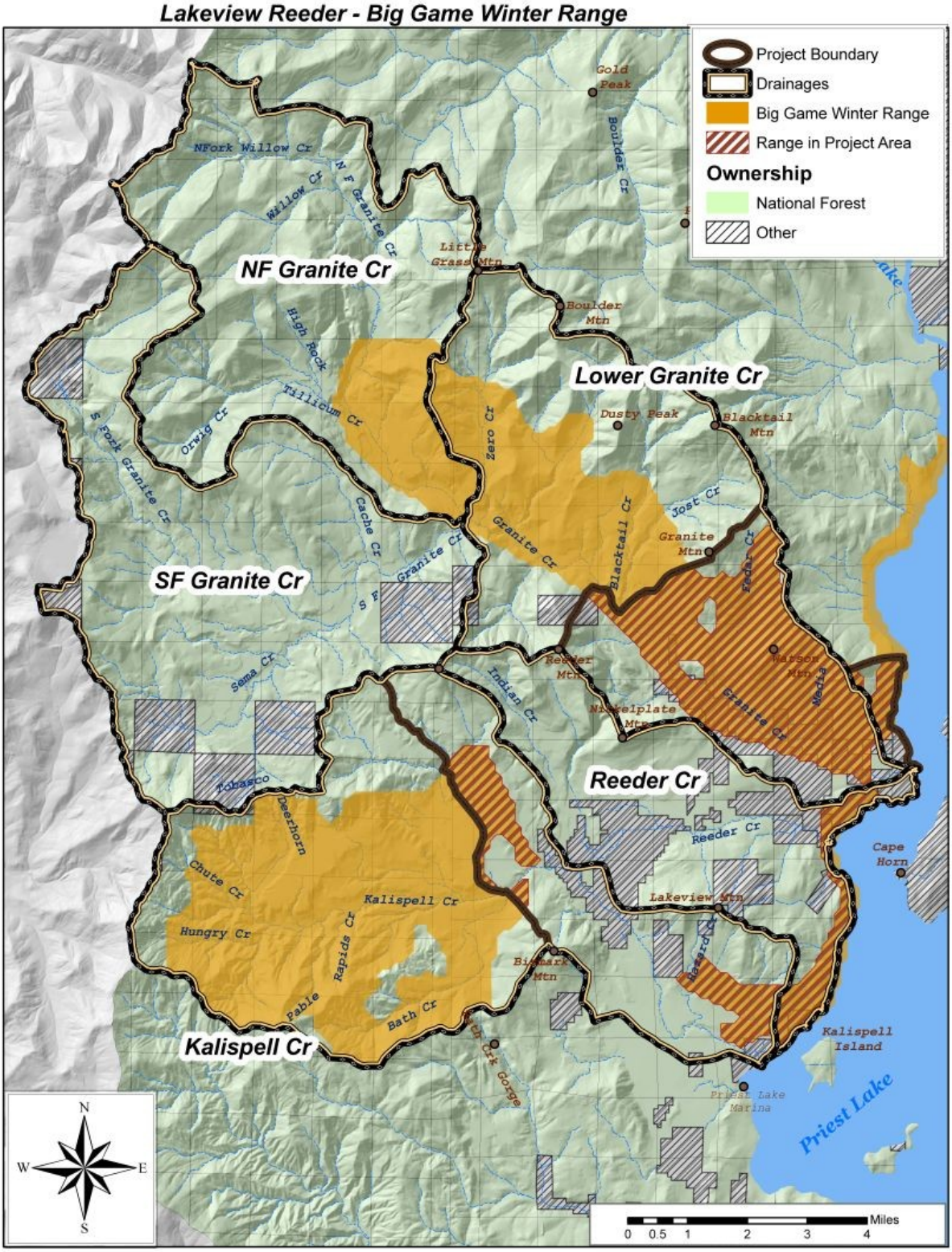
The small size of the winter range is due to the topographical and vegetative characteristics that cause deer to use a particular area. During the spring summer, and fall deer are building energy reserves by eating the large amounts of highly nutritious forage available. Very little energy is expended to find food and maintain survival. These energy reserves are critical during the winter months, when the deer use more energy than they take in. Since the deer rely on their energy reserves, any unnecessary expenditure of energy could reduce the chances of an individual surviving the winter. Energy expenditures result primarily from increased snow depths. The increase in energy expenditure is slight until the snow depth reaches the chest area of the deer. At this point, the energy expenditure increases dramatically and puts more stress and strain on the deer forcing the animal to seek out areas with less snow, which generally include lower elevations and south-facing slopes.

The south-facing slopes are favored for several reasons. The reduced snow depths are due to the angle of the slope receiving more direct solar radiation from the sun. Generally, the increased solar radiation also influences vegetative growing conditions which favor early seral stages such as shrubfields. The shrubfields usually have an abundance of available and nutritious forage which results in less travel time in reduced snow depths, and better energy conservation.

While foraging areas are a key component of the winter range, cover areas on the winter range are considered critical. During times of extremely cold temperatures and deep snow, foraging becomes almost secondary to the use of cover areas (Pauley, 1990). These areas are generally mature timbered stand with a dense canopy which serves several purposes. The main purpose is that the mature trees with their larger branches in the crown can intercept a larger proportion of the snow, resulting in reduced snow depths on the ground. A second function of the denser crown is to act as a thermal blanket, trapping warmer air in the stand. The overall result is a warmer area with reduced snow depths, which leads to less energy expenditure and more energy conservation.

The classification of the cover and foraging areas was done by analyzing the stand components and applying a suitability index model to the stand layer. Stands with attributes such as dense canopy cover were rated as higher quality cover stands while stands with open canopies were rated as lower quality.

Figure 3-34. Map of big game habitat cumulative effects analysis area



For the foraging aspect, stands with a significant shrub component and south facing slope were rated higher than stands with a lack of shrubs and on a north aspect.

Human activities and use can affect the condition of the deer on the winter range. In areas where there is a high level of human disturbance, the deer are subject to more stress. This stress causes more energy expenditure and can significantly impact the survivability of the deer. Areas of high human use within critical mid-winter ranges dramatically lower the quality of the winter range. However, if there is a lack of winter range suitable for energy conservation, then the deer are forced to use high human use areas at a higher energy level, increasing the probability of stress-induced mortality.

The private lands are also included in the deer's winter range. These areas are mixed, from residential areas to undeveloped areas with little human impact. Generally the area around Kalispell Bay is considered to have the highest level of human disturbance, within the project area (?), due to the amount of residences. A large portion of the mid-winter range occurs in the Kalispell Bay area due to the lower elevation and numerous south-facing slopes. The private lands in Kalispell Bay are considered part of the mid-winter range and deer do use the cover stands that exist here. With a new sub-division planned along the Kalispell Bay Road, there are concerns about the future quality and availability of the mid-winter range.

Several projects have taken place to enhance the winter range within the project area. The Priest Lake Sportsman group in conjunction with the Forest Service has slashed and burned pockets of shrubfields on Lakeview Mountain to increase the total amount of palatable young shrub stems. In the winter of 1996-97, the Idaho Fish and Game Department fed the white-tail deer population with deer pellets to help reduce the over winter mortality. Feeding stations were established along several points in the project area.

Existing Condition for White-tailed deer and Moose

Within the Lakeview-Reeder project area, 8,955 acres have been allocated for the management of big game winter range. The project area overlaps with winter range areas in Kalispell Basin, Granite Creek drainage and two areas along the shoreline with Priest Lake. The Kalispell Basin and Granite Creek drainages are primarily managed for winter range conditions for moose, whereas the areas along the shoreline with Priest Lake are primarily used by white-tail deer.

Whitetail deer and moose populations within the planning area are robust, and both species are likely considerably more abundant today than historically. Moose are more abundant today and is likely a product of several factors that may have work independently or in conjunction with each other. These factors likely include changes in landscape habitat configurations and loss of predominant predators such as wolf. Moose were not previously documented within or adjacent the project area until the early 1970s within the Washington State portion of the Kalispell Basin.

Forest Land Birds

Forest land birds represent a wide variety of species with varying habitat associations. Some species are associated with older forest, others are associated with younger forests; some species prefer wet forest types, while others prefer drier types. Hejl (1994) acknowledges that while we do not know all of the specifics of bird-habitat relations, we do understand many principles that would help maintain a healthy forest for most bird species: encourage old-growth characteristics, leave snags and replacement trees, leave or plant the natural diversity of trees found in the area, burn and allow fires to happen in a manner similar to natural fire regimes, and mimic natural landscape patterns. While no single forest condition or structural type will benefit all species simultaneously, providing a mosaic of habitat conditions and age classes will capitalize on habitat values for forest birds. Any forest treatment would benefit some species and have a detrimental effect on others. The most prudent way to manage for forest lands birds is to

maintain a wide variety of habitat types and to place particular emphasis on protecting and enhancing those habitat types and species which are currently underrepresented and/or declining.

Reference and Existing Conditions

Idaho has 243 species of birds that breed in the state (Idaho Partners in Flight 2000). A diversity of vegetation and topography results in a diversity of species. While all birds are important for their roles in the ecosystem, not all birds and habitats are equal when it comes to threats to their persistence. Idaho Partners in Flight (2000) identifies four priority habitats that represent species of moderate to high vulnerability and species with declining or uncertain population trends. These habitats are riparian habitat, non-riverine wetlands, sagebrush shrub habitat, and dry ponderosa pine/Douglas-fir/grand fir forests. The Lakeview-Reeder project area contains two of these four priority types, riparian habitat and dry ponderosa pine/Douglas-fir/grand fir forests.

Environmental Consequences

Introduction

This section displays and discusses the effects on those wildlife species identified in the preceding section that may be affected by the proposed actions and the No Action Alternative. Effects discussions include direct, indirect and cumulative effects, all of which may have positive or negative consequences. Information presented in this section is based on scientific literature, wildlife databases, professional judgment, recent field surveys, and habitat evaluations.

Cumulative Effects Analysis

Past actions and other disturbances have laid the foundation for today's forest vegetation and are depicted and accounted for in the baseline condition descriptions. This is especially true for habitat suitability analysis, which characterizes the changes in vegetation (succession) from past disturbances.

Cumulative effects discussions for alternatives include these past actions in combination with other relevant present, ongoing, and reasonably foreseeable actions, regardless of the source (past, present and reasonably foreseeable actions are described in Chapter 1). The appropriate scale or geographic bounds for cumulative effects analysis relates to an area that would be affected by the proposed action or reasonable alternative. This area is referred to as the cumulative effects analysis area and may vary among resources (see Table 1-21). Determining this area for wildlife depends upon a species' relative home range size in relation to its available habitat; topographic features that influence how species move and utilize their home range (e.g. watershed boundaries); and boundaries that represent the point of diminishing potential effects.

Table 3-31. Project cumulative effects impact zones for species analyzed.

Species Analyzed	*Cumulative Effects Area*
Canada lynx	Lynx Analysis Unit (Kalispell, Sema and Willow LAUs)
Grizzly bear	Kalispell-Granite and Lakeshore bear management units and project area.
Black-backed woodpecker	Project Area
Flammulated owl/Pygmy nuthatch/Fringed myotis	Project Area
Fisher/Marten	Lower Granite and Lower Kalispell drainages.
Western toad	Project Area
Northern goshawk	Project Area
Pileated woodpecker	Project Area
Forest Land Birds	Project Area

For most of the species analyzed, the Lakeview-Reeder project area is used as the cumulative effects analysis area. The project area totals approximately 29,380 acres, and is large enough to accommodate at least: single, and more often multiple, home ranges for even highly mobile species; the complete life cycle of most non-migratory wildlife; and breeding/nesting habitat for migrating songbirds.

Lynx Analysis Units (LAUs) were delineated following standards of the Lynx Conservation Assessment and Strategy (LCAS) (Ruediger et al. 2000). LAUs were not intended to represent actual lynx home ranges, but their scale approximates the size of area used by an individual lynx. The size of LAUs would generally be from 16,000 to 25,000 acres in contiguous habitat, and likely be larger in less contiguous, poorer quality, or naturally fragmented habitat. While other (state and private) ownerships within LAU boundaries may provide some suitable lynx habitat, standards and guidelines of the Northern Rockies Lynx Management Direction (NRLMD) generally apply only to capable lynx habitat under Federal ownership within individual LAUs. USFWS has determined that the LAU is a suitable cumulative effects analysis area for lynx.

The area selected for cumulative effects analysis for grizzly bear ("grizzly bear analysis area") includes the Lakeview-Reeder project area in combination with the Kalispell-Granite and Lakeshore bear management units. The direction for the analysis of cumulative effects on grizzly bear is based on the bear manage unit (BMU). Bear management units were originally delineated to approximate the home range of a female grizzly bear, which was 100 square miles.

The Lakeview-Reeder project area includes about 5,800 acres of private ownership with. Non-Federal ownerships within the project area are generally highly developed (homesites) or managed for the primary purpose of timber production. Since these timber stands are on relatively short rotations, they do not develop suitable habitat conditions for species that require mature forest structure. As a result, other ownerships are highly susceptible to adverse habitat modifications, and the presence of suitable habitat cannot be relied upon over time. Adjacent private lands both outside of and within the IPNF Administrative Boundary may provide suitable habitat for species analyzed. However, the Forest Service has no administrative control over these areas, and lacks data to adequately assess them.

Analysis Indicators for Selected Species

Table 3-22 below displays the indicators that will be used to measure effects on wildlife species. Indicators for each species vary and are based on those factors that could result in a measurable adverse or beneficial effect. For most species being analyzed, appropriate habitat parameters were measured to distinguish suitable habitat (specific parameters for individual species are discussed in the "Methodology" section for each species analyzed). A discussion of the changes in suitable habitat for each relevant species and the effects on species are disclosed in the following discussions.

Table 3-32. Issue indicators used to measure effects.

Species	*Indicator*
Canada lynx	Amount of lynx habitat in a LAU currently in a stand initiation structural stage that does not yet provide winter snowshoe hare habitat, amount of lynx habitat regenerated in the previous 10-year period, and impacts to multi-storied mature or late-successional forests
Grizzly bear	Changes to security in core habitat and changes in open and total road densities within the Kalispell-Granite and Lakeshore bear managements. Changes in key habitat components for grizzly bear and changes in mortality risk for grizzly bears.
Black-backed woodpecker	Changes in quality of post-fire and insect-infested forest habitat
Flammulated owl/Pygmy nuthatch/Fringed myotis	Changes to large snag habitat and trend toward suitable habitat conditions
Fisher/Marten	Changes to suitable denning habitat, changes to mature forest habitat
Townsend's big-earred bat	Changes to conditions at mine adits and mature and larger timber stands.
Western toad	Impacts to breeding habitat
Northern goshawk	Trends in suitable nesting habitat
Pileated woodpecker	Changes to large snag habitat and old growth habitat
Forest Land Birds	Impacts to priority habitats

Threatened and Endangered Species

Canada Lynx

Methodology

Lynx habitat was evaluated using a habitat suitability model derived from data in the Forest timber stand database (TSMRS), with corrections from field sampling and aerial photo interpretation. The habitat components identified by the model were based upon recommendations from an interagency review of published lynx literature (Ruggiero et al. 2000). The model breaks down lynx habitat into four major components, although standards in the Northern Rockies Lynx Management Direction (NRLMD) (USDA 2007a) only specifically address the stand initiation structural stage that does not yet provide winter snowshoe hare habitat (formerly called "unsuitable") and multi-storied mature or late-successional forests (loosely grouped as "late successional forage"). While surrounding private lands may make contributions to lynx habitat, most NRLMD standards only apply to the Federal land base within LAUs.

The potential effects on Canada lynx and its habitat were determined by predicting the changes in acres in the stand initiation structural stage and multi-storied mature forest that would result from the proposed action.

Effects of the No Action Alternative

In the absence of mechanical treatments, habitat conditions would continue to change in the Willow, Kalispell and Sema lynx analysis units. There would be a continued shift toward more shade tolerant species, and small stem density and understory congestion would continue to build up in most stands. Insects, disease and competition for sunlight and nutrients would hasten tree mortality and trigger increases in down woody material. More lynx denning habitat would be produced, and existing denning habitat would be enhanced. Mature, multi-storied stands would likely improve, while some winter snowshoe hare habitat will move out of the stand initiation stage and lose its value as preferred hare habitat.

The scenario described above assumes that there would be no stand-replacing fire in this area. Given the history of active fire suppression, existing high fuel loads in many stands, and increased fuel concentration that lack of management action would provide, it is reasonable to assume that the area will be affected by wildfire at some point in the future. The magnitude of this fire would depend upon area accessibility, available suppression resources, weather and other environmental factors. A mixed-severity fire would not likely alter large portions of available habitat, but a large stand-replacing fire would convert mature stands to a stand initiation phase, which would take 20-30 years to mature to the point where they could support high densities of snowshoe hares.

Effects of the Proposed Action

Direct and Indirect Effects

The project proposes timber harvest on approximately 56 acres within the Kalispell LAU. No timber harvest is proposed within the Sema or Willow lynx analysis units. Proposed regeneration harvest of this 56 acres of lynx habitat would increase the amount of habitat in a stand initiation structural stage not yet providing winter snowshoe hare habitat from 7.5 percent to 7.7 percent, .3 percent of which will have been converted through timber management projects within the last ten years. These percentages are well below the maximum allowed by standards in the NRLMD. No multi-story mature stands would be affected by this proposal. No denning habitat would be impacted within any of the LAUs within the project area.

Approximately 762 acres are proposed for burn only treatment or underburning within the LAUs. Of the burn only area, only 248 acres would impact capable lynx habitat that is currently shrubfield or other low quality lynx habitat, which would have minimal impact on lynx prey availability. Portions of these units would be bordered with fireline dug by hand crews (approximately 18 inches wide), but firelines are expected to support vegetation within five years after burning and again providing no permanent firebreaks would be constructed. Within lynx habitat any reconstructed (reopened) roads would be unavailable for general public use during implementation, and following project activities they would be managed as restricted access closures. The USFS does not expect the maintenance of designated haul routes to significantly increase traffic speeds or volumes, most haul route are currently managed as open roads and the increase volume of traffic resulting for project activities would be negligible.

Cumulative Effects Common to both Alternatives

The following past, ongoing and reasonably foreseeable actions are considered relevant in a cumulative effects discussion for Canada lynx:

Past Activities and Events – Within the early portion of the 1920's and 1930's, a large portion of the Sema and Kalispell LAUs experienced significant wildfire events. Following these wildlife events, within these lynx analysis units, quality lynx habitat was created and lasted until the mid 1980's. The Willow LAU has been influenced less by wildfire events within the past century but more by timber harvest, especially from the 1970s through the early 1980s. The road construction associated with older timber sales may have resulted in negative impacts to lynx through increased access for trappers, but many of these roads have been restricted during the summer months for a number of years to enhance grizzly bear habitat. Past activities and events would not have cumulatively significant impacts when added to the proposed action, since the effects are already incorporated into the environmental baseline and the current environmental baseline reflects habitat conditions well within parameters established by the NRLMD.

Current Management Activities – Personal use firewood gathering, non-motorized recreation, and standard road maintenance would not significantly impact Canada lynx as these activities would result in negligible changes to lynx habitat and lynx are not particularly vulnerable to human disturbance, although

roads would continue to provide access for trapping. Continued fire suppression would keep denning habitat intact, but also has the potential to prevent habitat from reverting an early successional structural stage since fewer acres would be allowed to burn. As a result, continued fire suppression would offset the impacts of this proposal to some degree. Off-road motorized recreation would have minor impacts to lynx through displacement during the summer months, since low population densities of lynx and the preference of these recreationists for more open areas make it unlikely ORV use would occur in the same general vicinity as lynx at the same time. The effect of over snow motorized use on lynx is unknown: while there is a lack of evidence that packed snow trails facilitate competition with other predators, there is evidence that competing predators use packed trails, suggesting a potential effect on competition for prey species for individual lynx. There are currently several popular snowmobile trails that traverse the project area, including FR 2516, 2231, 1362, 1347 and 2242. This proposal is not expected to increase over snow travel on these routes as the adjacent habitats are generally low elevations lined with dense vegetation.

Other Restoration Projects –Noxious weed treatments would take place along roads and other disturbed areas, and would cause inconsiderable changes in vegetative structure with respect to snowshoe hare habitat these areas offer very little shrub or tree cover. Juvenile tree ("precommercial") thinning of lynx habitat may only take place under specific circumstances outlined in the NRLMD (USDA 2007a), and would be limited to 6 percent of lynx habitat in the planning area (IPNF) and subject to formal consultation with USFWS. Any precommercial thinning expected to occur in the short term was incorporated into all action alternatives for this project, and the effects discussed above.

Currently active USFS timber sales – There are no other active timber sales on USFS lands in the Kalispell, Sema or Willow lynx analysis units.

Activities on other ownerships – The entire Willow and Kalispell LAU are administered by the US Forest Service. As a result, there would be no cumulative effects on Canada lynx as a result of activities on other (non-USFS) ownerships in the project area. While the Sema LAU contains private timberlands administered by Stimson Timber Company and Forest Capital, and activities on these lands my impact lynx, they are not included in calculations of habitat conditions within this LAU, based on direction provide within the LCAS (USFWS 2001). However, it should be noted that Stimson Timber company has developed a Lynx Conservation strategy with Washington Department of Natural Resources and manages their lands accordingly.

Conclusion

All alternatives would be consistent with all standards and guidelines in the NRLMD. Neither the action alternative nor the No Action alternative, in conjunction with past, present and reasonably foreseeable actions would result in greater than 30 percent of lynx habitat in the either the Willow, Kalispell or Sema LAUs being in the stand initiation structural stage not yet providing winter snowshoe hare habitat, and not more than 15 percent of lynx habitat in the LAU would have been regenerated within a ten-year period. No precommercial thinning is proposed in lynx habitat under any of the alternatives. There would be no impacts to multi-story mature stands as a result of the proposed action. Denning habitat would continue to be abundant and well distributed throughout the LAU's

This project would have only minor impacts on snowshoe hare habitat, as no activities are proposed that would reduce dense understories in early successional lynx habitat (such as precommercial thinning). Winter logging may affect snow conditions at a very local (harvest unit) level as a result of compaction, but would not alter snow conditions on a landscape scale. Denning habitat is abundant and well-distributed in the project area, and would continue to be following implementation. Although there would be alterations to – including regeneration harvest of – matrix habitat, contiguous patches of mature forest would remain, allowing unimpeded lynx travel through this habitat.

A complete list of NRLMD Standards and Guidelines and demonstrated project compliance can be found below.

Consistency with Forest Plan and Other Regulations Regarding Lynx

Standards and Guidelines in the Northern Rockies Lynx Management Direction (USDA 2007a) have been amended to the IPNF Forest Plan. The alternatives are consistent with this document, and therefore meets Forest Plan direction to "contribute to the conservation and recovery of the listed species on the Forest" (USDA 1987 p. II-6).

Relevant Standards and Guidelines from the Northern Rockies Lynx Management Direction are addressed as follows:

Standard ALL S1:

New or expanded permanent development and vegetation management projects must maintain habitat connectivity in an LAU and/or linkage area.

- The Lakeview-Reeder project is within the Kalispell, Willow and Sema LAUs. The Proposed Action proposes even-aged regeneration harvest of about 56 acres in the project area and an additional 248 acres of underburning. Protected riparian areas would still provide forested travel corridors between ridgelines.

Standard LAU S1:

Changes in LAU boundaries shall be based on site-specific habitat information and after review by the Forest Service Regional Office.

- LAU boundaries on the IPNF were refined based on more accurate habitat mapping and following discussions with members of the interagency Canada Lynx Biology Team (Claar 2007).

Standard VEG S1:

Unless a broad scale assessment has been completed that substantiates different historic levels of stand initiation structural stages, limit disturbance in each LAU as follows: If more than 30 percent of the lynx habitat in an LAU is currently in a stand initiation structural stage that does not yet provide winter snowshoe hare habitat, no additional habitat may be regenerated by vegetation management projects.

- Currently, 1,717 acres (7.5 percent) of lynx habitat in the Kalispell LAU is in the stand initiation stage. The proposed action would regenerate an additional 56 acres of lynx habitat, bringing the total of stand initiation to 7.7 percent within the Kalispell LAU.

Standard VEG S2:

Timber management projects shall not regenerate more than 15 percent of lynx habitat on NFS lands within an LAU in a ten-year period.

- Within the Kalispell, Sema or Willow LAUs, no lynx habitat has been regenerated by timber management activities within the last 15 years (Lynx_project file). Implementation of the proposed action would add 56 acres (0.3 percent) to this category for the Kalispell LAU.

Standard VEG S5:

Precommercial thinning projects that reduce snowshoe hare habitat may occur from the stand initiation structural stage until the stands no longer provide winter snowshoe hare habitat only: 1) within 200 feet of administrative sites; 2) for research studies or genetic tree tests evaluating genetically improved reforestation stock; 3) based on new information that is peer reviewed and accepted by the regional level

of the Forest Service, and state level of FWS, where a written determination states that a project is not likely to adversely affect lynx or that a project is likely to have short-term adverse effects on lynx or its habitat, but would result in long-term benefits to lynx or its habitat; 4) for conifer removal in aspen, or daylight thinning around individual aspen trees, where aspen is in decline; 5) for daylight thinning of planted rust-resistant white pine where 80 percent of the winter snowshoe hare habitat is retained; or 6) to restore whitebark pine.

- No precommercial (juvenile tree) thinning is proposed in lynx habitat for this project.

Standard VEG S6:

Vegetation management projects that reduce snowshoe hare habitat in multi-story mature or late successional forests may occur only: 1) within 200 feet of administrative sites; 2) for research studies or genetic tree tests evaluating genetically improved reforestation stock; 3) for incidental removal during salvage harvest (e.g. removal due to location of skid trails).

Fuel treatment projects within the WUI that do not meet Standards VEG S1, VEG S2, VEG S5 and VEG S6 shall occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest).

- No multi-story mature stands would be treated under the proposed action. Prior to implementation of Alternative 2, formal consultation would be initiated with the US Fish & Wildlife Service on a may affect, likely to adversely affect determination.

Standard LINK S1:

When highway or forest highway construction or reconstruction is proposed in linkage areas, identify potential highway crossings.

- There would be no permanent road construction within lynx habitat as a result of the Lakeview-Reeder project.

Guideline ALL G1:

Methods to avoid or reduce effects on lynx should be used when constructing or reconstructing highways or forest highways across Federal land. Methods could include fencing, underpasses, or overpasses.

- See compliance with Standard LINK S1, above.

Guideline VEG G1:

Vegetation management projects should be planned to recruit a high density of conifers, hardwoods, and shrubs where such habitat is scarce or not available. Priority for treatment should be given to stem-exclusion, closed-canopy structural stage stands to enhance habitat conditions for lynx or their prey (e.g. mesic, monotypic lodgepole stands). Winter snowshoe hare habitat should be near denning habitat.

- The proposed action would impact only 304 acres of lynx habitat within the Kalispell LAU. This includes 56 acres that would be regeneration harvested and 248 acres of shrubfield that would be impacted via burning. Regeneration harvest in these stands would accelerate the process of conifer regeneration and shrub growth that would otherwise happen more slowly (assuming there is no stand-replacing fire) due to tree mortality creating openings in the canopy. As a result, while this alternative would recruit more acres of early successional stage forest, fewer acres would potentially reach the mature multi-story structural phase.

Guideline VEG G4:

Prescribed fire activities should not create permanent travel routes that facilitate snow compaction. Constructing permanent firebreaks on ridges or saddles should be avoided.

- As many as 765 acres are proposed for underburning, 248 of which would impact capable lynx habitat. Portions of these units would be bordered with fireline dug by hand crews (approximately 18 inches wide), but firelines are expected to support vegetation within five years of burning. There would be no permanent firebreaks constructed for this project.

Guideline VEG G5:

Habitat for alternate prey species, primarily red squirrel, should be provided in each LAU.

- no mature forests within the Kalispell, Willow and Sema LAUs would be impacted habitat for alternate prey species would not be impacted

Guideline VEG G10:

Fuel treatment projects within the WUI as defined by HFRA should be designed considering Standards VEG S1, S2, S5 and S6 to promote lynx conservation.

- The proposed action is consistent with Standards VEG S1, S2, S5 and S6.

Guideline VEG G11:

Denning habitat should be distributed in each LAU in the form of pockets of large amounts of large woody debris, either down logs or root wads, or large piles of small wind thrown trees ("jack-strawed" piles). If denning habitat appears to be lacking in the LAU, then projects should be designed to retain some coarse woody debris, piles, or residual trees to provide denning habitat in the future.

- Denning habitat is currently abundant and well distributed within the Kalispell, Sema and Willow LAUs (lynx_project file). The proposed action would not impact potential denning habitat, leaving abundant and well-distributed denning habitat in the LAUs.

Guideline LINK G1:

NFS lands should be retained in public ownership.

- The Lakeview-Reeder project does not involve transfer of ownership of NFS lands.

Since the project does not involve livestock management and there are no active grazing allotments in or adjacent to the Kalispell, Seam or Willow LAUs, guidelines pertaining to this issue (Guidelines GRAZ G1-G4, LINK G2) are not addressed. In addition, Guidelines HU G1-G12 do not apply to vegetation management projects directly, or to linkage areas.

Grizzly Bear

Methodology

The analysis of effects on grizzly bears focuses on changes in habitat values for grizzly bear, such as security and core habitat, open and total road densities, and the impacts to mortality risk. Since the IPNF does not have a vegetation-based grizzly bear habitat suitability model, possible changes to vegetation are addressed qualitatively.

Direct and Indirect effects of the No action

If no action were taken, there would be less disturbance and potential for displacement for grizzly bears habitat since there would be no need for off-road mechanized activities. Artificial openings that are presently providing forage in the form of berry producing shrubs will close in as forest succession advances, which would be approximately 40 to 50 years after harvest. In the absence of fire, grizzly bear foraging habitat would probably decline in this area. Conversely, a large stand-replacing fire would create a temporary flush of high quality berry producing shrubs. In addition, there would be no gains in habitat effectiveness values such as increases in core habitat and decreases in road density associated with project activities.

Cumulative Effects Unique to This Alternative

The Proposed Grizzly Bear Access Amendment to the Forest Plan will establish management standards for core habitat, and road density standards for both the Kalispell – Granite and Lakeshore bear management units. These standards have not been formally established yet, but are likely similar to those identified in proposed action for the Lakeview Reeder Fuels Reduction Project.. Once adopted, these standards would be achieved within the timelines established for these bear management units.

Direct and Indirect Effects of the Proposed action

Direct and Indirect Effects

The effects of timber harvesting on grizzly bears can reasonably be categorized as short-term (during implementation) or long-term (post-implementation). Long-term habitat effects include changes in forest structure (reduction of cover and increased foraging habitat) and ongoing disturbance from newly constructed roads. Conversion of stands from cover areas to foraging areas probably improves habitat conditions for grizzly bears, since it is unlikely that forest cover is limiting in the project area of high proportion of timbered habitat on the landscape. This proposal would not permanently increase motorized route miles within either the Kalispell-Granite or Lakeshore bear management units. New road construction and reconstruction within harvest areas within the portion of the project areas that is outside of the recovery are would potentially result in displacement of bears from that area. Disturbance effects are limited to the short-term impacts of timber harvesting and subsequent fuels treatment. The level of potential disturbance is influenced by a number of factors including: 1) the intensity and duration of activity, 2) the correlation of the activity with seasonal habitat preferences of bears, 3) the association of activity with quality habitat, and 4) additive impacts from other sources of disturbance.

Fuels treatments within the Kalispell-Granite bear management unit would take place on 400 acres, which includes 340 acres of burn only treatment designed to rejuvenate shrubfields and aspen stands, and 60 acres of regeneration harvest. The regeneration harvest would take place during the grizzly bear denning season (November 30 – April 1) to reduce disturbance to bears. But slash disposal activities such as grapple piling and burning would take place outside of the spring bear season (April 1 – June 30) to reduce disturbance and or displacement of bears during this key season. This regeneration harvest with subsequent burning would potentially result in an increase in understory berry production on these areas after approximately 10 to 15 years. This could potentially increase grizzly bear forage opportunities within the project area.

Fuels treatments within the Lakeshore bear management unit would total 1,648 acres and would include 550 acres of burn only treatments, 493 acres of regeneration harvest and 592 acres of intermediate harvest, and 13 acres of pile only treatments. None of the proposed fuels treatments, with the exception of shrubfield burning, would take place within core habitat. Similar to the Kalispell-Granite bear management unit, regeneration and intermediate harvest would take place during the grizzly bear denning season (November 30 – April 1) with the exception of the slash disposal activities such as grapple piling and underburning, which would take place outside of the spring season (April 1 – June 30) to reduce

disturbance and or displacement of grizzly bears. Both the regeneration and intermediate timber harvest areas are anticipated to result in an increase in berry production on these acres. This would provide a benefit to grizzly bears. Berry production at these low elevations and moist habitats often mature earlier than berries at higher elevations. This would provide a potential benefit to bears by enhancing bear food production at the lower elevations within these bear management units.

Activities on the burn only treatments totaling 890 acres within both bear management units would be implemented during the spring season, but would be confined to only 3 days per year for the use of mechanized equipment such as helicopters to reduce long-term displacement of bears from the project area. Additionally, most of the burning would likely occur during the month of April to reduce short-term displacement of grizzly bears from the project area. Shrubfield burning activities would be conducted within four areas that are in core habitat, two areas within the Lakeshore BMU and two areas within the Kalispell-Granite BMU.

Helicopter flights in grizzly bear habitat represent a potential source of disturbance to grizzly bears. Potential impacts to grizzly bears range from behavioral changes, such as displacement to areas away from the disturbance, to physiological changes, such as increased heart rates and stress (Larkin 1996, Reynolds et al. 1986). There is wide variability in the reaction of grizzly bears to aircraft disturbances (IGBC 1987). Factors influencing how a particular bear may react to aircraft include the availability of escape cover, the topography of the landscape, the degree of habituation to aircraft, and the type, noise level, altitude above ground, flight path and distance away from the aircraft (USDI National Park Service 2003).

According to the Interagency Grizzly Bear Committee (IGBC 1998), grizzly bear core habitat is primarily defined in terms of roads and motorized trails. Although the use of helicopters within core habitat represents a potential disturbance or impact to grizzly bears and their habitat, it does not represent a reduction or loss of core because it is a temporary intrusion and does not involve the motorized use of restricted roads or the construction of new roads. Helicopters do not pose the same long-term displacement effects and increased mortality risk to grizzly bears that are associated with permanent landscape features such as roads. The use of helicopters is transitory and does not bring additional human use and public access into grizzly bear habitat, whereas roads are generally longer term or permanent features on the landscape that do facilitate human access. However, helicopter use may result in temporary impacts to grizzly bear core habitat because grizzly bears may be displaced from the area during the time that helicopter operations are ongoing and for some time after. Consequently, while helicopter use within grizzly bear core habitat would not require a deduction in the amount of core habitat, the potential temporary disturbance and displacement effects to grizzly bears has been considered and opportunities to reduce the impact have been incorporated.

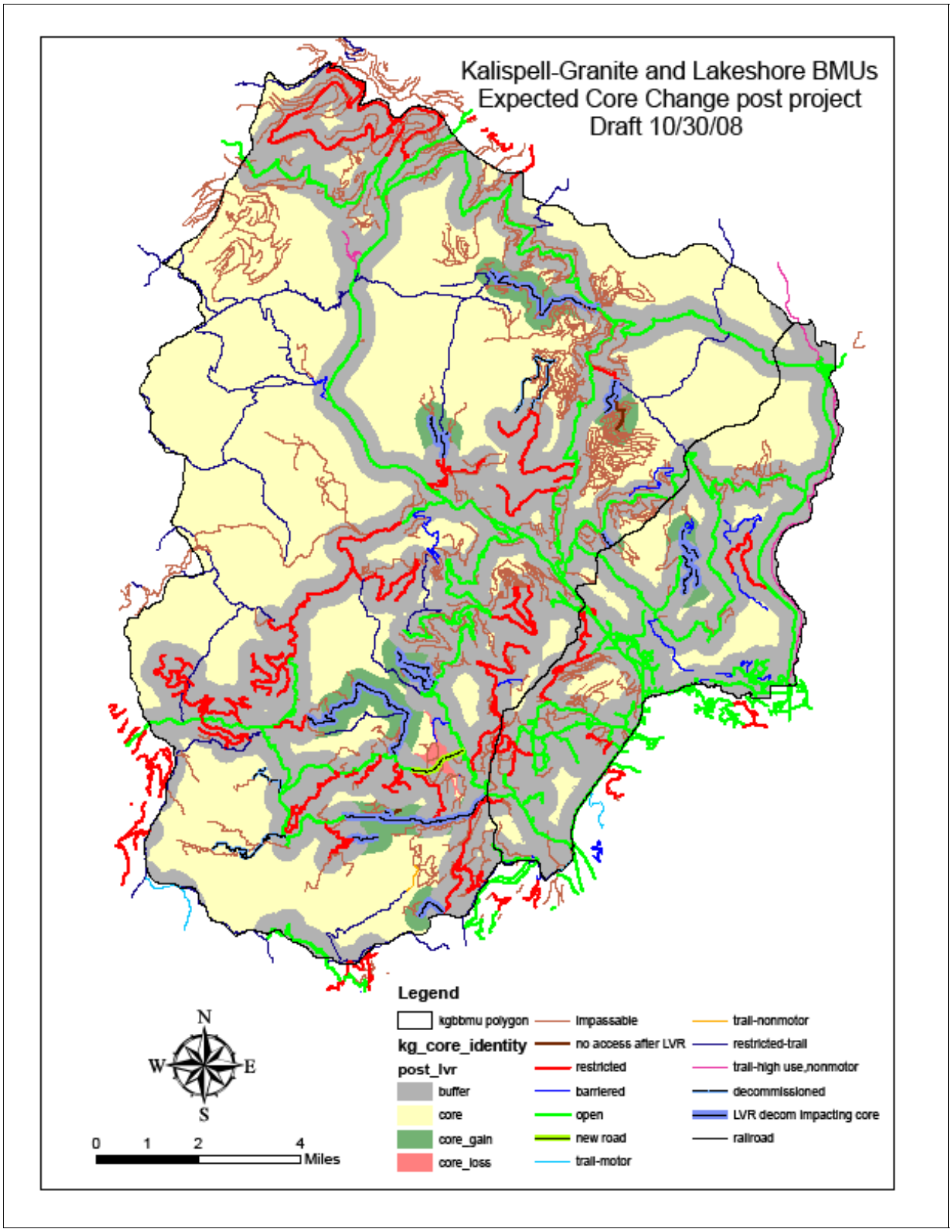
To reduce potential impacts to grizzly bears from the use of helicopters, several design features would be applied. Helicopter use would be kept to a minimum and only for tasks requiring their use or when they likely poses a lower level of disturbance to bears than alternative methods of accomplishing the same tasks.

Whenever possible, helicopters would use a flight path directly over open roads. Open roads are an existing source of disturbance for grizzly bears with a zone of influence from these roads extending out 500 meters to each side of the road (IGBC 1998). The zone of influence for helicopters varies in the literature from 500 meters to over 3,000 meters from the flight path or to the nearest ridgeline (Christensen and Madel 1982, USDA Forest Service et al. 1988, USDI Park Service 2003). Through past projects and ongoing discussions with the Fish and Wildlife Service, the zone of influence for the use of helicopters is considered 800 meters from the flight path. By requiring flight paths to remain over open roads when possible, it lessens the overall likelihood of disturbance to grizzly bears because there would

be overlap between the zones of influence of the road and flight path instead of creating two distinct zones of influence that would potentially affect more habitat.

The height above ground level at which aircraft fly can influence how much of an effect the aircraft has on wildlife. The height recommended in literature for reducing or eliminating disturbance to wildlife varies from 150 meters to 700 meters above ground level (Reynolds et al. 1986, Efroymson et al. 2000, USDI National Park Service 2003, Klein 1974). While recommendations vary, ongoing discussions between the Forest Service and Fish and Wildlife Service have considered 500 meters above ground level the prudent height at which the intensity of aircraft disturbance is diminished to a point less likely to cause a measurable impact to grizzly bears. Consequently, whenever it is feasible, taking into account flight safety, topography, necessary landings, sling loading, and other pertinent factors, helicopter flights conducted as part of project activities would occur at a minimum of 500 meters above ground level.

Figure 3-35. Map of Kalispell-Granite, and Lakeshore BMUs within the project area showing anticipated changes in core habitat



Core habitat within the Kalispell-Granite bear management unit would be increased by 15,350 acres (5.6 percent of BMU) as a result of implementation of the road decommissioning activities included with the proposed action. This would result in 55.75 percent of the Kalispell-Granite bear management unit being available as core habitat by year 2013. The proportion of spring habitat within core habitat would also be increased by 622 acres (1%) as a result of implementation of this alternative (Table 8). This would be accomplished through road decommissioning or storage of roads FR#1323, FR#1323A, FR#657, FR#1014, FR#638B, portions of FR#308, FR#656 and FR#1351, totaling approximately 25 miles (Figure 4)(Table 9). The roads and road segments identified for storage or decommissioning are currently managed as restricted access roads and many are not currently passable to motorized vehicles. Decommissioning of road FR#308 and FR#1014 would increase core habitat by 420 acres, offsetting the loss of core and security habitats resulting from construction of FR#308 reroute and the loss of security habitat associated with project activities. Decommissioning or storage of roads other than FR#308 would increase core habitat and reduce total road densities within this bear management unit, bringing the Kalispell-Granite BMU into compliance with the terms and conditions of the 2001 Amended Biological Opinion for the Continued Implementation of the IPNF Land and Resource Management Plan for the level of core habitat, open road densities and total road density.

Table 3-33. Grizzly bear habitats (spring, summer, fall) within core habitats within the Kalispell-Granite and Lakeshore bear management units.

Habitat	***Kalispell-Granite BMU***		***Lakeshore BMU***	
	Within Core prior To proposed action (Percent)	***Within Core after Proposed action (Percent)***	***Within Core prior To proposed action (Percent)***	***Within Core after Proposed action (Percent)***
Spring	4,385 (10%)	5,007 (11%)	637 (19%)	637 (19%)
Summer	4,168 (10%)	4,478 (10%)	438 (13%)	466 (13%)
Fall	34,120 (80%)	36,814 (79%)	2,346 (69%)	2,349 (69%)
total	**42,672**	**46,302**	**3,419.99**	**3.452**

Project level mitigation would maintain visual screening between timber harvest units and open road within the project area. Timber harvest units adjacent to FR#2213, 2516 and 2241 would maintain visual screening either through topography or vegetation for the equivalent of one sight distance for roads edge. This would attempt to ensure the vulnerability of grizzly bears does not increase during hunting season.

The roadside/surface maintenance (road reconditioning) identified for designated haul routes generally involves minor improvements within the road prism (brushing, blading, culvert replacement, and gravelling), and would take place on roads that are currently open to the public or on restricted roads that would remain restricted through the active bear season. Since an ambient level of disturbance is presumed to originate from open roads, it is unlikely that improved surface conditions would result in additional displacement. Improvements to approximately 4.5 miles of restricted roads during project implementation would not result in long-term increases in traffic, as use of these roads following project implementation would be limited to administrative use, of which the levels of use by season would follow that established within the amended biological opinion (USFWS 2001).

Table 3-34. Table of roads which would be either decommissioned or put into storage to provide change (increases of decrease to core habitat within the Kalispell-Granite and the Lakeshore bear management units.

Bear Management Unit	Road Number	Core Habitat Increase (acres)	Core Habitat Decrease (acres)	Geographic Location
Kalispell-Granite	1014	902		Boulder Mountain
	1323 & 1323a	412		Blacktail Mountain
	1376	402		Zero Creek
	1362c & 1362d	350		Indian Mountain
	337b	163		Virgin Creek
	638b	9		Granite Mountain
	657	1180		Diamond flats
	1351	232		Bath Creek
	308	428		Kalispell Creek
	308 reroute		121	Kalispell Creek
Lakeshore	1340a, 1340e & 1340d	308		Fedar Creek
	638b	29		Granite Mountain

Cumulative Effects Common to Both Alternatives

The following past, ongoing and reasonably foreseeable actions are considered relevant in a cumulative effects discussion for grizzly bears:

Past Activities and Events – It is unknown to what extent past timber harvest impacted grizzly bears in the short term (during implementation), since it is likely that grizzly bears were at low densities in North Idaho at the time of Federal listing in 1975, although it can be assumed that some displacement of bears may have occurred. The longer term effect of some of the more recent regeneration harvests, as well as the larger regeneration harvests done from the late 1960s through the early 1990s, is the reduction of forest cover and the potential increase of foraging habitat in the form o shrubfields. The construction of roads associated with these harvests likely reduced grizzly habitat effectiveness as a result of road related activities. Trail construction and subsequent use result in increased level of intrusion into grizzly bear habitat which likely resulting in reduced habitat effectiveness when trails were associated with quality habitats and or an increased level of mortality for bears as human use into areas increased.

Current Management Activities – Personal use firewood gathering and non-motorized recreation would not significantly result in any additions displacement effects to grizzly bears since none of these activities would elevate road densities. Road and trail maintenance activities, which are ongoing, have design criteria and timing restrictions, which reduce potential displacement impacts to bears. Continued fire suppression would help retain forest cover, further contributing to reduction of foraging habitat, although

extended fire suppression activities on larger scale fires may have adverse effects to bear through displacement due to use of mechanized equipment, but in the long term would provide a potential benefit to bears depending on the post fire shrub response. Off-road motorized recreation can displace bears from preferred habitat, particularly recurrent use in a particular area. Noxious weed treatments and underburning would take place along roads and other disturbed areas, and would have a minor displacement effect on grizzly bears since an existing source of disturbance is already present. A temporary food storage order or restriction put in place in 2006 within portions of the Priest Lake Ranger District and overlaps with the extreme eastern portion of the planning areas, has had a positive impact on bears, by reducing the opportunity for food conditioning reduces the potential mortality risk for bears. Sport hunting for big game species both within Washington and Idaho would continue to contribute to grizzly bear mortality through mistaken identity. The Granite-Reeder Sewer land exchange, which is located within the project area is located outside of the grizzly bear recovery area and would have little impact on grizzly bears. Currently the Idaho Panhandle National Forests is participating in development of a strategy, for the management of access within the Selkirk and Cabinet-Yaak grizzly bear recovery area. This strategy will develop management standards for each bear management units in regards to core habitat, open road density and total road density.

Currently active USFS timber sales – There are no active timber sale within the cumulative effects area on National Forest System lands.

Activities on other ownerships – Stimson Timber Company currently owns and manages approximately four square miles of property and Forest Capital Partners (FCP) owns one square mile of property in the Kalispell-Granite bear management unit. These lands are already roaded, so any future activities would probably emanate from existing roads. Within the Lakeshore bear management unit the development of private lands for residential use has been ongoing over the past decade. New homes, many for summer residences, are being constructed each year. With each new residence within the area, the potential exists for conflicts with bears (black and grizzly) for food conditioning and human habituation, which in many instance lead to the need to remove these bears from the population. Stimson Timber Company proposed future timber harvest on approximately 961 acres of there ownership within the project area. This harvest is outside of the grizzly bear recovery area but does received occasional use by bears.

In 2003, most of the Bismark Meadows areas was incorporated into the Wetland Reserve program administered by the Natural Resource Conservation Service. This has resulted in dramatic changes in the habitat values for grizzly bear within the Bismark Meadows area by improving spring habitat through a reduction in disturbance and improving forage production. Where previously livestock operations and the growing of agricultural products were predominant with the area, a steady conversion to wetland and meadow habitat is occurring. Starting in 2006, private conservation groups have begun to purchase property within this area with the goal of consolidating the ownership for grizzly bear conservation.

Conclusion

The proposed action would result in displacement from the project areas during project activities. This would be partially mitigated by implementing activities outside of the critical spring season in all BMUs, and restricting timber felling and hauling within the Kalispell - Granite and Lakeshore bear management units to the winter season. Core habitat and security habitat for grizzly bears would be impacted by construction of the Road 308 reroute but mitigated by decommissioning or storage of Forest Road 308 prior to beginning of the construction of the reroute. Within the Lakeshore bear management unit, security habitat would be reduced but would be mitigated by decommissioning or storage of a portion of Forest Road 1340. A no harvest buffer adjacent to all spring habitats including Bismark Meadows would be retained thus maintaining opportunities for grizzly bear security when using these important habitats. Strict food and trash handling requirements would be implemented by all contractors during the implementation of project activities, thus assuring no food conditioning of bears would be indirectly

associated with project activities. Food conditioning of grizzly bears within the project area by private residences is still a problem and will likely continue to be a source of mortality risk for bears and a safety risk for other residents and recreational users. Continued residential development within the Lakeshore BMU will potentially continue and provide additional attractants for grizzly bears, increasing potential mortality risk for bears. Ongoing land acquisitions within the Bismark Meadows area will work towards retaining important habitat for grizzly bears and prevent further development within that area, reducing future mortality risks for bears. Core habitat would be significantly enhanced within the Kalispell-Granite BMU and would be increased above the minimum threshold of 55 percent identified within the forest plan as amended (1987). The proposed action would result in an increase in core habitat and reduce total road densities within both bear management units, resulting in the Kalispell-Granite BMU being brought up to management standards. Cumulatively, the proposed action would have a beneficial impact to grizzly bear once completed. However, there would be a short-term impact to core habitat and security that could potentially displace grizzly bear. Therefore, the implementation of the proposed action is ***likely to adversely affect*** grizzly bears or their habitat during project activities because of the disturbance associated with the project.

Consistency with Forest Plan and Other Regulations

When implemented the proposed action would be consistent with the Forest Plan direction to manage the habitat of species listed under the Endangered Species Act (USDA 1987 p. II-6), by bringing the Kalispell-Granite and Lakeshore bear management unit into compliance with the Draft Supplemental Forest Plan Motorized Access Management Plan. Additionally when fully implemented this proposed action would also be consistent with the Terms and Conditions of the Amended Biological Opinion for the Continued Implementation of the IPNF Land and Resource Management Plan (USDI 2001.

Sensitive Species

Black-backed Woodpecker

Methodology

As discussed in the "Affected Environment" section, black-backed woodpeckers utilize a wide range of habitats if sufficient forage is available. This analysis focuses on post-fire areas or areas with bark beetle outbreaks of their importance as foraging habitat. Samson's (2006) habitat threshold analysis, which produces an estimate of 30,000 acres as the critical habitat needed in the Northern Region to maintain a minimum viable population.

Evaluation of black-backed woodpecker habitat is based on recommendations from the Black-backed Woodpecker Northern Region overview (USDA 2007b). The analysis consists of determining if post fire or bark beetle infested areas are impacted by the proposal, ascertaining whether sufficient habitat exists in the planning area to support a minimum viable population based on Samson's estimate of 30,000 acres, and documenting project effects on available habitat in the analysis area. For project analysis purposes, it was assumed that acres affected by timber harvest (including selective harvest) would no longer be considered black-backed woodpecker habitat, and the 1,475 acre wildlife burn would convert to foraging habitat. The cumulative effects analysis area for this species is the project area.

Effects of the No Action Alternative

Direct and Indirect Effects

Within the analysis area there are about 22,692 acres of NFS lands capable of supporting forested habitats. While there are no recently burned habitats in the project area, pockets of insect infestations (particularly mountain bark beetle) can be found throughout the Priest Lake Ranger District.

No immediate changes in snag habitat would occur as a result of implementing this alternative. Design criteria requires snag habitat be maintained at levels at of above average levels of habitat types within the project area. Habitat conditions would change according to natural events over time. As a healthy forest matures, some trees die from competition and other natural forces, resulting in higher quality and quantity of snags. Consequently, nesting and foraging habitat would be improved for snag dependent species in healthy, low risk stands.

In the high risk stands, the prevalence of root disease and insect damage would be expected to spread in this alternative, resulting in higher levels of tree mortality. The dead trees would be replaced by other shade tolerant species, which would be re-infected and die, perpetuating the cycle (vegetation ch3). This change would gradually replace such species as ponderosa pine, white pine, and western larch, preventing many stands from reaching mature structure.

Tree mortality would continue to provide an abundance of nesting and foraging habitat for some species. Black-backed woodpeckers are restricted primarily to post-fire habitat, their populations would remain at low endemic levels. However, high fuel accumulations resulting from elevated tree densities would increase the probability of a chance ignition becoming stand-replacing fire (Fuels ch3). If a stand-replacing fire were to occur, it would create a temporary flush of habitat for black-backed woodpeckers.

Effects of the Proposed Action

Direct and Indirect Effects

The Black-backed Woodpecker Overview (USDA 2007b) does not define the level of bark beetle infestation necessary for areas to be considered “infested”, and an argument could be made that practically every mixed conifer stand in the Northern Region has some level of insect infestation. Given the amount of forested habitat on the District identified by Forest Health Protection personnel as infested by mountain pine beetle and Western balsam bark beetle, it is assumed that some beetle-invested stands (and related snag availability) would be impacted by the action alternatives. The proposed action would harvest about 2,378 acres that could potentially be providing black-backed woodpecker habitat. In all likelihood, harvest will reduce snag densities below what this species prefers, although untreated portions of shelterwood units would remain as habitat. Tree mortality would continue in untreated stands, and additional snags may be created by underburning treated stands, thus producing more snag habitat. In addition, the 1,475 acres big game habitat burns are likely to create black-backed woodpecker foraging habitat. As discussed above, there is a surplus of beetle-infested habitat on the District to meet recommendations for a minimum viable population across the entire Ecological Province (USDA 2007b). The potential loss of less than 2% of black-backed woodpecker habitat on the District would not threaten the viability of a species that has nearly double the recommended amount of habitat for minimum viable populations in the Province concentrated in a relatively small area (Ranger District).

Years of active fire suppression have resulted in significant reduction of black-backed woodpecker habitat, causing populations of this species to remain at relatively low levels. While tree cutting would remove many small snags, and subsequent stand conditions would result in lower levels of small snag recruitment, nearly two-thirds of USFS-administered lands in the project area would remain unaffected by past and proposed cutting. Areas outside of proposed treatment areas would continue to be susceptible to insect and disease, thereby perpetuating small to medium sized snag habitat for black-backed woodpeckers

Intermediate harvesting of small diameter trees would be designed to increase the overall health and vigor of the stands. Since these activities are designed to produce stands with lower densities of larger stems and to reduce tree mortality, they could potentially have negative long-term impacts on black-backed woodpeckers, which prefer high densities of snags. However, black-backed woodpecker habitat would

continue to be produced on many moist forest habitats, as well as some untreated dry forests, in and adjacent to the project area

Cumulative Effects

The following past, ongoing and reasonably foreseeable actions are considered relevant in a cumulative effects discussion for black-backed woodpecker:

Past Activities and Events – Past timber harvest on 8,914 acres of NFS lands in the project area has reduced snag densities in logged stands in nearly every instance, particularly prior to implementation of the Forest Plan in 1987 when standards for snag retention were adopted. The long-term impact of these activities is the reduction of snags of all sizes on the acres harvested. In subsequent years, snag retention and snag recruitment (leaving higher densities of green trees for future snags) in harvested areas has improved through implementation of Forest Plan standards and, more recently, adoption of the Northern Region Snag Protocol (USDA 2000). Recently, as discussed above, tree mortality in untreated stands has increased Forest-wide, increasing available black-backed woodpecker habitat as a consequence. As a result, the legacy of historic logging in the project area is limited to a decrease in large-diameter (>20 inches dbh) snags. Production of smaller snags in untreated areas, as well as in harvest units >30 years old, due to natural mortality of immature trees from insect and disease infestations has compensated for the loss of small-diameter snags due to timber harvest.

Current Management Activities – Firewood cutting is anticipated to continue along seasonal and yearlong open roads, and has the potential to reduce snags within 50 meters of open roads. This activity could impact as much as 1,600 acres (5 percent of forested habitat) in the IPNF portion of the analysis area. However, not all snags near drivable roads will be taken by woodcutters, particularly smaller-diameter snags often utilized by black-backed woodpeckers. Also, as discussed above, insect infestations are expected to continue to produce small-diameter snags at a far greater rate than they can be removed. Black-backed woodpeckers have been described primarily as a post-fire obligate species – a species dependent upon habitat that results from a mixed lethal or stand-replacement fire that produces an abundance of snags. Interrupting the periodic disturbances created by lethal wildfires through continued fire suppression retards the emergence of post-fire habitat, but this same activity has contributed to the current conditions that make these stands vulnerable to insect infestation (high densities of small-diameter, suppressed trees). Conversely, if a wildfire occurs in the project area that could not be suppressed, habitat may be enhanced. Various recreation activities and routine road maintenance are unlikely to have any impacts on black-backed woodpeckers, since these activities would not measurably affect habitat. It is unlikely that noxious weed treatments would have any impacts on black-backed woodpeckers. This would not affect snag levels or other important habitat components.

Currently active USFS timber sales – There are no other current or proposed USFS timber sales within the black-backed woodpecker analysis area.

Activities on other ownerships – Stimson Lumber Company proposes timber harvest on approximately 961 acres of their ownership. It is likely that not all of these areas would be regeneration harvested and the potential for some level of snag retention would occur. As discussed in the introduction to cumulative effects analysis, other ownerships cannot be relied upon for long-term habitat contributions because they are subject to modifications (e.g. rural developments, forest land conversions) and irretrievable alterations. Due to the uncertainty of management actions and lack of detailed habitat data on these ownerships, the USFS assumes no contribution of suitable habitat for Sensitive species/MIS from adjacent property.

Conclusion

In conjunction with past, present and foreseeable actions the action alternative would further reduce the quantity of available snag habitat; however, tree mortality would continue to persist in the analysis area,

allowing black-backed woodpeckers to maintain populations at low endemic levels. As a result, black-backed woodpecker populations would remain at reduced densities and their current distribution would be sustained. Samson (2006) calculated that while the IPNF could potentially only support 18-31 pairs of nesting black-backed woodpeckers in recent post-fire habitats, the Forest could support nearly 1,000 pairs in insect infested habitats. Since no recent post-fire habitat would be affected, medium-sized (10-20 inch) snags are abundant on the District, and considerably less than 1 percent of the potential nesting habitat on the IPNF would be impacted, the proposed action is unlikely to result in a loss of viability of this species or trend it toward Federal listing.

Samson (2006) concluded that short-term viability of the black-backed woodpecker in the Northern Region and on the IPNF is not an issue:

- No scientific evidence exists that the black-backed woodpecker is decreasing in numbers.
- The extent and connectivity of forested habitat has increased since European settlement.
- Amounts of small and mid-size trees have increased since European settlement.
- Well-distributed and abundant black-backed woodpecker habitat exists on today's landscape.

Level of timber harvest is insignificant in the Northern Region (in 2006, 16,991 acres of 22,351,312 acres or 0.08 percent of the forested landscape) and IPNF (3,452 acres of 2,470,394 forested acres or 0.14 percent). In addition, salvage harvest made up a very small portion of this in 2006, both regionally (2,733 acres of 22,351,312 acres or 0.01 percent) and on the IPNF (227 acres of 2,470,394 forested acres or <0.01 percent) (http://www.fs.fed.us/r1/forest_range/timber_reports/timbersales.shtml).

Consequently, the proposed action may impact black-backed woodpeckers or their habitat, but would not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species.

Consistency with Forest Plan and Other Regulations

All alternatives are consistent with the Forest Plan direction to manage the habitat of species listed in the Regional Sensitive Species List to prevent further declines in populations, which could lead to federal listing under the Endangered Species Act, neither alternative would cause a loss of viability for this species (USDA 1987 p. II-28).

Flammulated Owl

Methodology

As discussed in the "Affected Environment" section, mature, open-grown, dry-site forests are considered the most critical and limiting habitat feature for flammulated owls. Flammulated owl habitat was evaluated through a habitat suitability index model (HSI) using data from the Forest timber stand database (TSMRS), and updated to reflect changes in condition identified by field exams or aerial photo interpretation. The model counts as capable habitat stands in habitat groups 1 through 3 (dry grand fir, all ponderosa pine and Douglas-fir); or habitat group 4 (moist grand fir) on south, southwest or west aspects where elevation is 3,000 feet or less. Suitable habitat includes those capable stands with a forest (cover) type of ponderosa pine or Douglas-fir; mature sawtimber or old-growth in size with at least one tree per acre 14 inches dbh or larger; canopy closure between 35 percent and 65 percent based on direct measurement or estimated from basal area; and less than ½ of the stand has had a regeneration harvest since the stand exam.

This query may overestimate flammulated owl habitat. The TSMRS database contains inconsistent data on snag distribution. This is an obligate snag-dependent species which nests in cavities in snags at least 15 inches dbh. Low elevation Douglas-fir and grand fir habitat types on dry aspects have the potential to

grow flammulated owl habitat. While, as a result of fire suppression, they typically have too dense an understory to be suitable for this species, with active management they could become suitable for flammulated owls. The model may also underestimate suitable habitat somewhat by eliminating stands that have previously been harvested using group selection prescriptions. On two separate occasions, flammulated owls have been documented using stands harvested with this prescription (USDA 2006). Consequently, District personnel field verified a subset of flammulated owl capable habitat in the project area for model validation purposes.

The habitat model identified 2,733 acres as capable flammulated owl habitat in the Lakeview-Reeder project area. The potential effects on the flammulated owl and its habitat were determined by predicting the change in habitat suitability that would result from each alternative.

No Action

While the no action alternative would not alter existing vegetation patterns through mechanical means, mortality caused by agents such as root disease and insect outbreaks would continue to exert change on habitat conditions. There would be a continued shift toward more shade-tolerant species in the majority of the stands. Forest encroachment that historically would have been held in check by low-intensity fire would continue to proliferate and crowd out the remaining 176 acres of open stands of ponderosa pine and Douglas-fir. Douglas-fir trees would continue to be recycled through disease-prone stands, creating a scenario that would discourage the development of more open, older forests of ponderosa pine and Douglas-fir (reference). Old-growth dry-site forest stands would become increasingly crowded in the understory by shade-tolerant species, causing these stands to move further from suitable habitat conditions (Flammulated Owl _project file). Consequently, habitat suitability for flammulated owls would decline.

As discussed in the “Affected Environment” section, much of the capable flammulated owl habitat within proposed units is currently not suitable due to dense canopy cover or undesirable species composition. Without management intervention, this habitat would trend toward denser cover of smaller trees and away from achieving suitable habitat conditions for flammulated owls. Dry habitats in the project area would continue to degenerate. High fuel accumulations resulting from fallen trees would lead to a higher risk of stand-replacing fires. If a stand-replacing fire were to occur, it would take at least 100 years for successional processes to restore habitat that would begin to provide suitable nesting conditions for flammulated owls.

Effects of the Proposed Action

Direct and Indirect Effects

The proposed action would harvest approximately 31 acres of timber in capable flammulated owl habitat. No areas of suitable flammulated owl habitat would be impacted by timber harvest. Approximately 13 of the 31 acres would be group selection harvested and underburned, the other 13 acres would be an intermediate harvest. These harvest areas contain a healthy component of large Douglas-fir and occasional large ponderosa pine, but also have substantial secondary canopy layers that collectively have made these stands too dense for flammulated owl occupation (Flammulated Owl_ project file). Removal of smaller trees in clumps (“groups”) would open up these stands and trend them toward suitable habitat conditions for this habitat guild. Group selection harvest is expected to reduce overstory canopy to about 35-45 percent (averaged across the stand/unit).

Given that flammulated owl habitat is generally restricted to areas with canopy cover between 35 and 65 percent (Howie and Ritcey 1987), this would reduce canopy cover to the lower threshold of suitability for 5-10 years following harvest. Treatment would concentrate on portions of the stands with congested understories, while leaving the parts with an existing structure of large, widely spaced stems untouched. If left untreated, it is doubtful that these acres would reach suitable habitat conditions in the near future

absent a stand-replacing disturbance event the tendency for overcrowding in the understory. Treatment would promote the restoration of more open grown, older forests of ponderosa pine/Douglas-fir on these sites and lead to long-term habitat stability for flammulated owls (reference). It would also greatly reduce fuels in these stands and the associated risk of stand-replacing fire through this small portion of the project area. With the current arrangement of vegetation, it is unlikely that the Lakeview-Reeder project area supplies ideal flammulated owl habitat.

The proposed action would build approximately 4 miles of new permanent/new cost share roads but none of the road would remove capable flammulated owl habitat. Approximately 794 ft of existing road that crosses unsuitable flammulated owl habitat is proposed for decommissioning within the project area. This road is already considered as impassable condition, so the impact/improvement for flammulated owls would be immeasurable

The shrubfield burning would also affect 821 acres of capable (but not suitable) within 9 areas that contain flammulated owl habitat. This activity will contribute to the overall strategy of reintroducing the role of fire on the landscape, and over time may establish long-lived serial trees species such as ponderosa pine and western larch.

Cumulative Effects

The following past, ongoing and reasonably foreseeable actions are considered relevant in a cumulative effects discussion for flammulated owl:

Past Activities and Events – Information on fire history within the project area indicates that approximately 2,425 aces of habitat considered as capable for flammulated owls burned at least once in the past 130 years. Of this approximately 82 percent of the unsuitable flammulated owl habitat had at least one fire impacting those acres with the last fire activity being in 1926. Of the 176 acres of suitable flammulated owl habitat, which had fire history information, only 7 acres had no historical fire history and the remaining suitable habitat had been impacted by one or more fire events in the past 130 years. Of the 2,759 acres of capable flammulated owl habitat within the cumulative effects area, 337 acres or 12% had some previous harvest activity (223 acres regen, 114 acres thinning). Of the 176 acres of suitable flammulated owl habitat 38 acres had been previously thinned.

Only about 9 miles of road within the planning area have been built across capable habitat, which equates to approximately 31 acres. Potions of these roads have been decommissioned, so a portion of these acres may in the future recover as flammulated owl habitat. About 6.3 miles (or 4 acres) are associated with open or gated roads. These roads are most likely to remain on the landscape and most at risk to lose snag habitat due to fuelwood gathering. Snagging operations occurred after the 1926 and 1931 fires in an effort to remove large snags that could act as lightning rods for future ignitions. This process removed many of the largest, tallest snags on the landscape, decreasing the number of suitable resting/nesting sites for flammulated owl prey.

Current Management Activities – Firewood cutting is anticipated to continue along seasonally and yearlong open roads. This activity has the potential to reduce large snags within 50 meters of open roads, and within capable and suitable habitat for flammulated owls. Interrupting the periodic disturbances created by lethal wildfires through continued fire suppression probably has mixed impacts on flammulated owls. High-intensity wildfire often reverts stands to an earlier successional stage. In some cases this would prevent immature stands from reaching habitat suitability, and in other cases would regenerate stands with high densities of small stems that may never reach suitability lacking disturbance. Regardless, fire suppression through the years has contributed heavily to the reduction of open grown ponderosa pine stands by preventing periodic underburns in these stands (fuels section reference). Since this activity is expected to continue, the effects would be partially mitigated by activities described in this

proposal. Various recreation activities and routine road maintenance are unlikely to have any impacts on flammulated owls, since they would not result in habitat modifications and flammulated owls are not readily disturbed by sporadic human activity (reference). It is unlikely that noxious weed treatments would have any impacts because the habitat modifications from this activity would be inconsequential for flammulated owls.

Currently active USFS timber sales – There are no other current or proposed USFS timber sales within the analysis area which would impact either suitable or capable flammulated owl habitat.

Activities on other ownerships – Approximately 5,878 acres or 20 percent of the cumulative effects analysis area is on private lands, including approximately 1,486 acres belonging to Stimson Lumber Company, and approximately 4,392 acres belonging to other owners for harvest, agricultural or residential purposes. These acres (even if capable) will likely provide little in the way of suitable flammulated owl habitat in the future. Stimson Lumber Company proposed to harvest approximately 961 aces of lands within the project in the future. No impacts are anticipated of the lack of either suitable or capable habitat within these land parcels.

Conclusion

The no action alternative would have no short term impact on flammulated owls or habitat within the project area. Although existing suitable habitat will continue to be threatened by stand replacing fire, which could reduce the amount of suitable habitat for this species within the planning area.

With the proposed action, the proposed treatments would reverse the general trend of affected stands toward unsuitable habitat conditions, and would contribute to stability of habitat conditions for flammulated owls. The proposed action does not involve commercial timber harvest in currently suitable habitat. While there may be some risk associated with timber harvest of capable habitat (snag loss and reduction of roosting habitat), several studies have documented flammulated owl use of selectively logged sites (Howie and Ritcey 1987, van Woudenberg 1999, Wright 1996, Wright et al. 1997). Additionally, there would be little risk to flammulated owls, in treating stands that are currently unsuitable due to excessive overstory and understory canopy. These stand are generally not occupied by flammulated owls.

Samson (2006) estimates that the IPNF contains sufficient habitat for about 426 flammulated owl pairs. There would be no reduction of suitable flammulated owl habitat acres as a result of this proposal. Effects of actions would not indicate a local or regional change in habitat quality or population status of the small acreage of habitat that would be impacted and that no suitable habitat would be adversely impacted, allowing flammulated owls to maintain their current distribution. Samson (2006) concluded that short-term viability of the flammulated owl in the Northern Region and IPNF is not an issue:

- No scientific evidence exists that the flammulated owl is decreasing in numbers.
- The extent and connectivity of forested habitat have increased since European settlement.
- Well-distributed and abundant flammulated owl habitat exists on today's landscape.
- The level of timber harvest is insignificant in the Northern Region (in 2006, 16,991 acres of 22,351,312 acres or 0.08 percent of the forested landscape) and IPNF (3,452 acres of 2,470,394 forested acres or 0.14 percent). In addition, salvage harvest made up a very small portion of this in 2006, both regionally (2,733 acres of 22,351,312 acres or 0.01 percent) and on the IPNF (227 acres of 2,470,394 forested acres or <0.01 percent) (http://www.fs.fed.us/r1/forest_range/timber_reports/timbersales.shtml).

Based on this analysis, the no action alternative or the proposed action may impact flammulated owls or their habitat, but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species.

Consistency with Forest Plan and Other Regulations

All alternatives are consistent with the Forest Plan direction to manage the habitat of species listed in the Regional Sensitive Species List to prevent further declines in populations, which could lead to federal listing under the Endangered Species Act. (USDA 1987 p. II-28).

Fisher and Marten

Methodology

Fisher/marten denning habitat was evaluated using a habitat suitability model derived from data in the Forest timber stand database (TSMRS), and updated based on field exam or site visit results. The model counts as capable habitat stands in habitat groups 3 through 10 (moderately dry Douglas-fir or grand fir, moist grand fir, western red cedar, western hemlock, and Engelmann spruce / subalpine fir). Suitable habitat includes those capable stands with a forest (cover) type of grand fir, western redcedar, cottonwood/aspen, Engelmann spruce, subalpine fir, western hemlock, Douglas-fir or lodgepole pine; mature sawtimber or old-growth in size with at least 20 trees per acre 14 inches dbh or larger; canopy closure of at least 50 percent based on direct measurement or estimated from basal area; and no regeneration harvest (clearcut, shelterwood or seedtree), improvement or liberation cut on more than ¼ of the stand acres since the stand exam. The potential effects on fisher/marten denning habitat were determined by predicting the change in habitat suitability that would result from each alternative.

Fisher and marten denning habitat is difficult to model because the timber stand database does not consistently characterize the amount of large woody debris these species require for denning and cover. While it is possible that the model overestimates denning habitat there is incomplete data on snags or down logs, this is unlikely for the following reasons: 1) any confirmed old growth within capable fisher/marten habitat is considered currently suitable, as these mature stands provide the large amounts of standing and down material that these species prefer; 2) most unlogged moist-site stands in the project area are probably providing sufficient dead and down material of the usually large amount of dead and down material that at associated with moist site habitats, but may be eliminated by the model based on size class information or lack of other data, and 3) several previously logged (salvage cut) stands in the project area clearly contained enough coarse woody debris and residual overstory canopy to provide fisher denning habitat. Allocated moist-site old growth in capable fisher/marten habitat comprised about 3,578 acres, and there are an additional 9,846 acres of mature forest in the analysis area that have no record of logging activity. As a result, the final suitable habitat estimate of 8,744 acres is probably conservative. The analysis also assumes that treated acres would no longer be suitable denning habitat reductions in overstory canopy cover, but a fisher's generalist diet implies that they will forage in nearly any type of forested habitat provided there is sufficient ground cover to attract prey.

of their preference for older stands with dense canopy cover and large snags (used for maternal dens), suitable fisher habitat closely mimics that required for other old-growth associated species such as northern goshawk. However, unlike goshawks, fishers prefer stands with congested understories for the cover these stands offer for hunting and avoiding predators. Consequently, high percentages of tree mortality in stands affected by insect infestations are unlikely to substantially reduce denning habitat.

The analysis of general fisher habitat (resting, denning and foraging) is based on management guidelines from Fisher Biology and Management in the Western United States (Heinemeyer and Jones 1994) and DRAFT, Forest Carnivores in Idaho (IDF&G 1995). Although the guidelines make a distinction between "preferred" and "suitable" habitat, they are grouped together to assess habitat quality; and so were not

separated for this portion of the analysis. IDF&G (1995) also makes minor distinctions between fisher and marten habitat, but *Martes* species were treated as a guild in this assessment. The percent of the area in mature/old forest structure is compared to the guidelines, and changes in forest structure from the existing condition as a result of project activities are discussed.

The analysis uses the total capable acres 50,758 on USFS lands in the project area as a "subdrainage," following the recommendation of Heinemeyer and Jones (1994) for subdrainage size (6,178 - 61,780 acres). Based on the amount of mature/sawtimber forest structure and old growth, the existing condition of the Lakeview-Reeder fisher analysis area currently meets criteria for a "high quality" subdrainage.

Effect of the No Action Alternative

Direct and Indirect Effects

The no action alternative would preserve potential foraging habitat for fisher, and would bring some stands into suitable denning condition more rapidly than treatment would, of fishers preference for stands with congested understories and dense overstory canopy cover. However, with this comes the increased risk of stand-replacing wildfire, which would effectively remove most burned-over areas from suitable fisher denning habitat for many years. The canopy cover of the drier types is higher than it would be under a natural fire regime, fisher may tend to use these dry site stands more now than they would have historically. Not coincidentally, these stands are at higher risk of stand-replacing wildfire than historic, open grown dry-site stands would have been. In summary, while the no action alternative would provide better fisher habitat than the action alternatives in the near future, there is a risk of denning habitat loss in the long term.

Effects of the Proposed Action

Direct and Indirect Effects

The proposed actions would treat approximately 3,158 acres of capable fisher/marten denning habitat, about 458 acres of which are currently suitable. Two thirty three acres of the suitable habitat proposed for treatment would be an intermediate such as thinning and is anticipated to retain habitat values for fisher because of the amount of retained overstory cover and requirements of retention of dead and down wood. Regeneration harvest on the other 216 aces of suitable denning habitat would reduce the suitability of these stands for fisher and marten because of reductions in the overstory canopy cover and the larger tree component.

The loss of a relatively small amount of suitable denning habitat in the analysis area (4 percent) would be partially offset by reductions in fuel accumulations on 1,535 acres that may help protect adjacent riparian areas and other suitable habitat from future wildfire. In addition, 909 acres of currently unsuitable fisher habitat would be treated by an intermediate harvest and is not anticipated to delay these stands development into suitable habitat, but actually may enhance these stand development into suitable habitat by promoting a faster growing and healthier timber stand. Proposed regeneration of 958 acres of capable habitat would occur on habitats that are at high risk of insect infestations or disease. While high mortality in these stands may initially result in increased denning habitat (since there would be larger amounts of cavity habitat and down woody material), eventually these stands would lose or fail to develop the dense overstory canopy that fishers and martens prefer for denning and resting sites. Also, the applications of INFISH guidelines help maintain intact riparian habitats important to fishers.

Cumulative Effects

The following past, ongoing and reasonably foreseeable actions are considered relevant in a cumulative effects discussion for fisher:

Past Activities and Events – Information on fire history within the project area indicates that approximately 39,000 aces of habitat considered as capable for fisher burned at least once in the past 130 years. This equates to about 85% of the unsuitable fisher habitat having had at least one fire impacting capable fisher habitat within the cumulative effects area. Harvest history indicates that 16,134 or 27% of the fisher cumulative effects analysis area had some level of harvest treatment with half of that being regeneration harvest. The remaining 15% of unsuitable habitat had no fire impacts, however, many of these acres did have harvest activities. Of the 8,308 acres of suitable habitat that had fire history data, 5,655 acres or 68% had at least one burn within the last 130 years. Many of these acres were likely in sheltered draws or were in some way protected from the devastating impacts of the fires. It would be difficult to determine whether past fires impacted only unsuitable or suitable habitat for fishers within the cumulative effect area, but it is likely both were impacted. It is reasonable to assume that fire has had a significant impact to shaping the overall quantity and distribution fisher habitat within the cumulative effect area for this species.

Approximately 443 miles of roads within the fisher cumulative effects analysis area equates to approximately 1,611 acres of 3 percent of the capable fisher habitat being converted to road systems. Although approximately one-half of these roads have been allowed to naturally revegetate and have allowed some level of habitat recovery for fisher. Additionally, open roads within the project area provided access for furbearer trappers historically and likely contributed impacts to fisher populations.

Snagging operations occurred after the 1926 and 1931 fires in an effort to remove large snags that could act as lightning rods for future ignitions. This process removed many of the largest, tallest snags on the landscape, decreasing the number of suitable resting and den sites for fisher.

Current Management Activities – Firewood cutting is anticipated to continue along seasonally and yearlong open roads. This activity has the potential to reduce snags within 50 meters of open roads. Although it is unlikely to disrupt normal fisher use patterns, this activity could result in fisher habitat deterioration adjacent to open roads by removing large snags that represent future dead and down wood denning opportunities. As discussed above, it is unlikely that denning habitat limits fisher presence in the analysis area. Fire suppression activities are generally good for fisher habitat, as they protect denning habitat from stand-replacing fire and contribute to understory congestion in dry-site stands that provide cover for small mammals that fishers prey upon. As a result, continued fire suppression would partially offset the effects of this proposal and for the No Action alternative. Various recreation activities and routine road maintenance are unlikely to impact fishers, although motorized over snow travel can provide access for trappers who may inadvertently catch fishers. It is unlikely that noxious weed treatments would have any impacts on fisher. Noxious weed treatment are generally associated with road prisms.

Currently active USFS timber sales – There are no other current or proposed USFS timber sales within the fisher/marten analysis area.

Activities on other ownerships – Stimson Lumber Company plans to harvest approximately 961 acres in the future. It is likely that this would impact capable fisher habitat, thus potentially impacting the amount of suitable fisher habitat within the planning area in the future. As discussed in the introduction to cumulative effects analysis, other ownerships cannot be relied upon for long-term habitat contributions. They are subject to modifications (e.g. rural developments, forest land conversions) and irretrievable alterations. Due to the uncertainty of management actions and lack of detailed habitat data on these ownerships, the USFS assumes no contribution of suitable habitat for Sensitive species/MIS from adjacent property.

Conclusion

On the Priest Lake Ranger District, the amount of fisher denning habitat is comparable to the quantity available historically, as evidenced by comparison of the sum of mature/large and old growth forest size classes over time (see "Forest Structure", Ch. 3). Despite a general direction on the IPNF to restore long-lived early serial species, there has also been an effort to preserve old-growth stands, allow natural succession in riparian areas, and preserve and recruit large woody debris forest wide. While this management strategy may temporarily reduce fisher habitat at the local scale, habitat should improve for this species with time and should be maintained on a landscape scale. There would be no permanent increases in access with any of the alternatives, so there would be no decrease in security for fisher.

In addition, understory congestion in many dry-site stands is potentially providing suitable fisher habitat in areas that did not prior to fire suppression, and currently only a small percentage of dry-site stands on the District are proposed for treatment. Riparian areas (potentially suitable habitat and important travel corridors) would remain intact through application of INFISH buffers.

Also, the level of timber harvest is insignificant in the Northern Region (in 2006, 16,991 acres of 22,351,312 acres or 0.08 percent of the forested landscape) and IPNF (3,452 acres of 2,470,394 forested acres or 0.14 percent) in recent years (http://www.fs.fed.us/r1/forest_range/timber_reports/timbersales.shtml). Since fishers are already at extremely low densities in north Idaho, it is unlikely that habitat is limiting in the region. Given this information, it is doubtful that reduction of up to 4 percent of suitable denning habitat (<1 percent of capable habitat) in the project area under the proposed action would result in a loss of viability of this species.

Finally, standards outlined in the NRLMD will benefit fisher and marten as well as lynx. These standards assure that there will be limits to the amount of forest conversion over a given decade, and that snowshoe hare habitat will be protected to supply high densities of this important prey species. INFISH guidelines and BMPs will assure that riparian habitats important to fishers will be preserved. Consequently, the proposed action may impact fisher or their habitat, but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species.

Consistency with Forest Plan and Other Regulations

All action alternatives are consistent with the Forest Plan direction to manage the habitat of species listed in the Regional Sensitive Species List to prevent further declines in populations, which could lead to federal listing under the Endangered Species Act (USDA 1987 p. II-28) population viability for this species would not likely be impacted In addition, the Lakeview-Reeder project is consistent with Forest Plan direction for old-growth habitat management which would contribute to maintaining high quality habitat for this species. (Vegetation_ project file).

Townsend's Big-eared Bat

Methodology

The potential effects on Townsend's big-eared bat were determined by predicting potential impacts to habitat, including mining adits and mature and old growth habitats resulting from the alternatives.

Direct and Indirect Effects of the No Action Alternative

The no action alternative would not alter existing vegetation patterns within the project area in the vicinity of existing potential bat habitat in the form of old mining adits, which would potentially retain the utility of existing adits for adits. Habitats for bats in the form of mature and old growth stands where bats may seek exfoliated bark habitat would not be impacted.

Direct and Indirect Effects of the Proposed Action

Project level mitigation requires that all adits within the project area be buffered by a minimum of 100 meters from any timber harvest or burning activities. This is intended to reduce direct and indirect impacts to bats and potential habitat. Habitats for bats in the form mature and old growth stands where bats may seek exfoliated bark habitat would not be impacted because the proposed action does not proposed harvest within these timber types.

Cumulative Effects

The following past, ongoing and reasonably foreseeable actions are considered relevant in a cumulative effects discussion for Townsend's big-eared bats: Past Activities and Events – Logging activity within the project area that harvested old growth and or mature stands may have reduced habitat for this species by eliminating opportunities of roosting.

Current Management Activities – Personal use firewood gathering, various recreation activities, and continued fire suppression would not significantly impact habitat for Townsend's big-eared bat populations. These activities are unlikely to impact habitat, and potential modifications to forested habitat would be inconsequential.

Currently active USFS timber sales – There are no other current or proposed USFS timber sales within the project area.

Activities on other ownerships – There are no known projects on private lands within the project area which may impact this species.

Conclusion

The proposed alternatives would provide little or no risk to bats, especially Townsend big-eared bat during implementation because the existing vegetation within the vicinity of mining adits would be maintained thus potentially maintaining current conditions within the adit and adit entrance. Consequently, the action alternatives may impact Townsend's Big-eared bats or their habitat, but would not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species.

Consistency with Forest Plan and Other Regulations

All action alternatives are consistent with the Forest Plan direction to manage the habitat of species listed in the Regional Sensitive Species List to prevent further declines in populations, which could lead to federal listing under the Endangered Species Act (USDA 1987 p. II-28). Neither alternative would cause a loss of viability.

Western Toad

Methodology

The potential effects on western toads were determined by predicting potential impacts to breeding habitat (wetlands) and terrestrial habitat resulting from the No Action and proposed actions.

Effects of the No Action Alternative

The No Action alternative would not impact Western toads. There would be no alteration of upland habitats or breeding habitat with this alternative.

Effects of the Proposed Action

Direct and Indirect Effects

Implementation of the proposed action may result in the temporary disturbance of western toads and upland habitat within the treatment areas. Indirect effects to breeding habitat have the potential to occur if there is increased sediment delivery to wetlands and waterways as a result of tree skidding and hauling. However, with Best Management Practices (BMPs) in place to protect water quality and fish habitat (see Hydrology section), and INFISH protection measures implemented to protect waterways and wetlands, impacts to western toad breeding areas should be minimal

The proposed action would result in several large (>40 acres) openings, although retention trees in shelterwood units would somewhat moderate climatic effects. Western toads may avoid these openings for 5-10 years following harvest, since toads have an affinity for forested cover in upland areas.

Within areas identified as potential breeding habitat for western toads, such as Reeder Lakes, Reeder Creek, Bismark Meadows and Kalispell Creek, activity buffers around these areas would tend to negate any negative impacts to western toads. There is the possibility that individual toads could be temporarily displaced or killed due to vehicles, tree removal, skid trails, road maintenance, or underburning. This disturbance would be short term, and likely only last during project activities. Western toads use a variety of upland areas, so the change in vegetation structure should have no long-term effect. All of the proposed timber harvest units are within 4 km of potential breeding habitat, so logging operations may pose a mortality risk to adults and dispersing juveniles. This possibility is greatly reduced for adult toads during the dry summer months, as they are mainly nocturnal (reference), as opposed to diurnal timber harvest operations. However, fuels treatments in any of the units, particularly shrubfield burning during spring season, may also present a risk of toad mortality.

Road decommissioning as part of this alternative may temporarily increase toad mortality during implementation but would likely reduce mortality and disturbance after completion.

Cumulative Effects

The following past, ongoing and reasonably foreseeable actions are considered relevant in a cumulative effects discussion for western toads:

Past Activities and Events – Since toads utilize a variety of forested habitats, historical timber harvest had the potential to impact toads in the form of occasional direct mortality from vehicles. Similar to this project, the effects of many of these events were likely short-term (during the logging and fuels treatment phases), and toads would have resumed normal activities afterward.

Current Management Activities – Personal use firewood gathering, various recreation activities (excluding off-road motorized use, addressed in alternative discussions), standard road maintenance, and continued fire suppression would not significantly impact western toad populations. These activities are unlikely to impact breeding habitat. These activities do not occur within breeding habitat and potential modifications to upland forested habitat would be inconsequential. Similarly, effects of noxious weed treatments would likely be limited to possible mortality caused by vehicles used for spraying, since areas of surface water are buffered from chemical application (USDA 1995).

Currently active USFS timber sales – There are no other current or proposed USFS timber sales within the project area.

Activities on other ownerships – Stimson Lumber Company proposes to harvest 961 acres of timber within their ownership in the project area. These activities are proposed on upland habitats and any breeding habitat in the form of streams and pools, impacts to breeding habitat are anticipated to be minimal. Although hauling on any planning road systems may result in an increase in toad mortality. As discussed in the introduction to cumulative effects analysis, other ownerships cannot be relied upon for long-term habitat contributions. They are subject to modifications (e.g. rural developments, forest land conversions) and irretrievable alterations. Due to the uncertainty of management actions and lack of detailed habitat data on these ownerships, the USFS assumes no contribution of suitable habitat for Sensitive species/MIS from adjacent property.

Conclusion

The no action alternative would have no impact on western toad breeding habitat nor would it increase the risk of toad mortality. The proposed action may cause adverse impacts to individual toads during project implementation. However, this risk is considerably reduced by project design features including timing restrictions, INFISH buffer, spring grizzly bear habitat buffers and BMPs. Although the action alternatives may slightly elevate the risk of direct toad mortality, of hauling, no breeding habitat would be affected by this proposal. Consequently, the action alternatives may impact western toads or their habitat, but would not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species.

Consistency with Forest Plan and Other Regulations

All action alternatives are consistent with the Forest Plan direction to manage the habitat of species listed in the Regional Sensitive Species List to prevent further declines in populations, which could lead to federal listing under the Endangered Species Act (USDA 1987 p. II-28), the project would not cause a loss of viability to the population or species.

Management Indicator Species

Northern Goshawk

Methodology

Goshawk nesting habitat was evaluated using a habitat suitability model derived from data in the Forest timber stand database (TSMRS). This model considered capable nesting habitat to be any stands in habitat type groups 2 through 6 (moderately dry Douglas-fir or grand fir; moist grand fir; western red cedar and western hemlock) on slopes of 40 percent or less. Since slope data in the TSMRS database is an average of plots across the stand, using this data to determine suitability can cause the model to exclude stands that have relatively flat microsites, or include portions of stands that may be too steep for goshawks to select as nest sites. To rectify this, the model was only used to identify vegetative factors that are predictors of goshawk nest sites, while topographic limitations were determined from digital elevation model (DEM) data. As a result, modeled goshawk nesting areas did not necessarily conform to delineated stand boundaries, but were identified by combining the stand layer with two meter resolution DEM data. Suitable northern goshawk nesting habitat was initially determined using the Forest-wide habitat suitability model as: capable stands (or parts of stands) that had a forest (cover) type of Douglas-fir, ponderosa pine, lodgepole pine, western redcedar, aspen, grand fir, western hemlock, western larch or western white pine; were mature sawtimber or old growth size classes with at least 20 trees per acre over 14” dbh; had not had a regeneration harvest (clearcut, shelterwood or seedtree), improvement or liberation

cut on more than ¼ of the stand acres since the stand exam; and had overstory canopy closure of 50 percent or greater based on direct measurement or estimated from basal area.

Once steeper (>40 percent) slopes were excluded by incorporating DEM data, capable goshawk nesting habitat was reduced. The slope threshold is generally a good indicator of nest sites on the Forest, as none of the 9 known territories has nest trees on slopes steeper than 40 percent. Habitat suitability was then validated for a number of capable stands in the project area through site visits and by identifying obviously unsuitable habitat using digital aerial photographs. Refinement of the habitat model through field validation was conducted within suitable nesting habitat. The analysis area currently contains 5 contiguous suitable nest stands larger than 40 acres in size. In general, capable but unsuitable nest stands are dominated by small-diameter trees or contain adequate numbers of large trees, but are heavily congested in the understory by high densities of small trees.

In a review of goshawk studies published since 1992, Greenwald et al. (2005) questioned the Reynolds et al. (1992) recommendations concerning goshawk habitat structure. Among other points, they stated that 9 of 12 studies demonstrated selection for stands with higher canopy closure, larger tree size, and greater numbers of large trees than found in random stands. Greenwald et al. (2005) also stated that across the western US, "mature and old-forests have declined to much less than 40 percent of the landscape" and recommend protecting existing mature and old-forest characteristics and prohibiting large reductions in canopy closure. However, nearly 64 percent of the Lakeview-Reeder goshawk analysis area consists of mature or old forest stands (and would continue to under all alternatives). Reynolds et al. (2005) expressed concerns with the content of the Greenwald et al. (2005) review that included "poor understandings of the ecological factors limiting goshawk populations, a failure to understand forest habitat as dynamic ecosystems, and incomplete literature review or inclusion of studies with limited samples of goshawks."

Additionally, studies cited in the Greenwald et al. (2005) review illustrate that habitat structure utilized by goshawks can be variable: from dry pinon/juniper woodlands to coastal temperate forests. Since the IPNF is charged with providing for "a diversity of plant and animal communities" (USDA 1987), it is inappropriate to narrowly focus land management on a single species. The multiple species, ecosystem approach advocated by Reynolds et al. (1992) addresses the "most ubiquitous factors appearing to limit goshawk populations", as well as habitat needs of other species utilizing National Forest lands. of concerns over the limited review of literature by Greenwald et al. (2005), and their apparent misunderstandings of Reynolds et al. (1992) and vegetation dynamics in general, the IPNF will continue to base goshawk habitat management upon the recommendations of Reynolds et al.

Effects of the No Action Alternative

As discussed above, most capable nest stands are unsuitable either because they lack a mature overstory component, or they have a mature overstory component but have grown out of suitability. The understory is congested by a high density of smaller trees. As time passes, more mature stands, that are currently suitable, would move away from suitability due to increasing understory congestion. Deteriorating stand health would result in large, uniformly-spaced trees being replaced by more numerous, densely-packed smaller trees (vegetation ch3). Large snags would eventually disappear, trending these stands even further away from suitable goshawk nesting and foraging habitat. A large stand-replacing fire would remove the dense forests this species prefers, but small fire-produced openings may be beneficial for foraging. Regardless of whether these stands suffer from stand-replacing fire or not, suitable goshawk nesting habitat will likely be lost over time.

Considering topography and configuration of suitable nesting habitat, an estimated 5 goshawk home ranges could be accommodated within the project area, assuming no overlap and assuming an average home range size of 5,000 acres.

Effects of the Proposed Action

Direct and Indirect Effects

There would be no impacts to known nest sites within the project area. If any nests are discovered during project implementation, these nest sites would be spatial buffered and temporally buffered from activities.

The proposed action would implement timber harvest on approximately 3,560 acres of capable nesting habitat, including about 480 acres that are currently suitable. Approximately 233 acres of the suitable acres proposed for treatment would undergo regeneration harvest along the southern slope of Nickleplate Mountain and canopy cover would not be reduced to below 40% and these stands would continue to be considered as suitable nesting habitat. Absent treatment, it is possible that the stands may fall out of suitable condition within several decades given the current level of mortality in the overstory layer. Treatment would result in a short-term habitat reduction, but would promote the stability of these stands over a longer time period. In addition, timber harvest would result in measurable reductions in fuel loading, thus reducing the possibility of stand-replacing fire in the future that may destroy adjacent suitable nesting habitat.

This alternative proposes even-aged regeneration harvest of approximately 209 acres of suitable nesting habitat and resulting in loss of nesting habitat within the planning area. As a result, the 209 acres of even-aged harvest would initially become unsuitable and converted to the “open” structural stage, and would progress to the “seed/sapling” stage once reforestation is established (usually within 5 years of harvest). Suitable nesting habitat may be regained on these acres after 60 to 70 years. The reduction of this 209 acres of suitable goshawk nesting habitat would remain to provide for the distribution and quantity of suitable nesting habitat within the project area sufficient to maintain 5 potential goshawk nesting home ranges.

Thinning young, small diameter trees, and future underburning would increase the overall health and vigor of the stands. Additionally, this thinning would improve species composition, resulting in stands that are more ecologically stable in the face of potential disturbances. Consequently, thinning actions would promote long-term stability of habitat conditions for northern goshawks. Road decommissioning, may have short-term impacts on goshawks through disturbance, but would have long-term benefits by reducing human access/disturbance (decommissioning of currently drivable roads) and increasing potential habitat

Cumulative Effects

The following past, ongoing and reasonably foreseeable actions are considered relevant in a cumulative effects discussion for northern goshawk:

Past Activities and Events – In combination with past natural and human-caused events, the total effect of action alternatives would help restore natural processes by favoring tree species composition and structures that are consistent with historic vegetative patterns of dry site ecosystems. While some stands have lost or are losing sufficient forest structure to achieve habitat suitability, proposed actions would lead to long-term stability of habitat for northern goshawks by promoting and maintaining a more open forest structure. In general, past sales that involved regeneration logging or overstory removal damaged goshawk habitat they did what?, while sales that involved salvage or thinning from below preserved or improved habitat they did what?. Historic harvest information indicates that 8,916 acres or 30 percent of the analysis area had some level of harvest treatment with 36 percent of that being regeneration harvest (goshawk_project file).

Past fires within the analysis area have been a factor in sculpting goshawk habitat within the analysis area. Fire history data show that approximately 5,298 acres or only 18 percent of the analysis area had no fires in the past 130 years. Approximately 11,357 acres or 39 percent burned once from 1880 to 1899. About

3,707 acres or 13 percent of the analysis area had burned once from 1900 to 1929, and 7,620 acres or 26 percent have burned 2 to 4 times since 1880. Of the capable goshawk habitat that had fire history data, approximately 22,683 acres had burned at least once in the last 130 years. This equates to about 81 percent of the unsuitable goshawk habitat having had at least one fire impacting those acres. The remaining 3,438 acres of unsuitable habitat had no fire impacts; however, many of these acres did have harvest activities (51 percent of the unsuitable goshawk acres that had no fire impacts did have harvest history within the stand). Of the 3,558 acres of suitable habitat that had fire history data, 2,813 acres or 79 percent had at least one burn within the last 130 years. Many of these acres were likely in sheltered draws or were in some way protected from the devastating impacts of the fires.

Current Management Activities – Firewood cutting is anticipated to continue along seasonally and yearlong open roads, potentially impacting capable and suitable goshawk habitat within the cumulative effects area. This activity may be disruptive to northern goshawks that may be nesting in the area, and in some instances result in displacement, as they are particularly sensitive to disturbance during the courtship and fledging periods. However, since it would emanate from open roads, firewood gathering would only incrementally elevate disturbance above what motorized traffic would normally provide. It is unlikely that personal use firewood cutting would make habitat modifications that would substantially impact goshawks since snags are a relatively minor component of goshawk habitat. Continued fire suppression has mixed effects on northern goshawks. While suppression efforts may protect currently suitable nest stands from stand-replacing fire, this activity has also contributed to the understory congestion of dry-site stands that has reduced suitable goshawk habitat in recent years. Various recreation activities and routine road maintenance are unlikely to impact northern goshawks, as most of these activities are associated with open roads, although off-road recreational use during the spring and early summer may disturb nesting goshawks to some degree, potentially resulting in displacement. It is unlikely that noxious weed treatments would have any impacts on northern goshawks since they would emanate from roads and not modify goshawk habitat.

Currently active USFS timber sales – There are no other current or proposed USFS timber sales within the northern goshawk analysis area.

Activities on other ownerships – Stimson Lumber Company plans to harvest 961 acres on their ownership within the project area, potentially resulting in reduction in the amount of capable and suitable habitat within the project area. The calculation of the distribution and amount of habitat to provide for 5 nesting pairs of goshawks within the planning dies on rely on any contribution for private lands. Due to the uncertainty of management actions and lack of detailed habitat data on these ownerships, the USFS assumes no contribution of suitable habitat for Sensitive species/MIS from adjacent property.

Conclusion

Then no action alternative would not impact capable or suitable nesting habitat for goshawks with the planning area. No known nests would be impacted. With the proposed action, there would be a reduction of suitable nesting habitat under the action alternative of 442 acres, the area would continue to provide adequate number of nesting stands as recommended by Reynolds et al. (1992) (At least five suitable nest areas, as well as three replacement nest areas, should be present per home range). Sufficient suitable nesting habitat would be maintained, such that all five currently suitable home ranges would remain suitable after implementation of the proposed action. No known goshawk nests would be impacted. If any nests are located during implementation, harvest operations would not take place within the 40-acre buffer surrounding the nest, and a limited operating season (no harvest March 15 – August 15) would be applied to harvest units within ½ mile of the nest stand.

Samson (2006) concluded that short-term viability of the goshawk in the Northern Region and IPNF is not an issue :

- No scientific evidence exists that the northern goshawk is decreasing in numbers.
- The extent and connectivity of forested habitat have increased since European settlement.
- Well-distributed and abundant northern goshawk habitat exists on today's landscape.
- The level of timber harvest is insignificant in the Northern Region (in 2006, 16,991 acres of 22,351,312 acres or 0.08 percent of the forested landscape) and IPNF (3,452 acres of 2,470,394 forested acres or 0.14 percent) in recent years (http://www.fs.fed.us/r1/forest_range/timber_reports/ timbersales.shtml).

In 1998 the US Fish and Wildlife Service (USDI 1998) concluded that the northern goshawk was not warranted for listing as threatened or endangered in the western US , based on best available knowledge:

- There was no evidence of a declining population trend for goshawks in the western US.
- There was no evidence that goshawk habitat is limiting the population, or that significant curtailment of the species' habitat or range is occurring.
- The goshawk continues to be well-distributed throughout its historical range.
- There are no significant areas of extirpation.
- While the goshawk uses stands of mature and older forests it is not dependent on old-growth, and uses a variety of forest habitats in meeting its life history requirements.

As a result, the action alternative may cause minor impacts to northern goshawks and their habitat at a local level, but within the cumulative effects analysis area and across the IPNF as a whole, the proposed action would not likely indicate a local or regional change in habitat quality or population status.

Consistency with Forest Plan and Other Regulations

All proposed alternatives are intended to meet or exceed Forest Plan goals and objectives for managing snag habitat and habitat management indicator species (USDA 1987) and old growth habitats. No old growth habitat would be impacted.

Pileated Woodpecker

Methodology

Habitat management for pileated woodpeckers follows direction in Old-Growth Habitat and Associated Wildlife Species in the Northern Rocky Mountains (Warren 1990) and is based on an analysis done for size class and old growth. The analysis methodology for determining potential effects on pileated woodpeckers involved mapping old growth and mature forest stands (i.e. suitable nesting habitat) in the pileated woodpecker analysis area and delineating hypothetical 1,000-acre home ranges around suitable nesting stands or groups of stands.

Based on relative habitat values and the acres of suitable nesting habitat a home range should have (Warren 1990), areas with at least 100 acres of contiguous mature/old forest habitat and an additional contiguous 100 acres of immature/sawtimber sized tree habitat were identified as having sufficient suitable nesting habitat. Once home ranges with suitable nest stands were identified, the suitability of surrounding stands in the home range to provide adequate feeding habitat was evaluated. Within each home range at least 500 acres of sawtimber/mature sawtimber forest and/or immature sawtimber habitat is needed to provide adequate feeding habitat (Warren 1990). Project impacts on suitable habitat were then determined for each home range.

Analysis identified a total of ten potential suitable home ranges that are associated with potential nesting stands of >100 acres. Each hypothetical home range currently contains at least 500 acres of sawtimber/mature sawtimber forest and/or immature sawtimber habitat to provide adequate feeding habitat (not including spruce- or subalpine fir-dominated stands). Project impacts were analyzed by assuming that group selection harvest would leave high enough average canopy cover across the stand to retain the previous size class, while even-aged regeneration harvest (shelterwood or seedtree) would remove a stand from that size class. These assumptions are based upon past experience with these types of silvicultural treatments.

This analysis also addresses potential reduction of large snags, and trends toward mature forest structure. Direct and indirect effects reflect changes in habitat conditions that would result from implementation of the alternatives. As discussed in the Affected Environment section, snag habitat for nesting is considered more limiting than foraging habitat. Nesting habitat is dependent on the age and size of trees, which makes pileated woodpeckers a good indicator species for older, larger-diameter trees and late-successional forests. Specific parameters analyzed for this assessment include the changes in distribution and quantity/quality of large snag habitat.

No Action

There would be a continued shift in species composition toward more shade tolerant species in the majority of the stands. This change would trend stands toward a smaller size class and younger age class of trees. Consequently, snag production would shift away from the larger, longer-lived species, affecting the long-term stability and persistence of large snag habitat in the Lakeview-Reeder project area. Habitat for species associated with large snags, such as the pileated woodpecker, would continue to decline. Although timber harvests over the last 20 years have begun to change the species composition toward long-lived seral tree species, the presence of large snags would continue to be relatively uncommon due to the overabundance of Douglas-fir and grand fir.

High fuel accumulations resulting from dead and dying trees would lead to a higher risk of stand-replacing fires. If a stand-replacing fire were to occur in the project area, there may be a short-term (0-50 years) flush of large snags as a result of crown fire in mature stands, followed by a period of 50 or more years where many of these snags have fallen and the regenerating stands have not yet produced trees of sufficient diameter for pileated woodpeckers nesting.

Effects of the Proposed Action

Direct and Indirect Effects

The proposed action would harvest timber on approximately 420 acres out of approximately 8,093 acres of potential pileated woodpecker nesting habitat within the mature or large timber size class. This represents a 5 percent reduction in the amount of mature or large timber size class within the project area. However, the post-harvest condition of each of the potential home ranges would still contain a combination of more than 100 acres of contiguous mature/old forest habitat and an additional contiguous 100 acres of immature/sawtimber sized tree habitat; and each would have a total of at least 500 acres of sawtimber/mature sawtimber forest and/or immature sawtimber habitat. No old growth habitat would be impacted.

Foraging habitat would remain, to some extent, in nearly all treated areas. Timber harvest would generally focus on smaller diameter trees of shade tolerant species, while large diameter snags and snag recruitment trees – particularly ponderosa pine and larch – would be protected. Outside of proposed units, tree mortality in lower risk stands would continue to advance, producing higher quantities of smaller snags, but not the quality large snags required by pileated woodpeckers.

While a reduction in snag densities over the short-term may impact nesting habitat, design features for snag retention (discussed in Chapter 2) would reduce these impacts. Some of the existing areas proposed for treatment currently may provide nesting (snags) and/or foraging habitat for pileated woodpeckers, but the harvest prescriptions as designed would provide for long-term maintenance of seral species such as white pine, ponderosa pine, and western larch. Western larch and ponderosa pine stands with large-diameter snags are considered high-quality habitat for this species. Project implementation would improve pileated woodpecker nesting habitat within the project area in the long term by increasing high quality, large-diameter snags.

Cumulative Effects

The following past, ongoing and reasonably foreseeable actions are considered relevant in a cumulative effects discussion for pileated woodpecker:

Past Activities and Events – Timber harvest on USFS lands in the project area would have reduced snag densities in logged stands in nearly every instance, particularly prior to implementation of the Forest Plan in 1987 when standards for snag retention were adopted. The long-term impact of these activities was the reduction of snags of all sizes. In subsequent years, snag retention and snag recruitment (leaving higher densities of green trees for future snags) in harvested areas has improved through implementation of Forest Plan standards and, more recently, adoption of the Northern Region Snag Protocol (USDA 2000). In general, sales that involved regeneration logging or overstory removal reduced pileated woodpecker nesting habitat most of these timber sales previously targeted larger trees. While sales that involved thinning from below preserved, or possibly improved habitat, of the potentially for enhanced growth tree species. While tree mortality in untreated stands has increased Forest-wide (USDA 2005), the majority of affected trees are in smaller size classes. As a result, the legacy of historic logging in the project area is a decrease in large-diameter (>20” dbh) snags. However, each of the hypothetical pileated woodpecker home ranges would contain in excess of 100 acres each of contiguous mature/old forest habitat once all logged areas (past and proposed) are eliminated.

Current Management Activities – Firewood cutting is anticipated to continue along seasonal and yearlong open roads. Large snags within suitable nesting habitat, including potential nest trees, could be removed by personal use firewood cutters within 150 feet of open roads. of this, it is generally assumed that these roadside areas do not provide sufficient habitat for snag dependent species. While personal use firewood cutting may locally reduce snag densities, on a landscape scale this is a relatively small amount of habitat (within the Lakeview-Reeder analysis area, about 300 acres of potential nesting habitat not included in proposed units – or less than 6 percent of available mature/old forest nesting habitat). Personal use firewood cutting along open roads is unlikely to cause conspicuous changes in structure (overstory canopy or stem density) of affected stands. Various recreation activities and routine road maintenance are unlikely to have any impacts on pileated woodpeckers since they would not impact nesting or foraging habitat structure.

Other Restoration Projects –It is unlikely that noxious weed treatments would have any impacts on this species, since it would not impact nesting or foraging habitat in any measurable way.

Currently active USFS timber sales – There are no other current or proposed USFS timber sales within the pileated woodpecker analysis area.

Activities on other ownerships – Stimson Lumber Company proposed to harvest approximately 961 acres on private ownership. These impacts are anticipated to impact pileated woodpecker foraging habitat and potential nesting. As discussed in the introduction to cumulative effects analysis, other ownerships cannot be relied upon for long-term habitat contributions. They are subject to modifications (e.g. rural developments, forest land conversions) and irretrievable alterations. Due to the uncertainty of

management actions and lack of detailed habitat data on these ownerships, the USFS assumes no contribution of suitable habitat for Sensitive species/MIS from adjacent property.

Conclusion

The action alternatives could reduce nesting habitat in the analysis area in the short term, but would not negatively affect the suitability of the potential home ranges as a result of loss of nesting habitat or structural changes (all hypothetical home ranges would continue to meet suitability recommendations). In addition, the proposed project incorporates design features that maintain minimum numbers of snags within the harvest units, and there are numerous snags being created outside of the proposed units that would not be treated (Vegetation section_ch3). Treatment would trend stands toward larger size classes and older age classes of trees. No treatments are proposed that would reduce old growth structure or integrity.

Samson (2006) found that both nest site habitat and winter foraging habitat are abundant and well distributed across the Northern Region by Ecological Province and Forest. In fact, the IPNF contains the most nesting and winter foraging habitat of any of the Northern Region forests, with winter habitat adequate to support 7,291 pileated woodpecker pairs. The regeneration of even 420 acres of potential nesting represents less than 1 percent of the available nesting habitat on the IPNF. Samson (2006) concluded that short-term viability of the pileated woodpecker in the Northern Region and on the IPNF is not an issue:

- No scientific evidence exists that the pileated woodpecker is decreasing in numbers.
- The extent and connectivity of forested habitat have increased since European settlement.
- Well-distributed and abundant pileated woodpecker habitat exists on today's landscape.
- The level of timber harvest is insignificant in the Northern Region (in 2006, 16,991 acres of 22,351,312 acres or 0.08 percent of the forested landscape) and IPNF (3,452 acres of 2,470,394 forested acres or 0.14 percent) in recent years (http://www.fs.fed.us/r1/forest_range/timber_reports/ timbersales.shtml).

Given the abundance of pileated woodpecker habitat on the IPNF, and that all hypothetical pileated home ranges would remain suitable after proposed treatments, the inconsequential amount of habitat that would be temporarily lost through treatment; and the fact that treatments are designed to foster larger tree diameters of seral species pileateds prefer for nesting; the proposed action would not affect the viability of this species, either within the cumulative effects analysis area or across the IPNF as a whole. Consequently, the action alternatives may cause temporary minor reductions in pileated woodpecker nesting habitat at a local level, but would not likely indicate a local or regional change in habitat quality or population status.

Consistency with Forest Plan and Other Regulations

All proposed alternatives are intended to meet or exceed Forest Plan goals and objectives for managing snag habitat and habitat for management indicator species (USDA 1987, Appendix X) and old growth habitats.

White-Tailed Deer and Moose

Methodology

The analysis for white-tailed deer and moose address the key factors in habitat management which have the greatest potential to influence populations and survivability within the project area.

Effect of the No Action Alternative

The no action alternative would preserve potential cover habitat for big game within the project area. However, with this comes the increased risk of stand-replacing wildfire, which would effectively remove winter cover for big game.

Effects of the Proposed Action

The proposed action would implement a combination of timber harvest or burning totaling 732 acres on big game winter range. Within the Granite Creek winter range a total of 332 acres would be treated, 315 acres of burn only, 7 acres of intermediate harvest and 10 acres of regeneration harvest. On white-tailed deer winter range along the Lakeshore a total of 400 acres of treatment would occur, 263 acres of burn only, 61 acres of intermediate harvest, 46 acres of regeneration harvest and 30 acres of handpiling. The handpiling would have no impact of winter cover. The burn only treatment are not anticipated to impact winter cover as these treatments are targeted for existing shrubfields and are not anticipated to impact surrounding cover within timbered habitats. The intermediate timber harvest would reduce overstory canopy cover but would retain enough cover that after several years the overstory canopy would close and again provide winter cover. The regeneration harvest would reduce winter cover and would not likely provide winter cover until the stands reaches maturity in 60 to 70 years.

The decommissioning or storage of FR# 1340 which is located on the Granite Creek moose winter range would increase security for moose and other winter big game species within that area, thus increasing habitat effectiveness on this winter range area. Increased roading within the lakeshore big game winter range area would reduce habitat effectiveness by and increase big game vulnerability within this winter range area.

Cumulative Effects

The following past, ongoing and reasonably foreseeable actions are considered relevant in a cumulative effects discussion for white-tailed deer and moose:

Past Activities and Events - Past activities (such as timber harvest) and natural processes (such as wildfire) have generally benefited species that require openings and younger forest stands, and been detrimental to species that require dense forest canopy such as big game require during the winter season. In general, historic logging has decreased the amount or quality of dry site and riparian habitat (through clearcutting, overstory removal and riparian harvest) within the analysis area, while more recent timber harvests have tended to maintain or improve these habitats by implementing riparian buffers and commercial thinning in dry-site stands.

Current Management Activities – Personal use firewood gathering, various recreation activities and standard road maintenance would not significantly impact big game of the low intensity of these activities and little change to the quality of winter cover is anticipated to occur. Continued fire suppression can have both positive and negative impacts on big game. Fire suppression has contributed to high tree densities and fuel accumulations that present a risk to the survival of some important winter habitats, while maintaining others.

Currently active USFS timber sales – There are no other current or proposed USFS timber sales within the project area.

Activities on other ownerships – Subdivision and residential development on private lands within the project area almost always conflicts with the management of winter habitat for big game species. Residential development removes winter cover, reduces food sources and provides a chronic source of disturbance and stress for big game species.

Conclusion

The proposed action would impact winter range habitat for big game species by reducing winter cover. Road densities would be reducing within the Granite Creek winter areas but increased within the Lakeshore big game winter area.

Consistency with Forest Plan and Other Regulations

While the Forest Plan identified that within the Priest Lake drainage winter cover would be emphasized, the Forest plan also directed that management for big game should incorporate State management objectives for big game species. The State of Idaho objective for big game management is to maintain existing populations. The proposed action would only slightly reduce winter cover within the Granite Creek and Lakeshore winter range areas and is not likely to influence big game populations wintering within these areas of the small acreage of habitat impacted. The Lakeview-Reeder project is consistent with Forest Plan direction for big game management.

Forest Land Birds

Methodology

Species differ in habitat requirements and their responses to management activities. Due to the sizable number of species that can occur in a forested landscape, it is impractical and nearly impossible to take a species by species approach. Rather, this analysis looks at the avian community as a whole, in the context of the surrounding landscape. It addresses priority habitats identified by Idaho Partners in Flight (2000) and discusses how management activities, or even a lack of management activities, can affect bird species composition and richness.

No Action

The Lakeview-Reeder project area contains two of four priority habitat types for forest land birds, riparian and dry ponderosa pine/Douglas-fir/grand fir forests. Currently the long-term viability of the dry ponderosa pine/Douglas-fir habitats is at risk. According to Idaho Partners in Flight (2000), 31 species of Idaho's breeding species use this habitat for nesting. As discussed in the flammulated owl section, dry forest habitats in the project area would continue to degenerate without management intervention.

Riparian habitats wetland habitats would remain unaffected by the proposed action, as riparian habitat conditions in the project area are not expected to substantially change in the absence of active management. However, due to fire suppression, the dry, upland forests in the project area are expected to continue to depart from historical, relatively open-canopied conditions dominated by large, shade-intolerant trees. As mentioned previously, these areas are expected to continue to become increasingly dominated by young, dense, shade-tolerant species. Consequently, the forests would become less able to support forest land birds associated with dry forest types. The perpetuation of a homogeneous landscape dominated by Douglas-fir would decrease habitat richness and habitat diversity, thereby limiting niches to support the diversity of land birds that occur on a forested landscape. In addition, the threat of potential stand-replacing fires would become more likely as stand density and disease increased and could eliminate forest land bird habitat for several decades.

Proposed Action

Priority habitats would not be adversely impacted by the proposed action. Applying required conservation measures, BMPs and INFISH recommendations would protect and maintain riparian habitat that occurs along stream corridors and other wetland habitats (see Chapter 2 "Design Criteria"). Opening the forest canopy on an otherwise monotonous landscape and managing for snags in these areas would increase landscape diversity and provide for those species that rely on more open habitat conditions (e.g. chipping sparrows, Williamson's sapsucker, hairy woodpecker, pine siskin). Addressing current stand conditions

contributing to a homogeneous landscape dominated by Douglas-fir would increase habitat richness and habitat diversity, thereby providing more niches to support land birds.

Burn only treatments would maintain vegetation diversity and potentially create or rejuvenate aspen dominated stands. For those acres treated, thinning would complement alternatives by promoting long-term stability of habitat conditions for land birds. Road decommissioning may have short-term impacts on some forest birds through disturbance, but would have long-term benefits by reducing human access/disturbance (decommissioning of currently drivable roads) and increasing potential habitat acres (revegetation of previously cleared roadbeds).

Cumulative Effects

The following past, ongoing and reasonably foreseeable actions are considered relevant in a cumulative effects discussion for forest land birds:

Past Activities and Events - Past activities (such as timber harvest) and natural processes (such as wildfire) have generally benefited species that require openings and younger forest stands, and been detrimental to species that require dense forest canopy. In general, historic logging has decreased the amount or quality of dry site and riparian habitat (through clearcutting, overstory removal and riparian harvest), while more recent timber harvests have tended to maintain or improve these habitats (riparian buffers and commercial thinning in dry-site stands).

Current Management Activities – Personal use firewood gathering, various recreation activities and standard road maintenance would not significantly impact forest land birds. Continued fire suppression can have both positive and negative impacts on migratory birds. Fire suppression has contributed to high tree densities and fuel accumulations that present a risk to the survival of ponderosa pine on the drier habitats and western larch on the moister habitats. Conversely, fire suppression has also protected riparian habitats and mature dry-site forests from lethal wildfire. Where active management does not occur, continued fire suppression will retain the current homogeneous nature of the vegetation. This would result in less diversity of habitat that might benefit a greater variety of species. Noxious weed treatments may have localized effects on some species, but would not alter species composition or structure in dry forest habitats, and riparian areas would not be treated.

Currently active USFS timber sales – There are no other USFS timber sales within the project area.

Activities on other ownerships – **Activities on other ownerships** – Simpson Lumber Company proposed to harvest approximately 961 acres on their ownership within the project area. As discussed in the introduction to cumulative effects analysis, other ownerships cannot be relied upon for long-term habitat contributions and they are subject to modifications (e.g. rural developments, forest land conversions) and irretrievable alterations. Due to the uncertainty of management actions and lack of detailed habitat data on these ownerships, the USFS assumes no contribution of suitable habitat for Sensitive species/MIS from adjacent property.

Conclusion

The action alternatives would not affect riparian habitats and would result in short-term impacts and long-term improvements to the dry forest habitat type. Consequently, although some birds associated with dry forests may temporarily be displaced under the action alternatives, over time, the area would be able to support a higher abundance of dry-forest associated birds than under current conditions.

Consistency with Forest Plan and Other Regulations

While the Forest Plan does not address specific Standards or Guidelines for managing forest landbirds, it does provide guidance for managing snag habitat and old growth. All proposed alternatives are intended

to meet or exceed Forest Plan goals and objectives for managing snag habitat (USDA 1987, Appendix X). Old growth habitat would be retained and old growth would continue to be managed for old-growth characteristics. The Lakeview-Reeder project is consistent with Forest Plan direction for old-growth habitat management (see “Old Growth”, Ch. 4).

3.4 Soils

Introduction

Soil is the unconsolidated mineral or organic material on the immediate surface of the earth that serves as the natural medium for the growth of land plants. A productive soil can sustain biological productivity, maintain environmental quality, and promote plant and animal health.

This project is designed: 1) to reduce hazardous forest fuels within the project area to decrease the risk of a wildfire negatively impacting the communities in the project area, public and firefighter safety, public infrastructure, private and National Forest System lands and resource values; and 2) to restore, enhance and protect forest ecosystem components to improve forest health, increase biological diversity, as well as reduce threats from catastrophic wildfire and insect and disease infestations.

While natural disturbance agents such as wildfires, insects and diseases have the potential to affect soil productivity, the activities pursued under the auspices of this project also have the potential to affect soil productivity. The purpose of this report is to investigate and disclose the potential effects of each alternative on soil productivity and to document compliance with the regulatory direction and applicable laws.

This report details the applicable laws and regulations that provide direction for the protection of the soil resource, explains the analysis methods and scale used to determine the potential effects of each alternative, identifies features designed to minimize detrimental soil disturbance and soil mitigation techniques that promote natural soil bio-physical recovery processes, describes the existing condition of the soil resources in the Lakeview-Reeder Analysis area, discloses the environmental consequences associated with each alternative, documents compliance with the applicable laws and regulations, and specifies the project design features and monitoring requirements.

Regulatory Framework

Laws and regulations provide direction for the management and protection of individual resources. Forest Service manuals and handbooks, forest plans, and BMPs identify the methods and guidelines that individual actions must follow in order to comply with the laws and regulations. In part, this regulatory framework defines the methodology and scope of analysis (what needs to be analyzed and how) for individual resources. The applicable regulatory framework that provides direction for the protection of soil productivity comes from the following principal sources:

Multiple-Use Sustained-Yield Act of 1960

Section 6(a) and (b) of MUSY directs the Forest Service to manage of all the various renewable surface resources of the national forests so that they are utilized in the combination and to achieve and maintain in perpetuity a high level annual or regular periodic output without impairment of the productivity of the land.

National Forest Management Act of 1976

Section 6(g) of NFMA charges the Secretary of Agriculture with insuring: (1) research and continuous monitoring of the effects of each management system to the end that it will not produce substantial and permanent impairment of the productivity of the land, (2) that timber will be harvested from National Forest System lands only where soil, slope, or other watershed conditions will not be irreversibly damaged, and (3) that harvests designed to regenerate an even-aged stand of timber will be used on National Forest System lands only where such cuts are carried out in a manner consistent with the protection of soil resources.

FSM 2500

The Watershed and Air Management Manual as amended by WO 2500-90-2, states that management activities are to be implemented: (1) in order to optimize sustained yields of goods and services without impairing the productivity of the land, or (2) in a manner that will improve soil productivity to take full advantage of its potential for increasing the productivity of forest and rangelands, or (3) to rehabilitate soils that are in an unsatisfactory condition. In addition, soil quality monitoring will be implemented to determine changes in long-term soil productivity and to advise decision-makers when adjustments are needed in land management practices to protect or improve soil productivity.

The regional supplement to this manual (R1 Supplement 2500-99-1) provides further guidance for soil quality monitoring and provides definitions for the parameters of the soil resource, detrimental disturbances, and monitoring techniques (USDA 1999b). This supplement stresses that one of the objectives of the Forest Service is to manage National Forest System lands under ecosystem management principles without permanent impairment of land productivity and to maintain or improve soil quality. Soil quality is maintained when erosion, compaction, displacement, rutting, burning, and loss of organic matter are maintained within defined soil quality standards. To comply with requirements of the laws and regulatory direction, the Chief of the Forest Service charged each Forest Service Region to develop soil quality standards for detecting soil disturbances indicating a loss in long-term productive potential.

The regional soil quality standards which, were revised by this supplement in 1999, recommend that new activities be designed so that they do not create detrimental soil conditions on more than 15 percent of an activity area. This recommendation is based on research indicating that a decline in productivity would have to be at least 15 percent to be detectable (Powers 1990). In areas where less than 15 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effect of the current activity following project implementation and restoration must not exceed 15 percent. In areas where more than 15 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effects from project implementation and restoration should not exceed the conditions prior to the planned activity and should move toward a net improvement in soil quality.

Detrimental soil disturbance exists when:

- Soil compaction results in a 15 percent increase in natural bulk density.
- Wheel ruts are at least 2 inches deep in wet soils.
- Soil displacement results in the removal of 1 or more inches (depth) of any surface soil horizon, usually the A horizon, from a continuous area greater than 100 square feet.
- High-intensity burns of long duration occur.
- Excessive surface erosion occurs as indicated by rills, gullies, pedestals, and soil deposition.
- Any soil mass movement caused by management activities occurs.
- Excessive loss of surface organic matter occurs.

These soil quality standards are intended to provide benchmark values that indicate when changes in soil properties and soil conditions would result in significant change or impairment of soil quality based on available research and experience. Soil quality standards apply to lands where vegetation and water resource management are the principal objectives, that is, timber sales, grazing pastures or allotments, wildlife habitat, and riparian areas. The standards do not apply to or include intensively developed sites such as permanent roads, mines, developed recreation sites, administrative sites, or rock quarries. They are not intended to prohibit other resource management practices such as, installing waterbars or preparing sites for planting, as long as such practices are consistent with long-term sustainability of the

soil resource. Permanent roads do affect soil-hydrologic function, however, their evaluation is more appropriately done on a watershed basis using models and other watershed analysis techniques.

1987 Idaho Panhandle National Forest Plan

Management direction in the IPNF Forest Plan (p. II-2) is to manage the soil resource to maintain long-term productivity.

The objective in the IPNF Forest Plan (p. II-8) is that management activities on forest land will not significantly impair the long-term productivity of the soil or produce unacceptable levels of sedimentation resulting from soil erosion. This will be accomplished using technical guides developed in conjunction with the soil survey and Best Management Practices necessary to protect soil productivity and minimize sedimentation.

The standards included in the Forest Plan (pp. II-32 and 33) which, are based on older Regional soil quality standards that included the impacts of system roads are:

- Soil-disturbing management practices will strive to maintain at least 80 percent of the activity area in a condition of acceptable productivity potential for trees and other managed vegetation. Unacceptable productivity potential exists when soil has been detrimentally compacted, displaced, puddled, or severely burned as determined in the project analysis;
- Projects should strive to maintain sufficient large woody debris to maintain site productivity; and
- In the event of whole tree yarding, provisions for maintenance of sufficient nutrient capital should be made in the project analysis.

Best Management and Soil and Water Conservation Practices

Best Management and Soil and Water Conservation Practices (BMPs) were developed as part of the NEPA process, with interdisciplinary involvement, and establish the connection between the Soil and Water Conservation Practice (SWCP) employed by the Forest Service and BMPs identified in the Idaho Forest Practices Rules and Regulations (IDAPA 20.02.01) and the Washington Forest Practices Rules and Regulations (Title 222 WAC), and to identify how the Soil and Water Conservation Practice Standard Specifications for the Construction of Roads and the Timber Sale Contract provisions meet or exceed the rules and regulations pertaining to the Idaho Forest Practices Act, Title 38, Chapter 13 and the Washington Forest Practices Act RCW 76.09. While the ultimate goal is the protection of water quality in compliance with the Clean Water Act, implementation of the BMPs designed protect the integrity of the soil resource as it affects water quality also afford protection to soil productivity. For this project, the BMPs were used to develop mitigation measures and design features and to provide a crosswalk for compliance with Idaho and Washington rules and regulations regarding soil protection.

Issues

The scoping process is used to help determine the issues to be addressed and for identifying the significant and non-significant issues related to the proposed action. Some issues relate to specific activities or areas while others pertain to the overall project. Several issues relating to soil productivity were identified from public comments received in response to multiple scoping efforts during the scoping process. These issues were arranged into two categories, non-significant issues and significant issues. Non-significant issues are those issues that are easily remedied through project design or would have only very minor or indistinguishable effects and therefore, do not warrant a thorough analysis. Significant issues are those issues could potentially have a considerable effect soil productivity and necessitate a more detailed analysis. In consideration with the regulatory framework discussed above, non-significant and significant issues are used to help define the scope of analysis.

The issues and how they are addressed in this document are outlined in Table 24 below.

Table 3-35. Issues pertinent to soil productivity.

Issue	*How the Issue is Addressed*
Non-significant Issues	
Use chippers on down trees which, provides mulch.	Chippers may be used for fuel reduction activities but on a limited basis relative to other methods of mechanical fuel reduction. Because chippers would have a limited application on this project, the effects of wood mulch are only briefly discussed in the Environmental Consequences section of this report.
The east side of Lakeview Mountain is very steep. What sort of work would you do to avoid creating some real erosion problems?	Very steep areas in any portion of the project area including Lakeview Mountain would either be avoided or would use a treatment method that has been shown to have very little impact on soil erosion (i.e. skyline harvesting). In addition, an appropriate amount of slash and woody debris would be left to mitigate the risk of erosion. Steep slopes and erosion issues are specifically addressed in the Features Designed to Protect Soil Productivity and Environmental Consequences sections of this report.
Several comments addressed the need to cite results of soil productivity monitoring especially when mitigation measures are being prescribed and not rely solely on BMPs without any validation of effectiveness.	Mitigation measures (which, include some BMPs), and their effectiveness as validated through monitoring are discussed in the Features Designed to Protect Soil Productivity section of this report. The techniques identified for this project would significantly decrease potential damage during logging, increase the speed of soil recovery after logging and enhance the long-term productivity of the soil.
Confidence intervals, standard deviations or standard errors must be presented in association with estimations or modeling results.	The margin of error around each estimate is ± 5% using the sampling protocol described in the Methodology of Analysis section of this report (USDA 2008)
In regards to fine and coarse woody debris, disclose how the project would be consistent with recommendations found in Graham et al.	Consistency with fine and coarse woody debris recommendations is addressed in the Features Designed to Protect Soil Productivity section of this report. Mitigation techniques and soil restoration measures meet recommendations put forth by Graham et al.
Significant Issues	
Several comments addressed the need to ascertain and disclose the extent of existing detrimental disturbance within the activity areas.	The extent of existing detrimental disturbance within the activity areas is detailed in the Affected Environment section of this report and is used to help predict the effects of proposed and future activities.
Several comments addressed the need to analyze the direct, indirect and cumulative effects of activities that have the potential to cause detrimental disturbance including logging, landing development, and off-road vehicle use.	This issue is analyzed in detail in the Environmental Consequences section of this report and the results are evaluated by the decision maker when deciding what choice of action to take. Existing levels of detrimental disturbance (compaction, rutting, displacement, high intensity burns, erosion, mass movement, and loss of organic matter) which, are a result of past activities, are combined with the predicted levels of detrimental disturbance from proposed activities and foreseeable future actions with consideration of the mitigation measures.
Disclose the implications of all landtype limitations for detrimental soil impacts.	Information on landtypes including their limitations is discussed in the Affected Environment section of this report and is used to help predict effects on nutrient capital and detrimental disturbance.

Issue	How the Issue is Addressed
Which nutrients may be inherently limited, what existing (critical) nutrient ratios are on these sites, and what historic biomass removals and associated activities have done to affect nutrient dynamics.	Information on current nutrient status within the activity areas is discussed in the Affected Environment section of this report and is used to help predict effects on nutrient capital.
Several comments addressed the need to analyze the direct, indirect and cumulative effects of activities in regards to nutrient alterations and associated effects on future growth.	This issue is analyzed in detail in the Environmental Consequences section of this report and the results are evaluated by the decision maker when deciding what choice of action to take. Changes in nutrient capital as a result of biomass removal or addition, long-term influences by parent material and natural processes, and predicted impacts from foreseeable future actions are examined. The predicted effects on future growth are discussed.

Methodology for Analysis

This section details the scope of analysis and describes analysis methods. The scope of analysis has been developed using the applicable laws and regulations and the issues identified during scoping. The analysis methods used are based on the best available science and proven field techniques.

Scope of Analysis

For this project, the scope of analysis refers to the activities that require analysis and the geographic and temporal bounds of that analysis. The scope of analysis was established using issues identified from public comments received during the scoping process and from the applicable laws and regulations pertaining to soil productivity.

Activities Analyzed

After considering the regulatory framework for the protection of soil productivity and the issues identified during the scoping process, it was determined that the following activities or disturbances were of primary concern and could potentially affect the productivity:

- Harvest operations including logging and associated landing development and biomass removal,
- Fuel treatments including piling and burning, prescribed burning, chipping, and masticating,
- Temporary road construction,
- Road decommissioning,
- Off-road vehicle use and associated trail development,
- Fire suppression, and
- Wildfire.

These activities have the potential to detrimentally disturb the soil and affect soil productivity through compaction, rutting, displacement, high intensity burns, erosion, mass movement, and loss of organic matter and ground cover. These detrimental disturbances and how they affect soil properties are discussed in detail in the Affected Environment section of this report.

Based on direction from the applicable laws and regulations this report focuses only on those disturbances that have the potential to affect soil productivity. For example, soil erosion and mass movement are

discussed here only as they relate to soil productivity. Information on how erosion and mass movement could affect water quality is discussed in the Watershed Resource Report in the project file (citation).

Geographic and Temporal Analysis Boundaries

Soil productivity is defined as the output of a specified plant or group of plants under a defined set of management practices, or total plant mass that is produced annually per unit area (citation). The most productive part of the soil occurs near the surface at the contact between the forest litter and the mineral soil (citation). This is also the part of the soil that is easiest to disturb by management activities. Therefore, the analysis of activities was limited to this most productive portion of the soil. Evaluation of deeper soil layers and underlying parent material was used only to determine how they influence the productivity of the upper soil layers.

As discussed above, the Regional Soil Quality Standards (R1 Supplement 2500-99-1) were designed to be applied at the level of the individual "activity areas". These activity areas serve as the geographic boundaries for this analysis. For harvest operations and fuel treatments the activity areas are defined as the actual treatment units and any associated temporary roads and landings. For road decommissioning as it affects soil productivity, the activity area is confined to the actual area the work is taking place. For these activities, the intent of this analysis was not to assess soil productivity across the entire "project area". Rather, the scope of this analysis was narrowed to assess the existing site conditions and effects to soil productivity within the immediate vicinity of the proposed management activities. The only exception to this would be the evaluation of slope stability, which requires a closer look at the adjacent terrain outside activity areas to determine if cumulative affects from past management activities and roads are adverse. However, evaluation of cumulative effects to soil productivity does not require in integrated "watershed-type" assessment since that is not considered an appropriate geographic area. This is because assessment of soil quality within too large an area can mask or "dilute" site specific effects.

The analysis area for the effects of off-road vehicle use, fire suppression, and wildfire is the project area. Predicting where these disturbances could occur is more difficult; therefore, the effects are discussed on a broader scale.

The soil quality standards do not apply to intensively developed sites such as permanent roads, mines, developed recreation sites, administrative sites, or rock quarries. These sites are considered as essential infrastructure, not part of the productive land base and are managed for other purposes. They are not intended to prohibit other resource management practices such as, installing waterbars or preparing sites for planting, as long as such practices are consistent with long-term sustainability of the soil resource. Permanent roads have the potential to affect soil-hydrologic function, however, and their evaluation is discussed in the Hydrology report in the project file (citation).

Concerning temporal boundaries, the temporal scale is dependent on the specific issue being addressed with no one scale being appropriate for all issues. The analysis may need to evaluate the effects of proposed management over all seasons for several days, years, decades, or perhaps centuries. This is complicated by data constraints that require monitoring to detect change – though data are often insufficient to identify even trends or trajectories of change until the impact is large enough or has been occurring for some time. Furthermore, there is often a lag between some action and its observed effect. This analysis strives toward an integrated approach to soil processes and function to project future trends in response to proposed management options to the best of abilities. Generally, detrimental effects on soils are not permanent and depend primarily on soil texture, parent material, aspect, and level of compaction. For this project, field assessments detected soil disturbance up to 80 years in the past and the effects of the proposed management activities can be estimated to about 80 years into the future.

Methods of Analysis

This section details the process used for each phase of the analysis. The first step is to assess the affected environment. This includes landscape, geology, landtype hazard ratings, pertinent soil characteristics, and existing site conditions of the analysis area. This phase of the analysis establishes a baseline from which the potential effects can be determined and alternatives can be compared. Secondly, the environmental consequences or potential effects of each alternative are determined.

Assessment of the Affected Environment

Landscape

Landscape information for the entire project area was characterized using published literature, USGS contour maps, and professional assessments. This information is important because it describes the development of the soils in the area.

Geology, Landtype Hazard Ratings and Soil Characteristics

Landtypes were assessed across the entire project area and provide information on geology, hazard ratings and basic soil characteristics. The underlying geology or parent material is a factor for slope stability, nutrient dynamics and potential nutrient limitations in the soil profile. Hazard ratings identify areas of concern for mass failures, erosion and sediment delivery to streams, and site productivity. Specific soil characteristics are used to identify sensitivity levels of different soils to common harvest and fuel treatments and can provide a guide for mitigating potential adverse effects. Landtype information was gathered from the Idaho Panhandle National Forests Land Systems Inventory (USDA Forest Service 1999) and field verified (see documentation in the soils section of the project file).

Existing Site Conditions

Existing site conditions were assessed in order to determine the current extent of disturbance within proposed treatment units. First, each potential treatment unit was researched to determine if past soil-disturbing activities had taken place. Records and research sources used to determine the type and extent of historic disturbances include (unless otherwise noted files are located at the Priest Lake Ranger District office):

- aerial photos (1932 to 2002);
- timber sale records (1950s to present);
- historic timber sale archives (early 1900s through the 1930s);
- fire history maps (1889 to present);
- stand exam data (contained in stand files, the Timber Stand Management Record System (TSMRS), and GIS datasets);
- personal communication with local residents, and;
- walk-thru surveys performed in each of the proposed treatment areas by district personnel in which evidence of past activity including stumps, skid trails, old roads, and fires, was noted (see project file).

Second, if any of the above sources revealed that past management actions may have caused soil disturbance in a given treatment unit, comprehensive on-site surveys were preformed by two qualified soil scientists accompanied by field technicians to determine the extent and character of the disturbance. In order to “calibrate” the survey team to local soil conditions, the natural soil bio-physical resiliency was assessed in several locations throughout the project area were past disturbance history was known.

Understanding the complex web of processes and elements that maintain how and why the soil is resilient to disturbance is key to evaluating sustained soil productivity.

A "modified Howes" sampling protocol was the survey method used to estimate the amount of detrimental disturbance within each treatment unit. This modified protocol is based on work completed in the Pacific Northwest and Intermountain west (Page-Dumroese and Jurgensen 2006; Howes 2000, USDA 2008) and uses a four-level soil disturbance classification system (Table 26).

Table 3-36. Soil disturbance classes.

Soil Disturbance Class 0 – Undisturbed
Soil surface: • No evidence of past equipment operation. • No depressions or wheel tracks evident. • Forest floor layers present and intact. • No soil displacement evident. • No management-generated soil erosion. • Litter and duff layers not burned. No soil char. Water repellency may be present.
Soil Disturbance Class 1
Soil surface: • Faint wheel tracks or slight depressions evident and are <5 cm deep. • Forest floor layers present and intact. • Surface soil has not been displaced and shows minimal mixing with subsoil. • Burning light: Depth of char < 1 cm. Accessory: Litter charred, or consumed. Duff largely intact. Water repellency is similar to pre-burn conditions. Soil compaction: • Compaction in the surface soil is slightly greater than observed under natural conditions. • Concentrated from 0-10 cm in depth. Observations of soil physical conditions: • Change in soil structure from crumb or granular structure to massive or platy structure, restricted to the surface 0-10 cm. • Platy structure is non-continuous. • Fine, medium, and large roots can penetrate or grow around the platy structure. No "J" rooting is observed.

Soil Disturbance Class 2
Soil surface: • Wheel tracks or depressions are 5 to 10 cm deep. • Accessory: Forest floor layers partially intact or missing. • Surface soil partially intact and may be mixed with subsoil. • Burning moderate: Depth of char 1- 5 cm. Accessory: Duff deeply charred or consumed. Surface-soil water repellency increased compared to the pre-burn condition. Soil compaction: • Increased compaction is present from 10-30 cm in depth. Observation of soil physical condition: • Change in soil structure from crumb or granular structure to massive or platy structure, restricted to the surface 10-30 cm. • Platy structure is generally continuous. • Accessory: Large roots may penetrate the platy structure, but fine and medium roots may not.
Soil Disturbance Class 3
Soil surface: • Wheel tracks and depressions highly evident with depth >10 cm. • Accessory: Forest floor layers are missing. • Evidence of surface soil removal, gouging, and piling. • The majority of surface soil has been displaced. Surface soil may be mixed with subsoil. Subsoil partially or totally exposed. • Burning High: Depth of char > 5 cm. Accessory: Duff and litter layer completely consumed. Surface soil is water repellent. Surface reddish or orange in places. Soil compaction: • Increased compaction is deep in the soil profile (> 30 cm in depth). Observations of soil physical conditions: • Change in soil structure from granular structure to massive or platy structure extends beyond 30 cm in depth. • Platy structure is continuous. • Accessory: Roots do not penetrate the platy structure.

Disturbance classes are a proxy method to determine whether or not observed soil disturbances are detrimental. The “best fit” soil disturbance classification is determined at each sample point and the information is aggregated to calculate how much detrimental soil disturbance exists in an activity area. Disturbance classes are defined primarily by morphological attributes, not quantitative measures. The disturbance classes are correlated with soil variables that affect tree growth and hydrologic and ecological function.

In addition to disturbance, the following characteristics were also measured:

- percent cover by category: rock, wood, vegetation & litter;
- down woody debris (tons per acre);

- litter and duff depths;
- percent of rock in the uppermost soil horizon;
- depth of volcanic ash, and;
- slope stability issues, erosion concerns and other soil issues.

Sample points consisted of visual field observations taken along a number of randomly oriented transects within each proposed treatment area. The number of sample points taken was determined by the activity area size. The larger the activity area the greater number of sample points taken. At least 30 samples were taken per activity area. Once the number of sample points was determined for a given activity area the distance between points was calculated so that the points would be evenly spaced to cover the entire activity area.

For this protocol, the actual area sampled is a six-inch diameter circular area around the center of the sample point. Again, the visual disturbance category was chosen by selecting the one best fitting the sample point. Areas outside the sample area were used for determining general context of the disturbance, but were not be used to decide the class of the sample point.

After transects were completed, the number of point samples in each disturbance class were tallied and the percent of detrimentally disturbed soil for each activity area was calculated (see onsite soil assessments in the soils section of the project file).

Determination of Environmental Consequences

The second step of the analysis is to determine the potential effects of each alternative. Detrimental disturbance predictions were determined using a combination of disturbance coefficients, professional assessments, and applicable published literature.

Impacts of the proposed harvest operations, associated piling and burning and prescribed burning, and temporary road construction were evaluated using disturbance coefficients developed specifically for the IPNF (Niehoff 2002). The detrimental disturbance coefficients pertaining to the various harvest and slash disposal methods were developed and derived from soil monitoring data collected from sites across the Forest (USDA 1997, 1998, 1999a, 2000, 2001, 2002, 2003 and 2004). This monitoring, which used the bulk density core sampling method for compaction and organic matter loss for displacement and burning, was collected and evaluated for all past typical harvest and slash disposal methods in use on the Forest. The disturbance coefficients were calculated by averaging the percentage of detrimentally disturbed soil for each harvest and slash disposal method. In addition, recently treated units in similar projects with similar soils and treatment techniques were evaluated by the soil survey team and calculations of detrimental disturbance were consistent with the disturbance coefficients.

The specific disturbance coefficients used for this analysis were developed from monitoring data collected after 1990, which represents management activities that were implemented utilizing best management practices. The coefficients in the model assume that the following best management practices have been implemented:

- If tractor yarding, use designated skidtrails at 100-foot spacings or greater, yard over slash and snow when possible.
- Use grapple machines on slash when piling slash.
- Broadcast burn and burn piles when surface soil moisture is greater than 25%.
- Operate harvesters, feller bunchers and forwarders on slash mats.

All Monitored sites were adjusted to represent detrimental disturbance based on the updated Regional Soil Quality Standards (R-1 Supplement 2500-99-1).

Existing and predicted disturbance calculations were added together to determine the amount of cumulative disturbance. Adjustments to predicted disturbance were made when existing skid trails could be used. When calculating predicted detrimental disturbance, the disturbance coefficients assume the following:

- Permanent transportation system (proposed and existing) and connected landings are not a part of the activity area and therefore not counted.
- Proposed temporary roads and landings in tractor and harvester-logged units are accounted for in the development of the disturbance coefficients.
- Proposed temporary roads used in cable and aerial harvest units must be added to harvest activities and are calculated by using a 14 ft. road width, .75 to 1 cut slope and 50 percent slope (35 ft.). Proposed landings associated with these temporary roads in cable and aerial units are accounted for by adding the following feet to the total road length:

  1 acre landing = 1244 feet

  .5 acre landing = 622 feet

  .25 acre landing = 311 feet

The disturbance coefficients are also limited to the following:

- the harvest and slash disposal methods for which coefficients have been determined, and
- they do not account for changes in soil type or the recovery of soils over time.

Predictions of effects from piling and burning fuel treatments, fireline construction, wildfires, road decommissioning, off-road vehicle use, and fire suppression activities used information from professional assessments and published literature.

Affected Environment

This section describes the landscape, geology, landtype hazard ratings, pertinent soil characteristics, and existing site conditions of the analysis area. Details found in this section provide the basis on which potential effects are analyzed in the Environmental Consequences section.

Landscape

The project area encompasses approximately 24,450 acres of Federal and private lands centered around the community of Nordman, Idaho, as well as the Granite Creek, Kalispell Creek and Reeder Bay areas along the west side of Priest Lake. The general project area extends from Kalispell Bay, Hanna Flats and Bismark Mountain areas in the south to Indian Mountain, Granite Mountain and Copper Bay to the north. Elevations range from 2,450 feet near Priest Lake to 5014 feet on top of Indian Mountain. Topography is shallow, though steep areas develop from structurally controlled slopes of beltrock and granodiorite. The project area encompasses forest lands that vary greatly in elevation, aspect, slope, forest type, disturbance history, and resilience to disturbance. Forested slopes are rich in diversity and productivity is high with abundant rainfall and ash-capped soils.

Glaciation over the past 50,000 years is the most evident land shaping force in this area. As the ice sheets moved over the mountains, material was scoured in some areas and deposited and compacted as tills in others, reshaping the landscape through the rounding of ridges and widening of valleys. The area around

Bismark Meadows, Kalispell and Reeder Creeks, and Hanna Flats is typical of the larger valley bottoms, which are generally surrounded by mountain toe slopes, gentle benches, and gently to moderately steep glaciated mountain sides. Steeper terrain and bare rock outcrops are found on the upper south and southeast faces of Lakeview, Nickelplate, Watson, Copper, and Granite Mountains and on the upper north and northeast faces of Bismark and Reeder Mountains.

Geology

The underlying geology for the Lakeview-Reeder project area includes: ~17 percent alluvial deposits; ~32 percent glaciated and residual belts; ~50 percent glaciated granitics; and <1 percent scree and rock outcrops. Most of the proposed treatment units occur on medium- to coarse-grained granodiorite and monzogranite and various glacial or alluvial deposits. Portions of some of the proposed units occur on a belt meta-sediment geologic formation known as the Pritchard formation (Miller et al. 1999, geology map in the soils section of the project file). Research indicates that some belt meta-sediment geological formations may have a natural deficiency of potassium (Garrison-Johnston 2003; Garrison-Johnston et al. 2003; Moore et. al 2004a; Shen et al. 2001). The granitic rocks of the project area are not expected to be as low in potassium as belt rocks (Garrison-Johnston 2004) but may exhibit moderate to low soil nutrient status because of their poor ability for nutrient retention.

Harvesting results in the removal of nutrients that have been accumulated in the wood and foliage over time. Of concern is the possible loss of potassium in the soil and its effect on forest health, especially the increased susceptibility to insects and disease (Garrison-Johnston et al. 2003) and a possible link between potassium deficiency and the lack of tree resistance to root disease (Garrison-Johnston 2003). Research (Garrison-Johnston 2003; Garrison-Johnston et al. 2003; Moore et. al 2004a; Shen et al. 2001) suggests a complex balance between underlying geology and the natural deficiency of potassium in northern Idaho. In comparison, soil nitrogen can be replenished more rapidly through nitrogen fixation or atmospheric deposition than can potassium, which is derived primarily from underlying geologic formations and is a product of slow weathering processes.

The Intermountain Forest Tree Nutrition Cooperative (IFTNC) continues to research potassium contents within tree species and different rock types in order to establish specific minimum thresholds for retention and effects of potassium on tree growth and resistance to root diseases (Mika, 2005; Shaw, 2005; Garrison-Johnston et al., 2007). Until these minimum thresholds are developed through research, the Idaho Panhandle National Forests are using management recommendations from the IFTNC as a guideline for maintaining sufficient potassium on a site. These measures have been incorporated into the project design criteria and mitigation.

Under most natural circumstances, potassium can return to the soil when the tree dies. Whole-tree yarding and removal of treetops can lead to the direct loss of potassium from the site (Morris and Miller, 1994). On some sites, 45 percent of the available potassium is detained in trees, with the remainder being held in subordinate vegetation, forest floor, and soil pools. Within the trees, about 85 percent of the potassium is held in the branches, twigs, and foliage (Garrison and Moore, 1998; Moore et al., 2004). It is therefore vital to recycle as many nutrients as possible before removal, which can be accomplished by overwintering small-scale debris to leach out potassium and other nutrients (Baker et al., 1989; Barber and Van Lear, 1984; Edmonds, 1987; Garrison and Moore, 1998; Laskowski et al., 1995; and Palviainen et al., 2004).

Most of the proposed treatment units are similar in one aspect: the topmost mineral soil horizon is volcanic ash. Mount Mazama, now Crater Lake, Oregon, experienced a cataclysmic pyroclastic eruption about 7,000 years ago. In the Priest Lake region, the ash is typically between 6 and 14 inches in depth and can be up to 24 inches deep (landtype description citation). The “ash cap” imparts both benefits and vulnerabilities to forest soil characteristics. Volcanic ash has a high water-holding capacity and provides

an excellent germination substrate for many native plant species. Unfortunately, ash is extremely vulnerable to compaction, displacement and (when laid bare by disturbance) erosion (Page-Dumroese 1993; Johnson et. al. 2007). All soils are more sensitive to disturbance when moist, but ash-capped soils are especially sensitive when moist.

Volcanic ash soils do not provide or hold plant-available nutrients well. Nitrogen (N) mineralization was strongly correlated with the presence of organic matter on ash-capped soils. For this reason, the organic element of the soil in the Priest Lake region is especially important (Garrison-Johnston et al. 2007). In addition to leaving branches in the forest for potassium retention, promoting a healthy soil organic component is perhaps the best way to maintain and enhance plant available nutrients for ash-capped soils.

Landtype Hazard Ratings

A variety of landtypes have been identified and mapped within the project area. Descriptions of each landtype, detailed acreages, and maps displaying landtypes and hazards are contained in the in the project file (PF SOIL-3). Hazard ratings have also been compiled and are broken into subcategories for mass failure, surface erosion, landtype sensitivity, and soil productivity. These are rated as low, moderate, or high for each landtype (Table 3).

Table 3-37. Summary of landtype hazards (in acres) associated with harvest activities in the Lakeview-Reeder activity areas.

Mass Failure Potential			*Surface Erosion Potential*			*Soil Productivity Potential*			
L	*M*	*H*	*L*	*M*	*H*	*L*	*LM*	*M*	*MH*
3664	194	7	3133	732	0	658	7	3161	38

L – Low; M – Moderate; H – High; MH – Moderately High

Mass Failure Potential

Mass Failure Potential (MFP) is the relative probability of downslope movement of masses of soil material. Mass failures detrimentally disturb soils because organic matter, the productive ash layer, and even subsurface layers of the soil can be carried down slope during a failure.

Besides natural failure, landslides or slumping can be triggered by a number of mechanisms, including harvest activities and related road building. Removal of forest canopy and cover from either clearcutting or wildland fire increases landslide occurrence (Gray and Megahan 1981; Megahan et al. 1978). This is primarily due to root decay, soil disturbance, increased snow accumulation and altered melting rates, and soil water increases from reduced interception and transpiration. Megahan et al. (1978) found that landslide occurrence increased only slightly when overstory canopy was reduced from 100 percent to 11 percent, but increased dramatically when canopy closure went below 11 percent. They also found that crown cover from shrubs affected landslide occurrence after 80 percent crown removal and indicated that landslide occurrence is more sensitive to shrub removal than tree crown removal.

Observations on the IPNF of past mass failures have indicated that management induced failures have always been attributed to roads (Niehoff 2002b). For example, drainage structures would fail or springs/seeps would saturate a road and cause a mass failure. Occasionally, a slump or slide was observed that was not immediately adjacent to a road. However, almost invariably these would occur on high MFP sites that were heavily harvested some years before (often 10-20 years earlier) that had a road some distance above them. In these situations, the road served to concentrate water somewhere above the slide and the water would saturate the soil downhill from the road and produce a failure. In heavily harvested

areas that occur on high MFP sites, as tree roots from the harvested trees eventually decay, the strength of the soil diminishes and roads located above the area can trigger slides.

Ninety-five percent of landtypes in that occur within proposed harvest units have low MFP, 5 percent have a moderate MFP and less than 1 percent have a high MFP. Small portions of stands 83802067 and 83801001 have high MFP (PF SOIL-3). Though field reviews found that conditions are currently stable, no logging should occur on these acres and therefore, these small areas would be eliminated when layout of the proposed units is finalized during implementation. In all proposed harvest units, the tree harvesting that would occur with the proposed action would leave a substantial number of live trees on the sites and roots from these trees would serve to provide strength to the soils. In four proposed harvest units predicted canopy closure would be reduced below the 11 percent threshold established by research. However, each of these units occur on sites with low MFP.

Portions of four of the proposed burn only units occur on moderate MFP sites and one 6 acre area occurs on a high MFP site. These burn units are mixed with areas of brush fields that would be ignited and areas of trees that would not be ignited. Fire may carry through portions of the treed areas but fire behavior is predicted to be low and would cause very little if any tree mortality or canopy closure reduction (see Fire and Fuels section). The high MFP site occurs within one of these treed areas and because the potential tree mortality or canopy closure reduction as a result of burning is very low, the potential for a mass failure to occur as a result of these activities is low.

All proposed road construction would occur on sites with a low risk of mass failure except one creek crossing on the north side of Lakeview Mountain. Although less than half an acre in size, it is a highly sensitive landtype. Here, appropriate design features would be utilized to prevent road failure and sediment delivery. In addition, the proposed road improvement work (e.g., replacing undersized or damaged culverts or road re-surfacing) could potentially decrease the likelihood of road caused mass failures. Additionally, standard contract provisions would be employed with this project, which suspend harvest operations and roadwork during very wet times when the potential for mass failures and surface erosion is highest.

For the above stated reasons, the potential that proposed actions would cause mass failures and detrimentally impact soil productivity is very low. Therefore, mass failure potential as it relates to soil productivity is not considered to be significant.

Surface Erosion Potential

Surface Erosion Potential is a rating of the relative susceptibility of exposed soils to sheet and rill erosion. In the activity areas, surface erosion hazard ranges from 81 percent , identified as low, to 19 percent , identified as moderate. None of the proposed activities occur on areas that have a high surface erosion rating.

The potential for soil erosion concerns is not so much associated with harvest treatments as with existing roads (Cacek 1989). The dominant processes in roaded portions are surface erosion from bare soil areas of roads, including the cutslope, fillslope and travelway. Re-vegetation of cutslopes and fillslopes can be difficult due to lack of soil moisture, organic material, low productivity potential and desiccation of seeds and seedlings, especially on south-facing slopes. However, the proposed road construction would occur on north facing slopes where re-vegetation efforts would be more successful and subsequent erosion of road cutslopes and fillslopes would be lower because of higher soil moisture. The travelway causes the greatest amount of soil movement from surface erosion. Road erosion and sediment yield usually decline after construction (Jones 2000; Switalski et al. 2004) but periodic large pulses of erosion may occur during intense water yield and overland flow events in interaction with road drainage systems. During field examinations, no surface erosion causing a loss of organic matter or mineral soil that would have a measurable effect on soil productivity was noted in any proposed treatment unit including those bordering

roads (PF-SOILS-056). With the incorporation of proven BMPs and contract provisions mentioned in the above section, no surface erosion causing a measurable effect on soil productivity is expected to occur from the implementation of the proposed actions.

With no high surface erosion potential within the project area, no evidence of surface erosion with proposed treatment areas, and incorporation of proven BMPs, surface erosion potential as it relates to soil productivity is not considered to be significant.

Soil Productivity Potential

Soil productivity potential is a rating of the relative capacity or ability of a soil to produce and sustain biomass. Soil productivity potential is low on 17 percent , low-moderate on 0.2 percent , moderate on 82 percent , and moderately high on 10 percent of the activity areas.

Soil productivity is typically based on the interrelationships between topography, climate, biologic activity, parent material and time of soil development. In turn, these soil forming factors influence water and nutrient holding capacity, soil aggregation and aeration, nutrient cycling, bio-physical resiliency to disturbance, and a myriad of other soil characteristics and processes.

Project design features that would maintain or enhance nutrient cycling, water and nutrient holding capacity, soil aeration, and biologic activity would protect long-term soil productivity (see Chapter 2 for detailed information on the project design features).

Soil Characteristics

Soil characteristics for many of the landtypes within the project area identified precautions for common harvest and fuel treatments. With the ash capped soils, maintaining site productivity depends on protection of the finer textured surface layers. Tractor operations can reduce productivity by compacting, displacing, or rutting surface soil. This limitation can be overcome by using cable yarding systems, designated skidtrails or operating equipment on slash or when the soil is frozen or covered with several feet of snow. Burning when surface soil layers are dry can cause damage and may reduce long-term productivity. Hot summer and fall burns can create water repellent surface soils with reduced infiltration rates, potential for greater overland flow and possible higher erosion rates from roads and skidtrails. Surface soil moistures should be above 25 percent when prescribed burning takes place. These moisture conditions may not exist during the fall burning window, so spring burning may be the best option on these sites in most cases. To maintain productivity, coarse woody debris levels should be between 17 and 33 tons per acre on the moist sites and between 7 and 14 tons per acre on the dry sites.

Under the objectives outlined in the National Forest Management Act, the U.S. Forest Service has assembled the North American Long-Term Soil Productivity Research Program (LTSP). The LTSP has focused its attention on two soil properties that are most influenced by timber harvesting and most related to forest integrity within the constraints of climate and topography: (1) soil organic matter, and (2) soil porosity (Powers, 1998).

These two issues are also the primary soil concerns for the Lakeview-Reeder project. Soil organic matter is influenced by fire, silvicultural prescriptions, timber harvests, and decomposition and accumulation rates. Soil porosity is most influenced by mechanical compaction and a lack of bio-physical resiliency.

Soil Organic Matter

The importance of soil organic matter cannot be overstated (Okinarian, 1996; Jurgensen et al., 1997). This organic component contains a large reserve of nutrients and carbon, and it is dynamically alive with microbial activity. The character of forest soil organic matter influences many critical ecosystem processes, such as the formation of soil structure, which in turn influences soil gas exchange, soil water

infiltration rates and soil water-holding capacity. Soil organic matter is also the primary location of nutrient recycling and humus formation, which enhances soil cation exchange capacity and overall fertility.

These processes have direct and tremendous effect on site productivity and sustainability. Fortunately, organic matter is the one component of the soil resource that, if managed correctly, can actually be improved by human activity. Manipulation of the organic constituents of the soil may be the only practical tool available for mitigating effects of harvesting systems that remove standing trees and dead and down trees, or cause extensive soil disturbance. Of the many organic materials incorporated in a forest soil, the woody component is in many ways the most important. To protect the sustainable productivity of the forest soil, a continuous supply of organic materials must be provided, particularly in harsh environments (Harvey et al., 1981). A clear understanding of fungal processes and the creation of soil organic matter are essential for forest management and forest soil restoration.

As mentioned, ash soils in the Priest Lake region lack nutrients and nutrient-holding capacity relative to other soil types, making stewardship of the organic horizon a top priority. A small amount of work has been done in an attempt to predict fuel loading while considering fuel succession. Fuel succession refers to the change in fuel properties and embodies the concepts of both accumulation and decay (Brown and See, 1981). Fuel succession is the change in the fuel complex over the long term, including changes in loading, size distribution, availability to burn, and live-to-dead ratios. These processes are the net result of the counteracting processes of accumulation and decomposition (Miller, 2000). The concept of fuel succession is useful when attempting to balance fuel loading and fire hazard issues against the needs of the forest.

Soil Wood

Brown Cubical Rot: No discussion about forest woody debris and biological activity would be complete without promoting the values of brown cubical rot, and recommendations that may increase the amount of the product of this unique decomposition process across the landscape.

Residue left after advanced brown-rot decay is a brown, crumbly mass composed largely of lignin. In healthy forest ecosystems, especially coniferous forests, the upper-most soil horizon contains a significant portion of brown-rotted wood residues. The sponge-like properties of advanced brown-rotted wood act as a moisture and nutrient sink. Because of the high lignin concentrations, and low carbohydrate rates, it persists in the forest for a long time (Blanchette, 1995).

The lignin product of brown rot is tremendously important in the forests of the West. Since brown rot typically affects only heart wood, it is important that large trees are allowed to die and decompose naturally in the woods. For example, a larch 36 inches in diameter may possess 24 inches of heart wood. This in turn decomposes to a 16-inch zone of brown cubical residue, often referred to as soil wood. Early logging techniques that bulldozed forest debris into piles and then burned the organics significantly reduced the occurrence of soil wood in our forests. Soil wood possesses one key characteristic that makes it important: the ability to hold water. This high water-holding capacity provides:

- Plant-available water, especially during the driest months;
- Excellent underground habitat for all types of soil biological activity;
- Appropriate conditions that cause a hub of mycorrhizae fungi activity.

Replacement of the woody soil components from a site that has lost such may take from 100 to 300 years (Harvey et al., 1981).

To ensure sustained forest use and protect ecosystem integrity, it is imperative that land managers understand two concepts in regard to the fungal resource. First, the role of fungi is essential for the continuance of many ecosystem processes. Second, with proper awareness and skill, forest managers can greatly influence fungal processes and potential benefits.

Wood decay fungi in the coniferous forest ecosystem have three major roles:

- breaking down plant residues and recycling carbon to the soil or the atmosphere;
- releasing mineral nutrients from plant residues and making the nutrients available to living organisms, and;
- producing the physical character of the soil matrix.

The outcomes of these processes promote soil water infiltration rates, soil water-holding capacity, cation exchange capacity, nutrient availability, nitrogen fixing activity, and habitat for mycorrhizae associations, to name a few.

Managers can influence fungal processes by considering the effects of silvicultural, harvesting, and slash disposal activities. Silvicultural plans that promote fungal processes will prescribe harvests that preserve a cool, moist microclimate and provide for a continuous source of large woody debris for use by fungi. Harvest techniques should be light on the land, disturbing as little soil as possible. Slash management techniques should emphasize leaving as much debris as is appropriate on site.

Soil Porosity

Soil porosity refers to the amount and character of void space within the soil. In a “typical” soil approximately 50 percent of the soil volume is void space. Pore space is lost primarily through mechanical compaction. Two fundamental processes are negatively impacted by compromised soil pore space:

- Gas exchange;
- Soil water infiltration rates.

Gas Exchange

Soil oxygen is fundamental to all soil biologic activity. Roots, soil fauna, and fungi all respire, using oxygen while releasing carbon dioxide. When gas exchange is compromised, biologic activity is also compromised. Maintaining appropriate soil biologic activity is paramount when considering long-term forest vitality.

Soil Water Infiltration Rates

Compacted soils do not allow appropriate water infiltration, leading to overland flow and associated erosion, sediment delivery, spring flooding, and low summer flows.

Compaction and the resultant decrease in soil pore space is common and detrimental over much of the recently (past three decades) managed forestland in the Priest Lake Ranger District. Skid trails are the longest lasting detrimental disturbance, where many machines travel over the same route. Again, activities on moist soils are especially damaging. Work on dry or frozen soils maintains much more of a soil’s natural ability to quickly restore pore spaces.

Existing Site Conditions

Detrimental Disturbance, Organic Material and Coarse Woody Debris

As mentioned, the many proposed treatment units display a wide variety of existing conditions. Table 3-388 shows the relative acreage of the soil conditions (field notes and primary data can be found in the project file).

The following is a summary of current soil characteristics for four basic situations:

- Undisturbed and Slightly Disturbed Units (5% or less detrimental disturbance)
- Moderately Disturbed Units (6 - 9.99% detrimental disturbance)
- Highly Disturbed Units (Greater than 10% detrimental disturbance)
- Soil Restoration Units (Greater than 15% detrimental disturbance)

Table 3-38. soil conditions found within surveyed units.

Disturbance Category	*Acres*
Undisturbed or slightly disturbed	2,801
Moderately disturbed	843
Severely disturbed	113
Soil restoration	130

Undisturbed and Slightly Disturbed Units (5% or less detrimental disturbance)

Most of these units experienced at least one burn in the early 1900s. Since that time the litter layer and soil organic matter has been developing but is not yet mature. There are very few signs of timber harvest or other soil damaging activities. Generally, these units have many small- to medium-sized trees and are currently self-thinning, which leaves needed woody debris on the forest floor.

Organic matter content is generally optimum or high in these units (PF SOIL-1). Exclusion of fire and management activities has contributed to increased duff accumulations.

Most of these forests contain appropriate amounts of large-diameter coarse woody debris, although several units are lacking (Table B1, Appendix B). Soil wood is common in most units, but large trees necessary for future soil wood contributions are rare. These areas typically exhibit a high degree of natural biologic resiliency and appropriate ecologic trends.

Moderately Disturbed Units (6 - 9.99% detrimental disturbance)

Most of these units also experienced a burn in the early 1900s and then were harvested sometime in the past decades. We suspect lasting impacts were caused from working on moist soils. Again, most of these units have many small- to medium-sized trees and are currently self-thinning.

The amount of organic matter content and coarse woody debris varies throughout these units (PF SOIL-1). Some stands contain high amounts of downed wood and optimum levels of organic matter while others have lower levels that reflect past management. Decomposition may also be affected due to light and moisture variations under different canopy densities. The soils in these units are moderately resilient.

Highly Disturbed Units and Soil Restoration Units (Greater than 10% and 15% detrimental disturbance respectively)

Four units in the project area exceed the Regional Soils Guidelines for long-term detrimental disturbance and seven units are highly disturbed. Most of these units were harvested within the past 30 years. The bio-physical resiliency of these soils has been significantly compromised; natural restorative processes are slow and incomplete. The primary type of disturbance was from compaction with rutting on skid trails. Generally, large coarse woody debris is wanting on these sites while organic matter is moderate to optimum (PF SOIL-1). Skid trails with appropriate amounts of woody debris displayed evidence of natural soil pore space restoration. Again, we speculate that most of these units were logged on moist soils.

The units with the most detrimental disturbance were typically those on low to moderate slopes. Where the topography is gentle, over-land driving is much easier, allowing higher densities of skid trails and associated disturbance.

Table 2Table 3-399 below, displays the percentage of detrimental disturbance within each unit surveyed by the soils team. Information for all proposed treatment units including those in which no evidence of disturbance was found during initial pedestrian survey is displayed in Table B4 in Appendix B.

Table 3-39. Percentage of detrimental soil disturbance by unit surveyed.

Detrimental Disturbance			Detrimental Disturbance		
Unit #	Total # Plots	Detrimental Disturbance	Unit #	Total # Plots	Detrimental Disturbance
83502086	90	4.4%	83902002	30	3.3%
83601069	90	2.2%	83902008	60	6.7%
83602082	90	10.0%	83902021	60	6.7%
83702040	30	6.7%	83902042	84	6.0%
83702075	30	0.0%	84001024	30	6.7%
83801001	110	4.5%	84001040	80	0.0%
83801003	90	5.6%	84001041	90	1.1%
83801005	90	7.8%	84001043	50	6.0%
83801006	80	8.8%	84001048	90	15.6%
83801009	30	6.7%	84001049	30	6.7%
83801012	75	2.7%	84001057	60	3.3%
83801013	30	0.0%	84001066	47	12.8%
83801015	90	3.3%	84001067	47	12.8%
83801016	60	5.0%	84002015	60	6.7%
83801016	30	3.3%	84002017	90	16.7%
83801020	90	15.6%	84002019	90	5.6%
83801027	47	12.8%	84002022	90	2.2%
83801028	80	11.3%	84002023	69	4.3%
83801049	30	6.7%	84002024	30	10.0%
83802070	95	1.1%	84002026	96	5.2%
83802072	55	0.0%	84002027	30	3.3%
83802073	84	7.1%	84002028	40	5.0%
83901003	30	6.7%	84002031	45	6.7%
83901006	85	15.3%	84002034	90	4.4%
83901019	47	12.8%	84002037	30	3.3%
83901023	85	3.5%	84002039	83	7.2%
83901029	60	8.3%	84002040	90	8.9%
83901030	90	4.4%	84002041	90	1.1%

Environmental Consequences

Direct and Indirect Effects

Alternative 1 — No Action

Under this alternative, no new management-induced detrimental direct or indirect impacts would occur in the project area. No road construction, road decommissioning, logging, or fuels treatments would take place. There would be no compaction or displacement beyond what currently exists.

On all sites soil potassium and nitrogen would continue to cycle, build up at current rates, and not be subject to removal due to fuels reduction. Soil nutrient cycling would continue in the soil at low rates from rock weathering, atmospheric deposition (mostly nitrogen), and nitrogen fixation. Soil nutrients would be bound in organic matter complexes and slowly released through decay.

For undisturbed to moderately disturbed sites, “no action” will have no direct or indirect negative influences on forest soils. Indirectly, the “no action” alternative will allow developing litter layers to mature. Untreated, self-thinning stands will contribute woody debris to decompose, adding needed organics and soil wood.

For the four severely disturbed sites, the “no action” alternative would have no direct negative impacts, but would create indirect negative impacts by missing an opportunity to actively restore damaged soils. These sites would naturally recover in time, approximately 60 to 80 years. Active management can accelerate processes to restore function in 40 to 60 years. These numbers are estimates based on field observations within the project area (PF-SOILS-28).

Stands currently at high mortality risk would not be treated and conversion back to more site-appropriate tree species would be delayed or would not occur in comparison to Alternative 2. The continued accumulation of dead and down fuel loads could contribute to an increased risk of stand loss due to wildfire, severe burning, erosion concerns, and loss of soil nutrients.

Alternative 2 — Proposed Action

Potential effects displayed and analyzed in this section include:

- Compaction, rutting and displacement;
- Nutrient fluctuations with changes in soil organic matter and amount of large woody debris;
- Prescribed Burning and Slash Disposal;
- Biomass Removal;
- Temporary Roads;
- Permanent Roads; and
- Reforestation.

Past effects from logging are detectable up to 80 or more years. Unlike past logging techniques, proposed activities would use techniques that maintain or promote natural soil bio-physical resiliency, by retaining appropriate nutrient cycling rates, soil water and nutrient holding capacity, and soil aeration. Therefore, the duration of effects of proposed activities should be relatively short compared to techniques used in the past.

Effects of the proposed treatment on the soil would be minimized by implementing the design features. The amount of expected detrimental disturbance would vary with proposed treatments. These estimates of

additional disturbance come from Niehoff (2002) as well as field observations and take into account best management practices described in Niehoff (2002). Table 3-40 illustrates expected effects based on a variety of proposed treatments and scheduled season.

Table 3-40. Predicted additional detrimental disturbance based on logging system and treatments from ground observations and Niehoff (2002).

Treatment	*Added Detrimental Disturbance (Niehoff, 2002)*
Tractor log w/ grapple piling on slash mat	13%
Tractor log w/ no slash treatment	13%
Tractor log on snow w/grapple piling or no slash treatment	10%
Harvester/Feller-buncher log; forwarder yard; grapple pile on slash mat	11%
Harvester log, forwarder yard on snow; grapple pile on slash mat	8%
Feller buncher log on slash mat; cable yard	6%
Feller buncher log on slash mat and snow; cable yard	0%
Prescribed burn in spring (moisture >25%)	0%
Prescribed burn in fall (moisture > 25%)	2%
Prescribed burn in fall (moisture < 25%)	31%
Skyline log	2%
Hand thinning w/ hand piling	0%*
Hand thinning w/ grapple piling	5%*

*values based on field observations of similar treatments on similar soils.

Effects of Soil Compaction, Rutting and Displacement

Soil compaction effects from ground based harvesting can last for decades but are not irreversible. Recovery processes vary greatly with soil texture and clay content and their interaction with climatic processes such as cycles of freezing-thawing and wetting-drying (Dykstra and Curran 2002; Landsberg et al. 2003). Persistence of compacted soil and, presumably, long-term consequences of compaction for tree growth depend on the severity of the initial compaction, the ability of species to cope with compacted soils, and rates of processes that de-compact the soil (Cromack and others 1979; Froehlich and McNabb 1983; Froehlich et al. 1985). Appropriate logging alone can leave the forest with a high degree of natural biological resiliency.

Biologic resiliency remains intact on skyline units, as much of the compaction is avoided. However, skyline yarding corridors where one end of a log drags over the surface can cause soil displacement, scraping off the organic layer and exposing the mineral soil to erosion. If soil displacement is severe enough to mix or remove the volcanic ash surface layer, the soil moisture holding capacity and associated productivity can be reduced, and this is essentially irreversible. With the incorporation of the design features, this would only occur in small, localized areas because…. and would not reduce the overall soil productivity of within the activity area.

Compaction can decrease water infiltration rates, leading to increased overland flow and associated erosion and sediment delivery to streams. Compaction decreases gas exchange, which in turn degrades sub-surface biological activity and above-ground forest vitality. Rutting and displacement cause the same indirect effects as compaction and also channel water in an inappropriate fashion, increasing erosion potential.

As mentioned earlier, site specific design prior to unit layout requires that proposed activities avoided landtypes that are known to pose a potential hazard. Therefore, the proposed activities would not adversely impact slope stability.

Effects on Coarse Woody Debris and Organic Matter and Associated Nutrient Fluctuations

Nutrients are reduced during harvesting by removing the stored nutrients that have accumulated in the trees over time. In addition, nutrient fluctuations can occur with the degradation of the litter layer and soil organic matter caused by increased decomposition rates, reduced annual litter contributions and changes in the amount of large woody debris. Loss of organic matter can decrease natural resiliency to disturbance, decrease nutrient cycling and nutrient availability, decrease soil water and nutrient-holding capacity, decrease aggregate formation and all benefits associated with aggregation (Jain 1997). Lack of large woody debris can influence the forest soil in a similar way as does the loss of organic matter.

Generally, nutrient losses are proportional to the volume of biomass removed from a site. The exact amount of nutrients lost from a particular site will vary with each forest type and site conditions (Grier et al., 1989). The amount of nutrients present in the trees will also vary with stand age and development of the humus layer (Grier et al., 1989). With the implementation of design features, harvesting on all sites would remove within each tree bole (and bark) about 22 percent of the potassium that is contained within a tree (Garrison-Johnston et al., 2004).

This may have an indirect effect on some plants that remain in the stand. The commercial removal of Douglas fir, grand fir, western cedar, and hemlock in association with leaving western larch would allow the release of stored foliar potassium as a beneficial nutrient for uptake by western larch (Garrison-Johnston et al., 2007; Garrison and Moore, 1998). Western larch is a more potassium-efficient species and would remain throughout those units where it already is part of the stand component. Measuring the effects of on-site productivity, however, cannot be done with certainty until more research information becomes available. At this time, management recommendations from the IFTNC are used as guidelines for maintaining sufficient potassium on a site and minimizing additional nutrient losses by over-wintering slash. In addition, precipitation (Stark 1979) and weathering of rocks will continue to make additional nutrients available on site. Annual needle, leaf, and twig fall, forbs, and shrub mortality will continue to recycle nutrients as well.

Field observations and soil transects show that organic matter varies throughout the activity area (PF SOIL-1). Organic matter content is high on most sites but low to optimum on others. Potential loss or reduction of organic matter can lead to a decline in several key soil and foliar nutrients (Powers et al. 2005). Indirect effects of soil wood loss include altered processes of forest regeneration and growth, favoring species requiring lower soil moisture, lower nutrient levels, and greater potential for soil erosion. Additional effects could also include loss of habitat for species requiring soil wood as dens or substrate for invertebrates, bacteria and fungi, which affect food availability for small rodents and their predators. Minor, localized losses are expected to occur under burn piles, at landings, or where severe fire occurs. However, with the incorporation of the design features, organic matter and ground cover would be maintained on at least 85 percent of each site and any changes in nutrient cycling and availability would not measurably affect site productivity.

The amount of coarse woody debris present in the project area varies (PF SOIL-1) as well. Many stands contain high amounts of downed wood originating from competition induced mortality and some from root disease and beetle infestation. These amounts exceed the recommendations of Graham et al. (1994) and Brown et al. (2003) and contribute to hazardous fuel loading. Historically, fire would have moderated the amount of accumulated coarse woody debris (Smith and Fischer 1997).

Approximately 17 to 33 tons acre of coarse woody debris (slash and logs) would be left on hemlock/cedar sites for coarse woody debris recruitment. This would provide a long-term source of nutrients and organic matter as well as protection against soil erosion (Brown et al. 2003; Graham et al. 1994). Removal of excess woody debris reduces the potential for high-temperature uncontrolled fires that could otherwise

sterilize the soil, cause highly erosive hydrophobic soil conditions, and reduce overall soil productivity (Pritchett and Fisher 1987).

Effects of Prescribed Burning and Slash Disposal

No measurable negative effects on soils are anticipated from post-harvest underburning if soil moisture content is greater than or equal to 25 percent when the burning occurs (PF-SOIL38, Niehoff, 1985). Throughout the project area, the prescribed burns would have limited detrimental effects when executed in the spring. Burning under controlled conditions of high soil moisture reduces potential nutrient losses and the chance of creating hydrophobic soils that can lead to increased erosion, sedimentation, and debris flows (Neary et al. 2005; Robichaud 2000; Swanson 1981).

However, on an unpredictable site-specific basis, small localized areas may burn at a severity level that removes all of the protecting duff and litter layers, even under managed fire conditions. The duff and litter layer is important in protecting the soil horizons, both as reducing erosion potential and in maintaining soil moisture. Litter prevents the breakdown of soil aggregates and reduces the velocity of any overland flow, thereby decreasing the erosion potential (Beschta 2004). Again, project design features are expected to minimize this effect.

Burning large slash piles can create extremely high temperatures in concentrated areas leading to the loss of phosphorus and potassium and the volatilization of nitrogen (DeBano 1981). Mitigation, therefore, recommends that burn piles be small (approximately 10 to 18 ft. diameter) and numerous, rather than large and few. In some cases, burning of the slash piles may create localized patches of hydrophobic soils for as much as one to two years, but the areas are generally not large or extensive enough to alter the slope hydrologic response or long-term soil productivity.

Prescribed fire can increase available nitrogen for one to two years following (Choromanska and DeLuca 2002). If litter layers and organic matter is kept intact throughout much of the stand, nutrient losses would be minimal from burning slash and would be localized. Nitrogen-fixing plants can colonize sites following fire and help restore N in the ecosystem (Newland and DeLuca, 2000; Jurgensen et. al., 1997). Following fire, soil erosion can increase, which could also reduce the nutrient pool (Megahan 1990). Generally, with plant colonization nutrient levels can reach pre-fire levels quickly (Certini 2005). Charcoal deposited following fire also adds carbon to the soil (DeLuca and Aplet 2008).

Proposed ecosystem burns are reserved for patches of senescent brush. A fire would undoubtedly increase the vigor of the native shrubs and increase wildlife browse. Many of these shrub lands are on rocky, somewhat harsh sites. The resiliency of these sites is fairly high because…. and the effects of the burn will be short. Burning could lead to an increase in mineral nutrients in the short term (Choromanska and DeLuca, 2002) and may also maintain higher nutrient availability in the long term (MacKenzie et. al., 2006). Burning when soil moisture is greater than 25 percent would avoid detrimental soil impacts (Neihoff, 2002).

In addition, sub merchantable material and broken foliage and limbs would remain on site and contribute to the nutrient pool. This material would be slashed, left over the winter to leach out nutrients, and treated with an underburn in the spring or grapple piled and burned in the fall when soil moisture conditions are at or above 25 percent. These measures would likely reduce the occurrence of nutrient-influenced insect and disease-caused mortality in the future.

Design features also require piling machinery to operate on a slash mat whenever enough material is available and on slopes less than 35 percent to prevent soil disturbance in excess of guidelines. These units would be entered from existing roads, skid trails, and firelines below or within the proposed units. Only areas that could be reasonably accessed would be treated and none of the trails would be excavated to facilitate access.

Some excavator fireline and some hand fireline would be constructed on regeneration units using prescribed burning as the slash disposal method. Firelines would not be constructed on burn only units except the few that are being implemented to promote aspen regeneration. The predicted additional detrimental disturbance, assuming a fireline width of 3 feet, was calculated to be no more than 2 percent for each unit (see project file for calculations). For the burn only units intended to promote aspen regeneration, (84001029, 84001031, 84001054, 84001032, 84001034, 84001026, and 84001028) each unit would incur only a portion of the disturbance because they would likely be treated together at one time. Therefore, the disturbance per unit would be less than 1 percent.

Biomass Removal

In some stands where fuel, topography, and vegetation conditions are conducive, fuels that would normally be grapple piled may be collected and transported out of the unit and processed for biomass utilization. The effects of these activities would be similar to grapple piling in that the same coarse wood and fuel reduction objectives would be met and machines would operate on a slash mat, however, pile burning would not occur.

Removing biomass has the potential to directly affect forest soils in three ways:

- Removing organic matter;
- Removing nutrient capital; and
- Physical soil disturbance (compaction, rutting etc).

Little long-term detrimental disturbance would result if the appropriate amount of woody debris remains on site, and the litter and duff layers are protected. Again, leaving at least 17 to 33 tons per acre is recommended (Graham et al 1994). The larger the size of the woody debris left on site, the more beneficial it is for long-term soil stewardship.

Nutrients can also be lost with biomass removal. However, many of the most important nutrients would leach out of green foliage if slash is left on site through the wet season. Biomass removals would not change the design feature of over-wintering slash.

Physical soil disturbance associated with biomass removal should be moderate. For ground-based thinning and skidding where operators would use the same trails developed when logging, an additional 2-5 percent detrimental soil disturbance on dry soil is expected. For hand-thinned units in which log forwarders would retrieve biomass off of dry soils, an additional 5 percent detrimental disturbance on dry soil is expected. These estimates are similar to grapple piling operations.

Temporary Roads

Temporary roads are proposed for 0.4 miles within the project area. Units 83702075, 83702040, and 84003020 would contain new temporary roads. These roads would add a small amount of disturbance (1 percent) within these units, approximately 1.1 acres of disturbance among the three units and each of these units would not exceed the 15 percent detrimental disturbance standard (Table 7). In addition, all temporary roads would be decompacted, cut and fill slopes would be pulled back to the original slope, and revegetated upon completion of use. Although not instant, the recovery of soil processes would be hastened significantly.

Permanent Roads

Permanent roads are not considered part of the disturbance by Region 1 standards but in the Idaho Panhandle National Forest Plan, permanent roads are a part of disturbance and the disturbance threshold is not to strive not to exceed 20 percent including these permanent roads. This is addressed in the soils

project file and in the Compliance with the Forest Plan and Other Regulatory Direction section. No units would exceed the 20 percent disturbance threshold.

Road Decommissioning

All developed roads built in the past have a lasting effect on soil productivity due to compaction and displacement. County, private, and USFS forest roads account for approximately 64 miles of roads in the Lakeview-Reeder Project Area (see project file). Their maintenance for residence access, recreation, and vegetation management calls for ongoing use, which results in compaction and displacement through the project area.

Decommissioning of approximately 24 miles of roads would improve previously impacted road beds through decompaction, addition of organic material, revegetation of bare areas, and weed control. Although rehabilitation through decompaction and/or recontouring cannot assume complete reversal to natural conditions, efforts initiate a long-term recovery process (see project file). Anticipated results would also provide for improvements in hydrologic function that otherwise may be prolonged as soil compaction persists.

Effects of Reforestation

Planting would be done by hand crews and access would occur from existing system roads. This activity would reduce the amount of time needed to recover vegetation, hydrologic function, and soil productivity after regeneration harvesting. A reduction in potential sediment production and delivery as well as potential slope instability could be expected with establishment of reforested activity areas. Additional benefits from planting western larch, ponderosa pine, and western white pine is their reduced requirement for potassium compared to species with increased abilities to sequester these nutrients, like Douglas-fir or grand fir (Garrison and Moore 1998; Moore et al. 2004b).

Cumulative Effects

How the existing impacts and expected new impacts from fuel treatments and foreseeable future activities act together to influence long-term soil vitality are described in this section. As mentioned, proposed treatments will employ low-impact logging techniques that minimize soil disturbance and maintain processes that promote natural soil bio-physical resiliency. No other treatment activities are planned in the foreseeable future on these sites.

Past Activities

Between 1890 and 1968 six large wildfires have burned and re-burned 32,031 acres within the project area. These fires created the initial conditions for existing soil respiration and decomposition rates, nutrient cycling, organic matter depth, and physical soil characteristics within treatment units. Today, the only lasting effects are in areas that burned very hot and soil organic matter and coarse wood is low.

Successful fire suppression activities within the project area have allowed stands to progress toward more shade tolerant species compositions, which are not as long-lived and are more susceptible to insects, disease, and consequently, fire. In addition, the absence of larger fires has allowed the depth of organic matter and the amount of large woody debris to increase.

Snagging operations and subsequent removal of felled material diminished the amount of downed wood recruitment for the affected sites. This may be the cause for a lack of course wood debris in some proposed treatment units today.

When proposed treatment units overlap past harvest units, there is a potential for detrimental cumulative effects (compaction, displacement, rutting, coarse wood deficiencies, etc.) to soil productivity. Besides the

direct effects of mechanized harvest operations, the timing and type of follow up slash treatments can add to detrimental effects to soil productivity.

Insect and disease activity has affected the amount of downed wood existing in stands today, which has an effect on the long-term nutrient status of a given site.

Old trails that are inside of an activity area and are still compacted may have detrimental effects to the soils resource. In addition, the construction and continued use of user created trails within treatment units has created some detrimental compaction and slowed recovery.

Alternative 1 — No Action

Under this alternative, no new management-induced detrimental direct or indirect impacts would occur in the project area. No road construction, road decommissioning, logging, or fuels treatments would take place. There would be no compaction or displacement beyond what currently exists. Therefore, the effects of past harvest and fuel treatments, road construction, and old and user created trails would not be cumulative. For the four severely disturbed sites, natural recovery would take approximately 60 to 80 years compared to 40 to 60 years with alternative 2.

The current amounts of organic matter and coarse woody debris created by past wildfires, fire suppression efforts, insect and disease induced mortality, and snagging efforts would continue to be added to. Nutrients would continue to cycle at current rates.

Alternative 2 – Proposed Action

Table 31 displays the predicted detrimental disturbance of proposed activities when considered with the existing amount of detrimental disturbance. The existing amount of disturbance reflects compaction related to past harvest and fuel treatment activities, old trails and user created trails that are inside of the activity area they occur in.

On undisturbed and moderately to highly disturbed units (0-15 percent detrimental disturbance) where ground-based logging and thinning are proposed, the effects would remain within the regional soil quality guidelines and thresholds because existing skid trails would be used. Employing all appropriate mitigation strategies would maintain natural biophysical resiliency.

Proposed mechanized activities on the severely disturbed units would generate similar disturbance patterns as described above. The difference is in the character of cumulative effects. These sites lack a full complement of processes and elements that promote natural soil biophysical resiliency. However, using all appropriate measures designed to minimize soil disturbance and soil restoration techniques, cumulative effects can be drastically minimized, and actually aid in soil recovery.

Regarding soil nutrient concerns, the current amounts of organic matter and coarse woody material in each activity area resulting from large wildfires, fire suppression activities, past harvests, snagging operations and insect and disease activity would change with this alternative. Certain nutrients, particularly potassium, are known to be critical for tree resistance to insects (Garrison-Johnston et al. 2003) and disease, especially root-rotting organisms (Garrison and Moore 1998).

In undisturbed units, typically those burned early in the 1900s, are just now reaching their potential for nutrient capital and efficient nutrient cycling. Therefore, adherence to the project design features is critical. Maintenance of sufficient nutrient capital would be provided by retaining coarse woody debris (Brown et al. 2003; Graham et al. 1994) and overwintering logging slash (Baker et al. 1989; Barber and Van Lear 1984; Edmonds 1987; Garrison and Moore 1998; Laskowski et al. 1995; and Palviainen et al. 2003).

Units that have experienced a moderate to high amount of detrimental disturbance in the past are vulnerable to cumulative nutrient effects. Past harvest activities have removed considerable amounts of carbon and also decreased annual litter fall for a time. Most important, those elements and processes that maintain nutrient capital and cycling must be protected. Again, employing the design features would reduce or minimize potential adverse cumulative effects.

Page-Dumroese (2000) found that relatively small levels of disturbance (less than 15 percent of the area) resulted in relatively small losses in carbon, nitrogen, and cation exchange capacity (CEC), ranging between 1-13 percent of the available pools. She concludes that at these levels of loss, current soil quality guidelines are adequate.

In addition, past fire suppression activities within the project area have allowed stands to progress toward more shade tolerant species compositions, which are not as long-lived and are more susceptible to insects, disease, and consequently, fire (see vegetation section for further information). With the implementation of alternative 2, this trend would be reversed and subsequent risks would be reduced (see fire and fuels section for further information).

Effects of prescribed underburning and pile burning could potentially remove woody debris that would otherwise provide nutrients to the soil as the decay process occurs (Page-Dumroese et al. 2006).When soils have adequate moisture conditions to retain their biological, chemical, and physical integrity, effects from the loss of forest floor can be minimized (Barnett 1989; Frandsen and Ryan 1985; Hungerford et al. 1991; McNabb and Cromack 1990). To minimize potential impacts, burning when soil moisture content is ≥25 percent would help maintain coarse woody debris requirements (Niehoff 1985 and 2002).

Fire would not be eliminated as an ecological process and proper management through fuel reduction and prescribed burning would sustain a future environment where fire is integrated and soil damage is minimal. Mitigation of unwanted potential fire effects through fuel treatments would reduce the chance of detrimental effects to soil productivity and would add little to no additional impact to the project area. There would be minor short-term amounts of soil disturbance from manual fire line construction. This would amount to no more than 2 percent additional disturbance (see project file for calculations).

Region 1 soil quality standards demand that we remain below 15 percent detrimental soil disturbance over the activity area in each treatment unit. The numbers represent on-the-ground conditions where skilled operators employ all applicable techniques that minimize soil disturbance.

Refer to Table 3-40 for coefficients used to predict potential detrimental disturbance for proposed logging and slash treatment scenarios including burning and piling. The level of disturbance increase also depends on the amount or lack of existing skid trails. Activity units that have had little prior disturbance will show a greater incremental increase in potential detrimental disturbance than those units that already contain a network of existing skid trails. Little to no increase in disturbance is expected in areas already containing a network of existing skid trails because equipment would re-use some if not all existing skid trails. Additionally, many units with detrimental disturbance would be winter logged for further resource protection.

Table 3-41. Summary of existing conditions and potential impacts for the Proposed Action following guidelines in Niehoff (2002) and the regional guidelines (1999b). Forest plan standards which integrate system roads into the analysis are addressed in Appendix C. Predicted additional detrimental disturbance percentages may not be equal to those projected in Table 6, as many of these units have existing levels of disturbance (related to existing skid trails, etc.) which would be re-used for this project. These predictions take into account the percentage of existing disturbance which can be re-used. (B=burn piles, BIO=biomass removal, FOR=forwarder, GP=grapple pile, HAND=hand thin (hand pile for slash treatment), TRA=tractor and UB=underburn).

Stand ID	*Acres*	*Logging System*	*Slash Treatment*	*Current Detrimental Disturbance (%)*	*Projected Detrimental Disturbance (%)*	*Winter Logging*	*Estimated Total Detrimental Disturbance (%)**	*Restoration Needed*
83304028	60.93	ECO_BURN		0.0	0		0.0	
83304059	295.67	ECO_BURN		0.0	0		0.0	
83502083	21.77	TRA	UB	0.0	13+2 (fireline)		15.0	
83502086	24.10	TRA	UB	4.4	12+2 (fireline)	X	14.0	
83502099	9.98	FOR	GP/BIO	0.0	11		11.0	
83601069	22.82	WILD_BURN		2.2	0		2.2	
83602082	46.93	BURN		10.0	0		10.0	
83702018	23.13	WILD_BURN		0.0	0		0.0	
83702019	20.24	WILD_BURN		0.0	0		0.0	
83702040	9.78	FOR	GP	6.7	8 + 1 (temp rd.)	X	12.4	
83702075	6.69	FOR	GP/B	0.0	11 + 1 (temp rd.)		12.0	
83801001	267.00	FOR	GP/B	4.5	11		13.3	
83801003	44.69	TRA	UB	5.6	10+2 (fireline)	X	12.8	
83801004	115.48	ECO_BURN		0.0	0		0.0	
83801005	119.49	FOR	GP/B	7.8	8	X	11.9	
83801006	37.59	FOR	UB	8.8	8+2 (fireline)	X	14.4	
83801009	7.67	HAND	GP/B	6.7	5		8.4	
83801009	22.58	FOR	GP/B	6.7	8	X	11.4	
83801012	61.34	FOR	GP/B	2.7	11		12.4	
83801013	18.09	TRA	GP/B	0.0	13		13.0	
83801013	16.31	FOR	GP/B	0.0	11		11.0	
83801015	45.89	FOR	GP	3.3	11		12.7	
83801016	28.84	FOR	GP	5.0	8	X	10.5	
83801020	15.25	FOR	GP/B	15.6	8	X	15.8	Yes
83801027	10.90	FOR	GP/B	12.8	8	X	14.4	
83801028	38.05	FOR	GP/B	11.3	8	X	13.7	

Stand ID	Acres	Logging System	Slash Treatment	Current Detrimental Disturbance (%)	Projected Detrimental Disturbance (%)	Winter Logging	Estimated Total Detrimental Disturbance (%)*	Restoration Needed
83801049	10.59	FOR	GP/B	6.7	8	X	11.4	
83802023	3.73	FOR	GP/B	0.0	11		11.0	
83802056	54.68	ECO_BURN		0.0	0		0.0	
83802063	195.98	WILD_BURN		0.0	0		0.0	
83802067	53.93	ECO_BURN		0.0	0		0.0	
83802070	42.32	TRA	UB	1.1	13+2 (fireline)		14.9	
83802072	75.65	TRA	UB	0.0	13+2 (fireline)		15.0	
83802073	13.68	FOR	GP/B	7.1	8	X	11.6	
83901003	4.01	FOR	GP/B	6.7	8	X	11.4	
83901006	46.44	FOR	GP/B	15.3	8	X	15.7	Yes
83901008	23.00	FOR	GB/B	0.0	11		11.0	
83901019	5.20	FOR	GP/B	12.8	8	X	14.4	
83901023	9.00	FOR	GP/B	3.5	11		12.8	
83901029	11.30	FOR	GP/B	8.3	8	X	12.2	
83901029	3.06	HAND	HAND	8.3	0		8.3	
83901030	26.00	FOR	GP/B	4.4	11		13.2	
83902002	2.64	FOR	GP/B	3.3	11		12.7	
83902008	37.00	FOR	GP/B	6.7	8	X	11.4	
83902008	2.00	HAND	HAND	6.7	0		6.7	
83902021	17.09	FOR	GP/B	6.7	8	X	11.4	
83902042	21.95	FOR	GP/B	5.9	11		14.0	
84001024	2.48	FOR	GP/B	6.7	5		8.4	
84001024	24.86	HAND	GP/B	6.7	8	X	11.4	
84001026	1.65	ECO_BURN		0.0	<1		<1	
84001028	1.44	ECO_BURN		0.0	<1		<1	
84001029	18.85	ECO_BURN		0.0	<1		<1	
84001031	26.42	ECO_BURN		0.0	<1		<1	
84001032	4.40	ECO_BURN		0.0	<1		<1	
84001034	2.85	ECO_BURN		0.0	<1		<1	
84001040	28.51	TRA	GP/B	0.0	13		13.0	
84001041	15.36	FOR	GP/B	1.1	11		11.6	
84001042	10.83	TRA	GP/B	0.0	13		13.0	

Stand ID	Acres	Logging System	Slash Treatment	Current Detrimental Disturbance (%)	Projected Detrimental Disturbance (%)	Winter Logging	Estimated Total Detrimental Disturbance (%)*	Restoration Needed
84001043	9.61	TRA	GP/B	6.0	10	X	13.0	
84001048	44.51	FOR	GP/B	15.6	8	X	15.8	Yes
84001049	3.00	HAND	GP/B	6.7	5		8.4	
84001054	9.42	ECO_BURN		0.0	<1		<1	
84001057	11.24	TRA	GP/B	3.3	13		14.7	
84001065	1.20	HAND	GP/B	0.0	5		5.0	
84001066	0.48	HAND	GP/B	12.8	5	X	12.8	
84001067	0.84	HAND	GP/B	12.8	5	X	12.8	
84001067	1.02	FOR	GP/B	12.8	8	X	14.4	
84002015	32.64	FOR	GP/BIO	6.7	8	X	11.4	
84002017	23.65	FOR	GP/B	16.7	8	X	16.7	Yes
84002019	174.50	FOR	GP/BIO	5.6	8	X	10.8	
84002022	9.86	FOR	GP/B	2.2	11		12.1	
84002023	104.46	FOR	GP/BIO	4.3	11		13.2	
84002024	10.00	FOR	GP/B	10.0	8	X	13.0	
84002026	85.00	FOR	GP/B	5.2	8	X	10.6	
84002027	13.05	FOR	GP/B	3.3	11		12.7	
84002028	12.45	FOR	GP/B	5.0	8	X	10.5	
84002031	15.65	FOR	GP	6.7	8	X	11.4	
84002032	8.29	HAND	GP/B	0.0	5		5.0	
84002034	86.00	FOR	GP	4.4	11		13.2	
84002037	12.61	FOR	GP/B	3.3	11		12.7	
84002039	70.53	FOR	GP/BIO	7.2	8	X	11.6	
84002040	62.51	FOR	GP/BIO	8.9	8	X	12.5	
84002041	24.89	FOR	GP/BIO	1.1	11		11.6	
84003009	1.87	FOR	GP/B	0.0	11		11.0	
84003009	63.14	FOR	GP/B	0.0	11		11.0	
84003009	8.74	FOR	GP/B	0.0	11		11.0	
84003010	3.96	FOR	GP/B	0.0	11		11.0	
84003012	5.36	HAND	HAND	0.0	0		0.0	
84003012	3.47	HAND	HAND	0.0	0		0.0	
84003016	26.48	FOR	GP/B	0.0	11		11.0	

Stand ID	Acres	Logging System	Slash Treatment	Current Detrimental Disturbance (%)	Projected Detrimental Disturbance (%)	Winter Logging	Estimated Total Detrimental Disturbance (%)*	Restoration Needed
84003017	22.08	FOR	GP/B	0.0	11		11.0	
84003020	15.83	FOR	GP/B	0.0	11 + 1 (temp rd)		12.0	
84003020	36.68	FOR	GP/B	0.0	11		11.0	
84003020	19.80	SKY	UB	0.0	0+2 (fireline)		2.0	
84003020	1.14	FOR	GP/B	0.0	11		11.0	
84003020	8.83	TRA	GP/B	0.0	13		13.0	
84003021	2.24	FOR	GP/B	0.0	11		11.0	
84003021	4.11	FOR	GP/B	0.0	11		11.0	
84003022	8.26	FOR	GP/B	0.0	11		11.0	
84003023	46.72	FOR	GP/B	0.0	11		11.0	
84003024	126.85	ECO_BURN		0.0	0		0.0	
84003024	13.06	FOR	GP/B	0.0	11		11.0	
84003024	4.84	ECO_BURN		0.0	0		0.0	
84003028	23.36	FOR	GP/B	0.0	11		11.0	
84003028	3.20	FOR	GP/B	0.0	11		11.0	
84003029	24.60	FOR	GP/B	0.0	11		11.0	
84003053	266.44	ECO_BURN		0.0	0		0.0	
84003054	121.91	ECO_BURN		0.0	0		0.0	
84003068	5.93	FOR	GP/B	0.0	11		11.0	
84003068	3.50	FOR	GP/B	0.0	11		11.0	

*These numbers were calculated assuming a 50% overlap with new disturbance on top of old disturbance. Where old disturbance was high and expected disturbance was low we are expect a much higher overlap.

Ongoing and Foreseeable Future Activities

A large wildfire would change soil respiration and decomposition rates, nutrient cycling, organic matter depth, and physical soil characteristics.

Continued fire suppression, would affect soil respiration and decomposition rates, nutrient cycling, organic matter depth, and physical soil characteristics. Direct effects as a result of fire suppression efforts include trenching and mixing of the soil layers and aerial retardant may affect the short term soil nutrient status.

Continued insect and disease activity would affect the amount of downed wood in stands, which would affect the long-term nutrient status of a given site.

Road decommissioning activities would begin the process of soil restoration and eventual recovery.

Construction and continued use of user created trails within treatment units would create some additional detrimental compaction and slowed recovery.

Alternative 1 — No Action

Large Wildfire Occurrence

Given the absence of fire over numerous decades and increased fuel loads in most of the project area, the chance of a large wildfire occurring with the implementation of Alternative 1 could be enhanced if an ignition starts in the project area during extreme dry weather conditions (Heyerdahl et al., 2007). The probability of a high-severity fire is not certain to occur within the project area during a given timeframe, however, the fact is that when a fire breaks out, the chances for high-severity fire effects on soils can be much higher in Alternative 1 with excessively heavy fuel loads compared to those that have successfully completed treatment, including post-harvest logging slash in Alternative 2 (Certini, 2005; Cram et al., 2006; Graham et al., 1994; Gorman, 2003; Keane et al., 2002).

The occurrence of a high-intensity wildfire would have an increased potential for impacts to soils and soil productivity in severely burned areas, especially since the risk of soil erosion increases proportionally with fire intensity (Megahan, 1990). Other effects would include the potential loss of organics, loss of nutrients, and a reduction of water infiltration (Wells et al., 1979). Burns that create very high soil surface temperatures, particularly when soil moisture content is low, result in an almost complete loss of soil microbial populations, woody debris, and the protective duff and litter layer over mineral soil (Hungerford, 1991; Neary et al., 2005). Nutrients stored in the organic layer (such as potassium and nitrogen) can also be lost or reduced through volatilization and as fly ash (DeBano, 1991; Amaranthus et. al., 1989).

Fire-induced soil hydrophobicity is presumed to be a primary cause of the observed post-fire increases in runoff and erosion from forested watersheds (Huffman et al., 2001). Though hydrophobicity is a naturally occurring phenomenon that can be found on the mineral soil surface, it is greatly amplified by increased burn severity (Doerr et al., 2000; Huffman et al., 2001; Neary et al., 2005).

Soil hydrophobicity usually returns to pre-burn conditions in no more than six years (DeBano, 1981). Dyrness (1976) and other studies have documented a much more rapid recovery of one to three years (Huffman et al., 2001). The persistence of a hydrophobic layer will depend on the strength and extent of hydrophobic chemicals after burning and the many physical and biological factors that can aid in the breakdown of these chemicals (DeBano, 1981). This variability means that post-fire impacts on watershed conditions are difficult to predict and to quantify.

If hydrophobic soils result from a severe high-temperature fire, moderate to high surface erosion could occur but the potential for mass failures would be low to moderate because of the Lakeview-Reeder Project Area's overall landtype characteristics; however, localized slope movement could be possible, especially along roads on steeper mountain slopes.

Fire Suppression

Within this project area, which is entirely within the wildland-urban interface, one of the foreseeable, future actions is wildfire suppression. Land management agencies and those with firefighting responsibilities in the area will have to continue to fight wildfires in the area to protect homes, private property, and public infrastructure. Additionally, natural ecological processes, including forest stand succession and tree mortality would also continue to occur. When the indirect effects of alternative 1 are added cumulatively to the future wildfire suppression and natural forest ecological processes, additional accumulations of down, woody debris (or fuels) and a higher fire hazard prior to the next stand-replacing fire event can be predicted. In this case, the potential detrimental indirect effects to soils (listed above) may be increased. These potential cumulative effects could include an increased potential for loss of organics, loss of nutrients, reduction in water infiltration, loss of soil microbial populations, loss of woody debris, loss of protective duff and litter layer over the mineral soil horizons, potential increase in risk of hydrophobicity resulting from fire, and associated potential increases in risk of post-fire runoff and erosion.

On small wildfires, soil disturbance from fire suppression activities is usually caused by hand tools; most hand fire-line construction has only minor (insignificant) impacts to the soil resource. During fire suppression, closed roads may be reopened for access and incorporated as fire line. As part of the post-fire work, the areas of disturbance are rehabilitated and the roads returned to their previous condition in most cases.

Insects and Diseases

Alternative 1 would not change the progression of stands toward more shade tolerant species compositions, which are more susceptible to insects and diseases. Increases in the amount of downed wood would continue to provide nutrient capital and consequently, increased fuel loadings.

Road Decommissioning

Road decommissioning activities would not occur with the implementation of this alternative. Therefore, there would be no cumulative effects.

User Created Trails

Disturbance from general motorized use and recreational access has been occurring and will continue throughout the project area indefinitely. With the exception of increased ATV and trail bike use, no changes are anticipated in the existing recreation profile.

Four-wheel and two-wheel motor cycle use is rapidly increasing throughout many Forest Service lands. A portion of this use is off-road and illegal, sometimes causing significant detrimental soil disturbance. Alternative 1 would not create additional routes for these activities to occur and would create any cumulative effects from this sort of use.

Alternative 2 – Proposed Action

Large Wildfire Occurrence

Timber harvesting would open up tree canopies and logging slash from tree limbs, tops, and un-merchantable pieces would add to existing short-term fuel loadings. Canopy removal would allow wind

and sunlight to penetrate, heat, and dry the debris, which could increase potential fire intensity and severity until the slash is treated or naturally abated. However, the long-term risk for a stand-replacing wildfire would be reduced by creating more open stand structures that would have lower accumulations of large diameter fuels and that would be less likely to support crown fires (see Specialist's Report on Fire and Fuels).

The occurrence of a high-intensity wildfire would have a decreased potential for impacts to soils and soil productivity with the implementation of alternative 2. The risk of severely burned soils and soil erosion, the potential loss of organics and nutrients, and impacts to water infiltration would be reduced.

Fire Suppression

Within this project area, which is entirely within the wildland-urban interface, one of the foreseeable, future actions is wildfire suppression. Land management agencies and those with firefighting responsibilities in the area will have to continue to fight wildfires in the area to protect homes, private property, and public infrastructure. The proposed vegetation and fuels treatment in the project area would not necessarily prevent wildfires from occurring, but would increase the ability to suppress such a fire should ignition occur in treated areas (Maurer, 2007).

On small wildfires, soil disturbance from fire suppression activities is usually caused by hand tools; most hand fire-line construction has only minor (insignificant) impacts to the soil resource. During fire suppression, closed roads may be reopened for access and incorporated as fire line. As part of the post-fire work, the areas of disturbance are rehabilitated and the roads returned to their previous condition in most cases.

Insects and Diseases

With the implementation of alternative 2, species that are more susceptible to insects, disease, and consequently, fire would be would be reduced. Inputs of large woody debris would be reduced to lower, but appropriate levels. This would reduce fuel loadings in treated stands and with the implementation of design features aimed at maintaining appropriate amounts of coarse woody debris, nutrient capitol would not be negatively affected and in some stands would be improved.

Road Decommissioning

Decommissioning of roads with the Hungry-Deer project would occur within the project are and would improve previously impacted road beds through decompaction, addition of organic material, revegetation of bare areas, and weed control. Although rehabilitation through decompaction and/or recontouring cannot assume complete reversal to natural conditions, efforts initiate a long-term recovery process (see project file). Anticipated results would also provide for improvements in hydrologic function that otherwise may be prolonged as soil compaction persists.

User Created Trails

Disturbance from general motorized use and recreational access has been occurring and will continue throughout the project area indefinitely. With the exception of increased ATV and trail bike use, we anticipate no changes in the existing recreation profile.

Four-wheel and two-wheel motor cycle use is rapidly increasing throughout many Forest Service lands. A portion of this use is off-road and illegal, sometimes causing significant detrimental soil disturbance. Forest thinning can increase illegal off-road activity, as site distances increase; the temptation to illegally travel cross-country travel becomes great. In addition, skid trails may provide routes for increased overland travel. Leaving an appropriate amount of woody debris on the ground greatly discourages cross-country motorized use. As an additional prevention measure, features designed to discourage user built

trails would decrease some the potential of this to occur in some areas. Any harvest or fuels treatment activity adjacent to any system trails that would create openings at the trailhead or near the trail that could allow motorized user-built shortcuts to the trail or off trail use would require barriers to prevent this. In addition, any skid trails that could be easily accessed by OHVs would have logs and other debris spread over the trail to create a barrier (see Recreation section).

Therefore, some user created trail construction would increase as a result of this alternative, but impacts to soils is expected to be low as current impacts are low and additional impacts are not expected to be significant with the implementation of the design features discussed above.

Monitoring

For activities related to this project, all alternatives would comply with specific monitoring requirements identified by the IPNF Forest Plan. The length of time needed for monitoring is determined by the results and evaluation of the activity or effect that is being monitored. When it is certain that regulations and standards are being met, monitoring of a particular element would cease. If monitoring evaluations show that regulations or standards are not being achieved at the desired level, management intervention would occur and monitoring would continue.

Not all monitoring is considered mandatory, and its implementation is not a consideration in the determination of environmental effects. Site-specific monitoring of project activities is designed to verify that the projects are effective in meeting project and Forest Plan objectives. Monitoring projects are designed to be accomplished during project activities, but are dependent upon the availability of funds and other resources.

Specifically, for this project monitoring would include treatment units that currently exceed or are at 15 percent detrimental impacts post-harvest to assess the effectiveness of design criteria included in this report and compliance with Forest and Regional Soil Quality Standards.

Compliance with the Forest Plan and Other Regulatory Direction

Multiple-Use Sustained-Yield Act of 1960 and the National Forest Management Act of 1976

This project as designed would be consistent with Section 6(a) and (b) of MUSY and Section 6(g) of NFMA. Proposed management activities would not substantially or permanently impair the productivity of the land. On currently undisturbed and moderately disturbed units the effects would remain within the regional soil quality guidelines. Employing all appropriate mitigation strategies would maintain natural biophysical resiliency. Using all appropriate measures designed to minimize soil disturbance and soil restoration techniques, cumulative effects on the severely disturbed units can be drastically minimized, and actually aid in soil recovery. Soil impacts are expected to be nearly undetectable within 20 to 40 years based on professional judgment, experience and research on these soil types. Timber will be harvested where soil, slope, or other watershed conditions will not be irreversibly damaged. All proposed harvests, including even-aged regeneration harvests, would be carried out in a manner consistent with the protection of soil resources.

FSM 2500

Proposed management activities would be implemented to optimize the sustained yield of goods and services without impairing the productivity of the land and would improve soil productivity on some sites by rehabilitating soils that are in an unsatisfactory condition. In addition, soil quality monitoring for this project would include treatment units that currently exceed or are at 15 percent detrimental impacts post-

harvest in order to assess the effectiveness of design criteria included in this report and compliance with Forest and Regional Soil Quality Standards.

The regional supplement to this manual (R1 Supplement 2500-99-1) defines soil quality standards which, recommend that new activities be designed so that they do not create detrimental soil conditions on more than 15 percent of an activity area. This project as designed would not exceed 15 percent detrimental disturbance in areas where less than 15 percent detrimental soil conditions exist from prior activities. In areas where more than 15 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effects from project implementation and restoration would not exceed the conditions prior to the planned activity and would move toward a net improvement in soil quality.

Restoration treatments would maintain long term soil productivity and mitigation measures such as winter harvesting, reusing existing skid trails, retaining appropriate litter and duff layers and enough standing trees for annual litter contributions, burning under appropriate conditions, and allowing recommended volumes of large woody debris to stay on site would reduce cumulative impacts and protect those processes and elements that maintain soil biophysical resiliency.

The standards do not apply to or include intensively developed sites such as permanent roads, mines, developed recreation sites, administrative sites, or rock quarries.

1987 Idaho Panhandle National Forest Plan

Management direction and objectives in the IPNF Forest Plan (p. II-2 and 8) emphasizing the maintenance of long-term productivity and avoiding unacceptable levels of sedimentation resulting from soil erosion would be met with this project. This would be accomplished using mitigation measures and features designed to protect soil productivity and minimize sedimentation, which were developed using established BMPs.

The standards included in the Forest Plan (pp. II-32 and 33) which, are based on older Regional soil quality standards that included the impacts of system roads are:

- Soil-disturbing management practices will strive to maintain at least 80 percent of the activity area in a condition of acceptable productivity potential for trees and other managed vegetation. Unacceptable productivity potential exists when soil has been detrimentally compacted, displaced, puddled, or severely burned as determined in the project analysis.

The Proposed Action would comply with this standard. All proposed activity areas are below soil quality limits for disturbance and would maintain the acceptable productivity potential for trees and other managed vegetation. No unit would exceed the 20 percent forest plan standard when including system roads (See the LVR project file “Soils Folder” for the forest plan standards document). In addition, decommissioning 24 miles of system roads will help alleviate some of the disturbance.

- Projects should strive to maintain sufficient large woody debris to maintain site productivity.

The Proposed Action would comply with this standard; large woody debris retention would follow the research guidelines of Graham et al. (1994) to ensure the maintenance of site productivity.

- In the event of whole tree yarding, provisions for maintenance of sufficient nutrient capital should be made in the project analysis.

Whole tree yarding is not proposed with this project. In addition, design features have been developed that protect site nutrient capital by allowing nutrients to leach from green slash and following organic matter management recommendations.

Best Management and Soil and Water Conservation Practices

For this project, mitigation measures and design features were developed using BMPs and are compliant with Idaho and Washington rules and regulations regarding soil protection.

3.5 Hydrology

Introduction

Aquatic Environment

The three primary watersheds, within the Lakeview Reeder Project area, are Granite Creek, Reeder Creek and Kalispell Creek. All three of these watersheds have been influenced by both natural and human-induced events. Natural events include historic fires and erosion due to geologic influences. Human-induced events include railroad construction, homesteading, road construction, logging, fire suppression, and land development. These events have influenced the watersheds' erosional processes, hydrology, stream channels, water quality, and aquatic species and habitats. The following discussion briefly highlights the natural events and human disturbances that formed these three basins.

Geologic, Climatic and Fire Events Affecting the Aquatic Environment

For the purpose of this discussion, the natural events include glaciation, volcanic deposition and wildfire.

Geology and Soils

The underlying geology of the Lakeview Reeder project area includes both glaciated and unglaciated granitics, glaciated and unglaciated belt rocks and alluvial deposits. Generally speaking this complex arrangement of geology types has created a relatively complex stream network. The response of a channel to disturbances is primarily a product of the basins underlying geology. It is the underlying geology that is the source of the channel substrate. For example, the residual (unglaciated) granitics composing much of the headwaters of Kalispell basin weather easily into fine sands that dominate the mainstem of Kalispell Creek. In Reeder Creek, the basin's hydrology is dominated by the single large wetland known as Bismark Meadows. This meadow is the product of the past glaciation, whereby this wetland was likely a small lake and thus much of the substrate in the meadows is very fine sediments. In Granite Creek, the lower reaches of the channel braid through ancient unconsolidated alluvium deposited by the glaciers. This unconsolidated alluvium is a mix of sands, gravels, cobbles, boulders and bedrock. Because the material is unconsolidated, the channel is prone to migrating across the floodplain where one finds this unconsolidated alluvium.

Generally speaking, most of the soils within the actual project area are relatively stable in terms of mass failure potential and sediment delivery risk. A more thorough narrative regarding the geology and soils is found in the soils section of this document. Maps displaying mass failure potential and sediment delivery potential for the project area are located in the project file.

Glaciation

Prior to glacial influences 12,000 to 15,000 years ago, stream channels and valley bottoms were likely of shallower gradient, with wide floodplains. As glaciers melted, streams worked through the glacial outwash. Gradually, water from the receding glaciers forced the stream channels to downcut to reach the final elevations of Priest Lake (USDA draft in progress). Because the glaciation happened fairly recently in geologic time, the existing stream channels can be described as geologically young. Overtime the glaciated slopes began to support vegetation and gradually the process of ecological succession began.

Volcanic Deposition

The addition of ash to the soil from the eruption of Mount Mazama approximately 10,000 years ago boosted vegetation growth and productivity by increasing the soil nutrients and water-holding capacity. Today this relatively thick volcanic ash layer is critically important to reducing natural surface erosion and providing productive growing conditions (see Soils and Geology).

Rain-on-Snow

All of these basins have evolved with rain-on-snow events. A rain-on-snow event is a phenomenon that occurs when a Pacific storm system brings warm air (Chinooks) and/or rainfall during the winter months (November through February). During these conditions, condensation of water vapor liberates heat, which is the greatest source of energy for snowmelt. The result is rapid melting of snow, resulting in a sharp peak in streamflow. It is likely that while these events are fairly common, the events vary between basins. Even within a basin, the rain-on-snow event varies between the upper and lower ends of the basin. Typically, the upper portions of the drainages have deeper, colder snow packs that are difficult to melt during a rain-on-snow event. This means that the snow pack absorbs the water and there is less runoff. In the lower portion of the drainages, the typical rain-on-snow event is more likely, producing increased water yields. Historically, the reaction of these basins to a rain-on-snow event would be a slight increase in stream discharge that would last one to five days before the weather pattern changed. It appears from a report by DEQ in 2001 that while rain-on-snow events do occur within the drainages, the dominant channel forming events are associated with the annual spring melt which occurs anywhere from March through May.

Wildfire

Across the Priest River Subbasin, wildfires were a significant disturbance factor influencing erosional processes, hydrology, and stream channel morphology. As described in the Fire section, fires of variable intensities occurred within the Priest River Subbasin at 50 to 150-year intervals. More severe stand-replacing or “lethal” fires occurred about every 200 years or so, depending upon variables described in the fire section of this report.

During severe fires, water yield can increase due to canopy removal and decreases in evapotranspiration (McCaughey, Farnes and Hansen 1997; Beschta 1990; and Tiedemann et al 1979). The shifts in water yield may cause adjustments within the stream channel through changes in water quantity, timing, and duration. Adjustments can include increases in bank erosion, increases in the sorting and transport of bedload sediment, and potential stream bank erosion. Surface erosion can increase due to the reduction of hillslope vegetation. As a result, movement of bedload and fine sediment through stream channels is accelerated. When severe fires remove large woody debris and vegetation in the riparian zones, stream velocity increases, bank stability decreases, pool habitat is removed and stream temperatures increase (Minshall and Brock 1991).

With the exception of the steep headwater drainages, it is unlikely that historic fires consumed the trees in the riparian zones. Fire affected the streams by killing trees within and on the fringes of the riparian zones. Over time this fire-killed timber would gradually fall over and supply large woody debris to the streams. The fires also affected the streams by reducing the forest canopy, which allowed greater snow accumulation on the ground and increased water yields during spring flows. Instream erosion would increase slightly in the channels in response to the increased water yields. Sediment transported during these peak flows would settle out at breaks in the stream gradient and/or behind channel obstructions.

Granite Basin Fires: Within the Granite Creek basin, the majority of the fire history is focused in the middle of the basin, near Tillicum Peak, with fires occurring in both 1890 and 1926. Fires occurring in 1890, 1900, 1909 and 1926 had areas of both double and triple burns. It appears from the field reviews that the burned riparian areas are fully recovered, though the amount of available recruitable large woody debris is likely diminished because of the past fires and subsequent salvage logging in the riparian zones.

Kalispell Basin Fires: The “double burn” of the 1926 and 1939 fires was a significant event in the ecological history of the Kalispell drainage. Both of these fires were concentrated in the headwaters of the Kalispell watershed. The 1926 fire burned about 47 miles of the riparian zone and the 1939 fire burned about 39 miles (project file). Between the two fires, about 24.5 miles of riparian zone were burned over

twice. While the 1926 fire was within the natural range of variability (NRV), it is likely that the 1939 fire was beyond the NRV because of the large amount of timber that was on the ground in preparation for logging (see Fire section). In the headwaters, stream channels had reductions in large woody debris and subsequent increases in water and sediment yields; they have been adjusting geomorphologically ever since. Most streams in the Kalispell basin have recovered or are still recovering from the fires of 1926 and 1939.

Reeder Basin Fires: Like Granite Creek, the fires in 1890 and 1926 covered the greatest amount of acreage. The fire of 1926 consumed most of the timber on Lakeview Mountain. Since the fires, the vegetation has slowly recovered and the effects of those early fires are not evident in the current water or sediment yields. However, it is likely that the amount of large woody debris of a larger size class is probably relatively low given how completely the 1926 fire consumed the fuels in the lower part of Reeder Creek.

Human Induced Effects

For the purpose of this discussion, the anthropogenic effects to the physical aquatic environment include the following: roads, railroads, timber harvesting, home development, fire suppression and domestic water use development.

Road Construction

Roads can influence erosional processes, hydrology, and stream channel conditions. Research on water-road interactions is extensive (Gucinski et al 2000). Three recent papers, Roads Analysis: Informing decisions about managing the national forest transportation system, (USDA 1999), Ecological Effects of Roads, (Hourdequin 2000b) and Water/Road Interaction Series (USDA 2000a), give excellent summaries of the impacts and interactions between roads and water resources. The following paragraph summarizes findings from these papers and reports.

Roads can affect the routing of water through a watershed by intercepting, concentrating and diverting flows from their natural paths and by encroaching on the natural floodplains of streams. Changes in stream routing can result in peak flow increases, both in volume and timing. Surface erosion occurs on most forest roads because their surfaces, cutslopes, fillslopes and associated drainage structures are usually composed of erodible material and are exposed to rainfall and concentrated surface runoff. Mass wasting failures (slides and collapses) on forest roads occur when slope support is altered, the road prism is saturated with groundwater, subsurface flow is interrupted, hillslope drainage is rerouted, or debris flows occur at failed stream crossings. Culverts at road-stream crossings can cause large inputs of sediment to streams when there is more water than the culvert can handle, or when the culvert inlet is plugged and water is forced over the road fill. The result is often erosion of the crossing fill, or diversion of streamflow onto the road surface, into the inboard ditch, or both. Roads that encroach upon streams have the ability to restrict the streams access to the floodplains, increase stream velocity and reduce the introduction of large woody debris to channels.

Roads that encroach on streams directly affect riparian characteristics by removing shade, altering floodplain interactions and delivering sediment to streams. Other ways that roads affect the watershed is that they 1) are often sources of mass failures, 2) intercept surface runoff and extend channel networks, 3) accelerate the rates of runoff and 4) may block the movement of fish within the drainage because of impassable culverts.

Railroad transportation system

A logging railroad and associated chutes were constructed in the Kalispell Drainage from December 1927 until February 1931. The railroad line began at Priest Lake and terminated eleven miles up the drainage near Chute and Deerhorn Creeks. In addition to the mainline, spurs were constructed up the following

sub-basins: Bath, Virgin, Hungry, Nuisance, Rapids and Deerhorn. Chutes and skidtrails were used to move the logs to loading areas along the railroad. The railroad and chutes generally followed the stream bottoms and adjacent lower slopes. The right-of-way clearing to accommodate the railroad line was about 50 feet and the right-of-way clearing for the chutes was about 20 feet.

The construction of the railroad and chutes impacted the streams of the Kalispell drainage in several ways. Riparian vegetation was removed immediately next to the streams and channels were ditched to facilitate the railroad and chute construction. To make the chutes operational, some water from the streams had to be diverted. These impacts from the railroad transportation system likely caused long-term adverse effects to the channel dynamics because of the loss of recruitable large woody debris, increased sediment delivery and altered channel configurations. After the logging was completed, the rails and ties were picked up and reused elsewhere. Refer to the narrative discussing cultural resources for more information regarding the historic use and location of the railroad and chutes in the Kalispell watershed.

A much smaller railroad system was developed for the lower end of Reeder Creek. No similar railroad system was developed in Granite Creek.

Timber Harvesting

Logging and land clearing has been occurring in all three basins since the early 1900s. Early reports document that ranchers and homesteaders cleared tracts of land to raise cattle and crops (e.g. Bismark Meadows). For the rest of the three basins, historical logging records prior to 1950 are fairly limited. Beginning in the 1950s, the Forest Service Record keeping improved significantly and data was recorded as timber was harvested.

Harvest methods and removal of timber products from the national forest has changed substantially over time. Early harvest methods (1950s, ’60s, and ‘70s) focused primarily on financial objectives of providing low cost wood products. Harvesting often occurred in the locations with the highest volume and most easily accessible stands. Timber harvest often occurred within riparian areas and adjacent to streams. Most of the harvest prescriptions were primarily designed to produce healthy young stands with shorter rotation ages.

Fire Suppression

Prior to active fire suppression, large fires resulted in a mosaic pattern of burn severity. The fire section of the LVR project states that the mosaic pattern was likely created by variations in fuel structure, site variability with wind and weather events and variations in fuel moistures. In the 1930s, the Forest Service began to effectively suppress wildfires. Record keeping for Priest Lake fire fighting began in earnest in 1940. Since 1940, 144 fires have started within the Lakeview Reeder Project area. However, only 76 acres have burned with the 144 fire starts. With so little acreage actually burning since 1940, it appears that fuel loading within the project area is now higher than it would have been had the fires not been suppressed. Given that the fuel loading is higher across the landscape, the risk of a larger more intensive and possibly damaging fire has also increased.

Home Development

Home development has escalated in the lower ends of all three basins during the 1980s as property owners began developing their lots. With home development came a decrease in infiltration and an increase in runoff, both of which may have contributed to higher peak water yields and potential increases in sediment delivery. In addition to developing their lots, many homeowners also attempted to modify the streams flowing through or adjacent to their homes. Some of these modifications (e.g. armoring of channel banks and removing riparian vegetation) has destabilized portions of each of the three primary channels.

Domestic Water

Beneficial uses within the project area include many domestic water rights. Figure 19 displays the location of the domestic water sources within the analysis area. A separate listing of each legal water right is located within the project file. Each of these water rights would be protected as part of the project design (see Chapter 2, Features Designed to Protect Soil, Water, and Fish Habitat).

Within the Lakeview Reeder Project area, there are 28 water rights and 269 domestic use wells on file with the Idaho Department of Water Resources (project file). According to the IDWR, when a domestic well is drilled, water rights are not necessarily recorded. As displayed in Figure 19, most of the domestic wells are located in the lower most portions of Reeder and Granite creek watersheds, where development is most dense. To our knowledge, all of the 28 water rights are for groundwater or springs, with the exception of one surface water right claim for domestic water (project file). Each of these water rights will be protected as part of the project design.

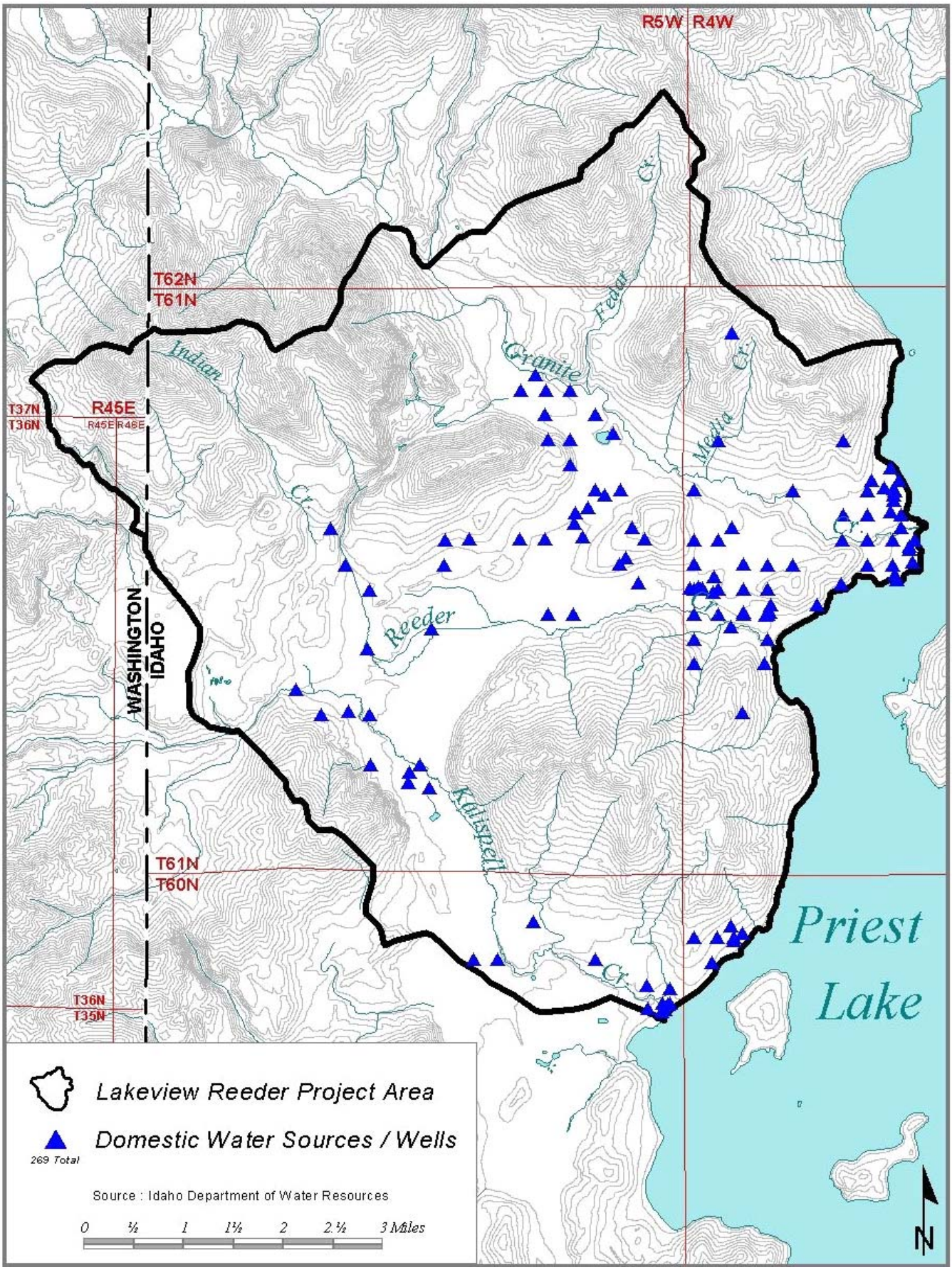


Figure 3-36. Map showing the location of domestic water sources/wells in Lakeview Reeder Project Area.

Biological Based Disturbances

Beavers

Historical accounts from the turn of the century suggest that beaver dams were extensive within the Priest Lake Basin. The cyclic nature of beaver populations in the Kalispell basin has been a function of food, habitat availability, and fur market fluctuations. Beavers have been an important agent of change within the Kalispell and Reeder basins. Research shows that beaver populations naturally build up and crash (Naiman 1988). This natural rise and fall of the beaver populations in the Kalispell and Reeder drainages played a major role the basins hydrology. The largest contiguous area of beaver activity was near Bismark Meadows. It is possible that in some years, the beaver activity was so great that they cause the flow of Kalispell Creek to flow north to Reeder Creek or flow in its current channel. Other major impacts beavers had in the basin were changes to sediment movement and/or transport, riparian tree species, fish habitat and refugia, recharge to groundwater aquifers, and control of stream runoff. Wherever beaver activities were major, the effects would be a reduction in sediment transport downstream, an increase in pool frequency, a temporary reduction in large diameter hardwood species, an increase in groundwater recharge, and a moderating effect upon streamflow peaks. As the beaver dams failed, the stream would have pulses of water and sediment movement downstream. Most of the sediment would gradually be trapped behind in channel obstacles (i.e. other beaver dams or large woody debris) and/or be deposited in pools.

Stream surveys of Kalispell and Reeder basins in the early 1990s (project file), noted that very few beaver dams existed anywhere in the watershed. This lack of beaver dams over the years caused the streams to have less complex fish habitat and increased sediment movement through the channels. However, similar stream surveys conducted years later in both Kalispell Creek (2002) and Reeder Creek (2006) noted numerous large, stable dams that have been built throughout the basins. The beaver dams within Kalispell are located along all of the mainstem and many of the tributaries throughout the basin. The beaver dams within the Reeder drainage are most prominent from Bismark Meadows to the confluence with Priest Lake. These findings suggest a resurgence of beaver within the larger basins. The newly constructed beaver dams have increased available fish habitat, created sediment stores, and increased the baseflow of the streams during the summer months.

Surveys of Granite Creek have documented beaver activity as well. In Granite Creek, the beaver activity is not as dominant as was observed in either Reeder or Kalispell Creeks. Most of the beaver activity in Granite Creek within the project area is located in the lower reaches.

Effects of Vegetation Change on Hydrology

Prior to human influences, insect and disease outbreaks occurred but did not have measurable influences on the hydrology in the drainage. When insects and diseases occur at levels outside their natural ranges, much larger openings in forest canopy can occur, causing long-term increases in water yield as the diseased tree species self-perpetuate and canopies remain open (see Vegetation Section). However, when tree species less susceptible to insects and diseases are planted (e.g. non-blister rust resistant white pine or off-site ponderosa pine), hydrologic recovery can be delayed because the trees die before full maturity. Lastly, the change in grass species from native grasses to noxious weeds can affect hydrology as well. Often the invasive noxious weeds are not able to hold the soil on site and erosion may increase in those areas with extensive noxious weed populations.

Regulatory Framework

Forest Plan Standards

The Idaho Panhandle National Forests Forest Plan outlines standards that meet Forestwide goals and meet or exceed State water quality standards (IPNF Forest Plan, p. II-33). It requires implementation of project-level standards and guidelines for water quality contained in the Soil and Water Conservation Practices Handbook (FSH 2509.22), including those defined by State regulation or agreement between the State and Forest Service. The Forest Service is required by law to comply with state water quality standards developed under the Clean Water Act. The Environmental Protection Agency (EPA) and individual States are responsible for enforcement of these standards.

Clean Water Act

The principal law governing pollution in the nation's streams, lakes, and estuaries is the Federal Water Pollution Control Act (P.L. 92-500, enacted in 1972), commonly known as the Clean Water Act (as amended in 1977, 1981 and 1987). The Clean Water Act is the primary federal law that protects the nation’s waters, including lakes, rivers, aquifers and coastal areas. The Act's primary objective is to restore and maintain the integrity of the nation's waters.

Through the Clean Water Act, each state is required to provide guidance and direction to protect and restore water bodies (40 § 131.12). The State of Idaho has met this federal requirement through their state Best Management Practices (BMPs). The Forest Service is required to meet and/or exceed State Best Management Practices to protect water quality (Forest Plan, p. II-33).

Under section 303(d) of the Clean Water Act and EPA regulation (40 CFR 130.2(J), 130.7), states are given authority to list which waters do not meet water quality standards or have impaired beneficial uses. This list of impaired waters is commonly known as the “Section 303(d) list”. The individual states are directed by the EPA to improve the aquatic conditions of those streams not supporting beneficial uses. Once a water body is listed as impaired, it is the state’s responsibility to develop a Total Maximum Daily Load (TMDL) for each pollutant of concern. These TMDLs are then submitted to EPA for review and approval or disapproval.

The timber treatment portion of the Lakeview Reeder Project area is located entirely within the State of Idaho, though the analysis area and some mitigation work associated with the project includes lands within the State of Washington. None of the streams in the project area are listed for the State of Washington as not supporting beneficial uses. However, each of the same streams is listed for the State of Idaho as not fully supporting beneficial uses.

For the State of Idaho, the most current official list of streams not supporting beneficial uses is the 2002 303(d) list (approved in December 2005). According to the 2002 303(d) list, Kalispell, Reeder and Granite Creek are listed for temperature. Both Kalispell and Reeder have approved TMDLs for sedimentation/siltation (Section 4, 2008 Integrated Report). For the Kalispell Basin, the EPA approved the TMDL sediment reduction plan submitted for the basin by DEQ (DEQ 2001). This TMDL plan issued in October 2001 (p. 189) stated that “relocation of Forest Road 308 would remain as a top priority for TMDL sediment reduction efforts.” The TMDL plan for Reeder Creek was presented as an addendum to the Priest River TMDL plan and was released in April 2003. The focus of the Kalispell and Reeder Creek’s TMDL sediment reduction plans are to improve beneficial uses, which are more thoroughly discussed below.

Though watershed restoration activities are being planned for the all three drainages, only Kalispell basin and Reeder Basin have restoration specifically proposed to meet the goals of an approved TMDL reduction plan. For Kalispell basin, the Forest Service is proposing removing almost 3 miles of Road 308

out of the riparian zone. This effort is in direct alignment with the final TMDL plan that identified this sole piece of road as one of the leading causes of high sediment delivery into Kalispell Creek (DEQ 2001). In the Reeder Creek drainage, the Forest Service is proposing improving existing road surfaces that are actively contributing sediment and removing excess roads. According to the Reeder Creek TMDL report, the DEQ reports that opportunities for significant reduction in sediment yield to Reeder Creek from the road network appear to be limited because except for a few crossings, most of the road network is beyond the 200 foot buffer distanced from Reeder Creek. The author of the DEQ report goes on to mention that the single most beneficial improvement within Reeder Creek will be the project in Bismark Meadows that is part of the Wetland Reserve Program.

Road work is proposed throughout the Lakeview Reeder Project area. Some of the proposed road work includes improving existing roads, whereas some road work would lead to removing roads from the landscape. The proposed action includes maintaining 18 miles of road and reconstructing 4.7 miles of road. Improving existing roads through maintenance and reconstruction would allow continued access while reducing sediment delivery from the roads to the streams. In these instances, road improvements may include rocking, grading, cleaning ditches and improving road drainage. Other roads will be made hydrologically inert through storage and/or decommissioning. The road storage and decommission treatments would be implemented in the next five to ten years. The road storage/decommissioning work would include removal of culverts, limited channel restoration, full and partial recontouring of the road prisms, or decompaction and/or revegetation of roadbeds (approximately 25.5 miles). Roads that are put in storage are left on the system and may be used again in the future. Roads that are decommissioned would be removed from the system and would not be suitable for future use. A complete list of roads proposed for improvement, storage and decommissioning is available in Appendix D of this document.

There is no TMDL plan in place for reducing temperature in any of the three drainages.

Idaho Water Quality Rules and Regulations

The “water quality criteria” for waters with the State of Idaho are presented in IDAPA, 58.01.02.250 (“Surface Water Quality Criteria for Use Classifications”). With the Idaho Administrative Code, there is a section that specifically addresses beneficial uses (IDAPA, 58.01.02.053 (“Beneficial Use Support Status”). Beneficial uses in the IDAPA include the following: Cold Water Communities, Salmonid Spawning. Seasonal Cold Water Communities, Warm Water Communities, Modified Communities, Primary Contact Recreation, Secondary Contact Recreation, Domestic Water Supply and Special Resource Water. In the IDAPA, the drainages are organized by Subbasins. In the Priest Subbasin (HUC 17010215) there are thirty-one (31) listed water body units. Of the 31 water bodies, Granite, Kalispell and Reeder are individually listed, but no specific beneficial uses are assigned to the water bodies: Only Priest Lake is listed for specific beneficial uses.

Within the State of Idaho, water quality standards and beneficial uses may or may not be specific to a particular water body. None of the streams within the project have State assigned beneficial uses (project file) and therefore are termed “undesignated surface waters”. Waters which are “undesignated” shall be “protected for beneficial uses, which includes all recreational use in and on the water and the protection and propagation of fish, shellfish, and wildlife, wherever attainable” (IDAPA, 58.01.02.101). Water bodies not specifically listed by the State of Idaho are assigned beneficial uses based on data and observations (Table 32). Within the cumulative effects analysis area (see project file), beneficial uses include domestic water supply, salmonid spawning, coldwater organisms, and primary contact recreation and special resource water.

Table 3-42. Beneficial uses in each drainage of the cumulative effects analysis area (Idaho specific).

Watershed	*Domestic Water Supply/Special Resource Water*	*Salmonid Spawning*	*Cold Water Organisms*	*Primary Contact Recreation*
Granite Creek	X	X	X	X
Reeder Creek	X	X	X	X
Kalispell Creek	X	X	X	X
Priest Lake	X	X	X	X
Boulder Creek		X	X	X

Washington Water Quality Rules and Regulations

Though the project area includes the State of Washington, Lakeview Reeder will not include any timber harvesting within Washington. However, there are plans to remove excess roads on lands within the State of Washington under this same project.

Instead of the term "beneficial use", the State of Washington uses the term "designated uses". In the Washington Administrative Code (WAC 173-201A-010) there is a comprehensive discussion regarding water quality criteria and designated uses.

> "The purpose of this chapter is to establish water quality standards for surface waters of the state of Washington consistent with public health and public enjoyment of the waters and the propagation and protection of fish, shellfish, and wildlife, pursuant to the provisions of chapter 90.48 RCW. All actions must comply with this chapter. As part of this chapter: (a) All surface waters are protected by narrative criteria, designated uses, and an antidegradation policy." (WAC 173-201A-010)

The designation of water bodies in the State of Washington is defined in WAC 173-201A-600 Use designations. According to this guidance, all freshwaters of the State not named in the WAC, are to be

> .."protected for the designated uses of: Salmonid spawning, rearing, and migration; primary contact recreation; domestic, industrial, and agricultural water supply; stock watering; wildlife habitat; harvesting; commerce and navigation; boating; and aesthetic values."

Best Management Practices

The States' water quality standards regulate non-point source pollution from timber management and road construction activities through the application of Best Management Practices (BMPs). The BMPs were developed under authority of the Clean Water Act to ensure that the States' waters do not contain pollutants in concentrations that adversely affect water quality or impair a designated use. The use of Best Management Practices (BMPs) is also required in the Memorandum of Understanding between the Forest Service and the States as part of our responsibility as the Designated Water Quality Management Agency on National Forest System lands. State-recognized BMPs that would be used during project design and implementation on National Forest lands are contained in Appendix A.

Critical Management Issues

Critical management issues for protecting water resources include water yield, soil erosion and mass wasting, hydrologic function, riparian function, stream temperature and cumulative watershed effects. The following discussion describes each of these critical issues and identifies the issue indicators that will be used to evaluate potential effects to water resources.

Water Yield

Issue indicators: ECA in acres, predicted water yield increases (WATSED Model outputs), increased risk for rain-on-snow events and road density in miles per square mile.

Simply stated, water yield is a function of total precipitation, forest canopy and infiltration capacity. Most of the annual precipitation in the project area occurs as snowfall that is gradually released to streams through infiltration and shallow groundwater discharge. The hydrologic cycle assumes that given a certain amount of precipitation, some of the water will infiltrate into the soil, some will runoff, some will be transpired by vegetation, and some will evaporate. According to Elliot (2005), in a forested ecosystem, approximately 1 percent of average annual water yield is surface runoff and the remaining 99 percent is subsurface runoff.

Natural disturbances such as fire tend to increase water yields by reducing canopy cover and plant uptake of subsurface flows and by possibly producing hydrophobic soils after severe burns (McCaughey et al. 1997, DeBano 1981; USDA 2000; Brooks no date; Huffman et al. 2001); whereas dense, immature stands tend to decrease surface and subsurface flows. A range of vegetative and water yield conditions would probably have been present in the Lakeview Reeder project area through space and over time. This is evident when reviewing the historic fire activity maps (project file).

Many peak flows in northern Idaho are associated with mid-winter rain-on-snow events and rain-on-spring-snow events with peaks that are usually higher but of shorter duration than normal spring high flows (MacDonald and Hoffman 1995). Models cannot predict peak flows resulting from these events because their frequencies are random. The rain-on-snow events do not occur on an annual basis; and they are dependent on certain climatic conditions such as air temperature, intensity, and duration of precipitation, elevations, and snowpack characteristics (Berris and Harr 1987). Although the bankfull flow tends to be the main channel-forming flow, these higher peaks can induce significant channel changes, particularly if they are accompanied by mass failures.

Given that total precipitation is not heavily influenced by site specific land uses, then the focus for water yield alteration in a forested drainage focuses upon changes in forest canopy and changes in soil infiltration capacity. Forest canopy cover functions in the hydrologic cycle to moderate precipitation runoff by intercepting and transpiring water. Generally, removal of the forest canopy (by insects, disease, fire or machinery) can result in increased water yield and hydrograph modification (e.g., increased peak flows, particularly in areas subject to rain-on-snow events). Increased peak flows may result in more extensive stream bank erosion, channel scouring, and bedload deposition.

To gain a better understanding of the “normal” water yield for this area, the hydrologist considered what has historically happened to the forests (see Vegetation section). In the historical riparian condition, streams had ample large woody debris and their flows fluctuated with the season, much as they do today. One of the differences between current conditions and historical conditions is that today, there is considerably more coniferous vegetation on the slopes than what existed at the turn of the century. The net effect of the denser forest canopy is likely decreased water yield compared to conditions around 1900. The stream channels that exist today likely evolved with the higher flows that prevailed when more open pre-European settlement forests existed.

From the 1940s to the 1980s, timber harvesting was fairly extensive in the three primary watersheds (See Project File for maps of past timber harvesting). The primary effect of these older timber harvests was soil compaction (from old tractor harvesting) and the delivery of sediment to the streams from the associated transportation system (roads and railroads). As described earlier, the stands had been more open historically and therefore at the time of the timber sales, it is reasonable to assume that water yields were likely lower than they had been historically. The water yields were lower because more of the landscape

was covered with a denser stand of trees taking up more water than had occurred historically. Numerous researchers have attempted to quantify the effects of timber harvest on water yield (Cheng 1989, Golding 1987, Harr 1989, Hicks 1991 and Troendle 1983). The research states that the effects of timber harvest on existing water yields depends upon a number of variables including, but not limited to, geology, vegetative patterns, species mix, channel types, climate, and extent of vegetative manipulation.

Wetland complexes serve to attenuate peak water yields by holding back the runoff and slowly releasing the water into the streams. Both Kalispell and Reeder Creeks are dominated by large wetland complexes that moderate the flow through the watershed. Kalispell has several wetlands in the upper third of the drainage including Deerhorn, Potholes and Mountain Meadows. Reeder Creek flows through Bismark Meadows. Within the actual project area, Granite Creek does not have the large wetland complexes that are evident in both Kalispell and Reeder Creek basins.

Another driving factor in water yield volumes is the seasonal timing of the higher runoffs. The watersheds in the analysis area are snowmelt driven with peak snowmelt generally occurring between April and June. There are no gauged streams in the project area. Most spring peaks are related to rapid warming and rain on high-elevation snow. The occasional wintertime runoff peaks likely resulted from rain-on-snow events in the typical mid-elevation, sensitive-snow zone. Peak runoff for all three of these drainages generally occurs between April and June during spring snowmelt (DEQ, 2001). Spring runoff, along with the occasional rain-on-snow event, has caused flooding in the lower portions of these watersheds. This flooding is a normal channel function and is a natural process under which the channels evolved. To date, the damage associated with these annual peak runoffs is limited and is normally isolated to road crossings and homes or yards encroaching on the floodplains.

Water yield will be assessed using the WATSED model in tandem with the thorough stream and road field reviews conducted for this project.

Water Yield and Equivalent Clearcut Area (ECA)

Equivalent Clearcut Areas (or Acres) (ECA) were used as an indicator for water yield. According to Belt (1980), the overall relative risk of impacts to the hydrologic functions of a forested watershed may be calculated as the ECA. The ECA is calculated from the total amount of tree crown removal in forest stands that has resulted from timber harvesting, road construction, fire, and other activities.

Researchers have attempted to quantify the value of using Equivalent Clearcut Areas method (or similar approaches) to evaluate the response of drainages to openings. Despite numerous research efforts (Stednick 1996, Menning 1997, Beschta 2000) there is no absolute ECA value that serves as a threshold for concern for openings that maximize runoff. Much of the variability has to do with the unique responses of the specific drainages to stochastic events (i.e. rain-on-snow events). Other variabilities in watershed response have to do with the spatial distribution of the openings across the landscape and the underlying geology. Recognizing the range of watershed variability (i.e. geology, basin size, orientation and climate) along with the potential impact of stochastic climatic events, supports using a range of ECA values for analysis. In Stednick (1996), the review of past research showed extremely variable results. In some cases, removal of very little vegetation caused elevated water yields and conversely in other studies, drainages with 100 percent harvest have had no measurable increase in annual water yield. Stednick attributed the variability to harvest location, harvest type, pretreatment vegetation cover or measurement error. After reviewing the studies, Stednick (1996) determined that approximately 20 percent of the catchment vegetation cover must be harvested for a measurable increase in annual water yield. Thomas and Megahan (1998) summarized the ECA discussion well. “Given the complex nature of the effects of forest cutting and roads on stream flows, it is not surprising that the literature provides mixed messages about peak flow responses”.

On a more local level, ECA values less than 15 percent are considered low for the IPNF and canopy openings (ECA) less than 20 percent are unlikely to result in measurable water yield changes. Based on Stednick's research (1996) (that included the Rocky Mountains), , an ECA approaching 25 to 30 percent is used as an indicator that more intensive field surveys are warranted to determine if a watershed is at a threshold for hydrologic impacts. Within the three primary watersheds, the existing ECA for Kalispell Creek is 11 percent, Reeder Creek is 10 percent and Granite Creek is 12 percent (Watershed Characteristics). Based on past research (Stednick 1996) and the experience of the IPNF, none of the three ECA values are within any levels of concern.

While increased water yields may be problematic to streams, there is no similar concern with low flows. Keppeler (1998) found that changes in base flows occurred during the late summer season only after 50 percent or more of a watershed was harvested: The proposed treatments for the Lakeview Reeder Project would not begin to approach this level of harvesting.

Water Yield and Rain-on-snow Conditions

Canopy openings in the critical zone can increase sensitivity to extreme weather events due to decreased evapotranspiration, and increased snow accumulation, ablation, and melt. The result of creating the openings in the critical zone is an altered hydrograph with higher peak flows due to a "flashier" response to climatic events, reduced base flows, and overall increased water yield.

Table 3-43. Existing canopy openings[a] in both the rain-on-snow zone portion of the watersheds of the focused cumulative effects analysis area and the total watershed areas.

Watershed(s)	***Openings in the Sensitive Rain-on-Snow Zone (acres) (between 3,000 and 4,500 feet)***	***Openings in the Transitional Rain-on-Snow Zone (acres) Focused Cumulative Effects Analysis Area (below 3,000 feet)***	***Percent Openings in ONLY the Sensitive Rain-on-Snow Zone Entire Drainage***	***Percent Existing Equivalent Clearcut Areas based on WATSED model calculations***
Granite	1725	948	63%	13.8%
Reeder	1022	1132	39%	5.5%
Kalispell	1778	528	71%	3.4%

[a] Canopy openings refer to those stands of trees less than 25 years of age and/or 25 feet tall. This excludes natural openings such as Bismark Meadows.

Approximately, 62 percent of the Lakeview Reeder focused CEA area is located within the most sensitive elevational band of 3,000 to 4,500 feet. This band of elevation equates to the "zone" most likely to experience rain-on-snow events. Elevations below 3,000 feet are considered "transitional" zones that accumulate and melt snow fairly quickly. The elevations above 4,500 feet may experience rain-on-snow events, but the snow above these elevations tend to be deeper and colder and thus not as prone to typical rain-on-snow events (Patten and Cobb, 2002). Looking at a map of the Lakeview Reeder Project area along with the data presented in Table 2 it appears that very little of the Granite, Reeder and Kalispell drainages on National Forest Service lands have current openings. However, the privately managed lands (mostly located below 3,000 feet elevation) appear from aerial photos to have experienced measurable development. Absolute numbers of openings on private land were not available for this analysis. Total existing canopy openings from past timber harvesting on National Forest lands comprising the Lakeview Reeder project area are relatively low; therefore, existing management-induced rain-on-snow effects are minimal.

Road density

Roads directly contribute to the disruption of hydrologic function and increased sediment delivery to streams, and indirectly effect streams from activities that accompany road access (e.g., timber harvest and livestock grazing) (ICBEMP 1996). Roads contribute to increases in peak stream flows by increasing drainage efficiency as roads intercept and concentrate runoff from hill-slopes. Changes that may result from increased peak flows include alteration of stream geomorphology and ecology, more rapid turnover of riparian zone vegetation, and increased transport of woody debris and sediment (Jones and Grant 1996).

The streams and roads within the project area are relatively stable as described in the "Existing Watershed Condition" discussion below. Still, road densities are moderately high for the drainages at 3.6 mi/mi2 for Kalispell Creek, 4.8 mi/mi2 for Reeder Creek and 3.0 mi/mi2 for Granite Creek. It was revealed in the field surveys that though the road densities are relatively high, the damage(s) to the streams was largely done at the time of construction. According to our records, Highway 57 was constructed in 1920 and most of the private and Forest Service roads were built in the 1950s. Since the 1980s, very little new road construction has occurred in any of the three primary watersheds. The roads within the project area were surveyed and it was determined that there were only limited instances where roads were contributing sediment. Although, field surveys within the Lakeview Reeder project area documented that sediment delivery from most of the roads is minimal, the high road densities continue to alter hydrologic runoff patterns and overall hydrologic function.

Sediment Yield

Issue indicators: Sediment model (WATSED Model) and road density on sensitive land types in miles per square mile.

Erosion rates in undisturbed forests are negligible (Clayton and Megahan, 1997; Elliot 2002, Elliot et al. 1996). Ground-surface cover plays an important role in reducing erosion and is inversely related to erosion (Elliot 2002). There is no sediment monitoring data for the streams within the project area to indicate current vs. natural loading and transport rates. Therefore, the WATSED model was used to estimate the natural background and existing condition due to management activities on federal lands for sediment yield in the project area.

Sediment modeling cannot predict the individual effects of random events such as rain-on-snow induced road fill failures. Most large failures of road fills in northern Idaho have been associated with rain-on-snow events, particularly at stream crossings. There are approximately 240 miles of existing road in the focused cumulative effects analysis area for the Lakeview Reeder project area that lie within the normal rain-on-snow elevation of 3,000 to 4,500 feet above sea level. The combination of unstable road fills and extreme runoff events such as those caused by the rapid melt-offs that are likely in this zone can result in catastrophic failures and associated sediment delivery to streams. Though large failures have occurred in each of the drainages, few such failures have occurred within the confines of the project area since at least the turn of the twentieth century. The mass failures that occurred in the last twenty years have been directly linked to roads (e.g. Roads 638 and 1340).

Megahan (1986) states that the highest erosion rates within undisturbed forests results from landslides. WATSED simulates the chance of accelerated mass erosion in response to management activities. Therefore, the program makes it appear that sediment yields are more continuous from year to year, when in fact mass erosion is episodic. This fact by itself explains why individual year outputs from the program have limited precision (Patten 1989). Therefore, annual sediment yields may be lower than the predicted values during typical years, but higher during years with above average precipitation.

The sediment yield issue for the Lakeview Reeder Project will be assessed using the WATSED model and professional judgment from the project hydrologist regarding form and function of streams and landforms.

Hydrologic Function

Issue indicators: Ability of channel to balance water and sediment yields

Hydrologic function addresses the ability of a drainage to balance water and sediment yields. More specifically, it defines how movement of water through the landscape as precipitation passes through the forest canopy, over and through the soil, and through streams, rivers, and lakes on its way to the ocean. A generalized relationship indicating the "stable channel balance" is described in Rosgen (1996) as proportionality between sediment discharge, stream discharge, particle size and slope. A change in any one of these variables initiates adjustments in the other variables, thus resulting in a change to the channel.

Stream segments are defined in this document using the Rosgen channel typing methodology (Rosgen 1996). There are several stream types within the analysis area, these have been mapped and can be found in the project file. In the headwaters, the most common stream types are As and Bs (Rosgen 1996); these are characterized by narrow floodplains, fairly straight streams with high gradients (greater than 4 percent water surface slopes). "A" streams have step/pool morphologies and are capable of transporting sediment throughout the year. An example of an "A" stream type would be the headwaters of Indian Creek. "B" stream types have more gentle gradients, typically between two and four percent gradient, the streams access their floodplains and are moderately sinuous. An example of a "B" channel type would be Fedar Creek. Most of the main stems of the Granite, Reeder and Kalispell that flow through the project area are "C" channel types. These are the pool riffle streams that meander, are of low gradient and are common in wide valleys. Within Bismark Meadows, there are portions of the mainstem of Reeder Creek which are "E" channel types. This channel type has a low gradient, is very sinuous and is deeply incised. The "E" channel types are associated with fully functioning riparian meadows that flood regularly.

The hydrologic function of the streams within the Lakeview Reeder Project will be assessed using the field data coupled with outputs from the WATSED model and professional judgment from the project hydrologist regarding possible effects to the streams.

Riparian Function

Issue indicators: Equivalent clearcut area (ECA) within RHCAs, domestic water sources, riparian road density in miles per square mile.

Many aquatic and terrestrial wildlife species are dependent on riparian (i.e., streamside) habitat. Forested riparian areas provide the large woody debris (i.e., fallen trees in streams) that creates scour pools, dissipates erosive energy, controls bedload movement, stabilizes stream channels, and provides cover and food supplies for fish and other aquatic life. Live and fallen vegetation in riparian areas filters sediment from overland flow before it reaches stream channels. Riparian vegetation also provides shade to moderate stream temperatures and protects cold-water fisheries. Timber harvesting, road construction, or catastrophic stand-replacing fires can adversely affect these critical riparian functions.

Generally, the amount of road erosion in a watershed is a function of road density and the conditions of cutslopes, road surfaces, fillslopes, and road drainage structures. Where road erosion occurs close to streams, sediment is more likely to be delivered to channels and impact water quality and fish habitat. Studies have shown that for non-channelized flow, sediment rarely travels more than 300 ft (Belt et al. 1992). Non-channelized sediment transport distances increase with slope and decrease with the amount of obstructions (e.g., vegetation, rocks, logs, etc.) between the road and stream. Ditch relief culverts or other

road drainage systems that convey runoff to hill-slopes away from stream channels usually do not deliver sediment to streams. The risk of sedimentation from road washouts or other road-related mass slope failures impacting aquatic habitat is also far greater where these incidents occur near streams in riparian zones.

Currently, there are over 52 miles of road within 300 feet of the streams of the Lakeview Reeder Project Area. Of these 52 miles of existing riparian road, about 25 miles are open and drivable, the remainder is technically not hydrologically closed, but instead is restricted or impassable. The mileage of total riparian roads equates to 0.56 miles/mi2 for road density. According to the IPNF Watershed Characterization database (2006), the riparian zone is considered hydrologically open for 10 percent of Granite Creek, 7 percent of Reeder Creek and 12 percent of Kalispell Creek.

The riparian function of the streams within the Lakeview Reeder Project will be assessed using the field data coupled with outputs from the WATSED model and professional judgment from the project hydrologist regarding possible effects to the streams.

Water Temperature

Issue indicators: Riparian disturbance: riparian ECAs and riparian road densities.

The single most important variable which controls direct solar radiation and thus heat influx in small forest streams is shade (Cobb 1988). Variables other than vegetation, which influence the amount of solar radiation reaching the stream, include stream width, orientation, solar angles and surrounding topography. With the proposed activities, the only variable that could possibly increase the amount of solar radiation reaching the stream would be timber harvesting. Timber harvesting in the riparian zone can increase solar radiation to the stream and thereby increase stream temperatures (Moore et al. 2005). Leaving riparian buffers can decrease the magnitude of stream temperature increases and; changes to riparian microclimate but substantial warming has been observed for streams within both unthinned and partial retention buffers. A range of studies has demonstrated that streams may or may not cool after flowing from clearings into shaded environments. Electronic temperature sensors (HOBOS) have been used in all three primary streams to assess stream temperatures. The effects of the proposed alternatives upon stream temperature will be assessed using the field data and an evaluation of any possible disturbances that could adversely affect stream temperature.

Cumulative Watershed Effects

Issue indicator: WATSED results and interpretation, Properly Functioning Condition (PFC) analysis and trend and effect on TMDL pollutants.

By definition, cumulative impacts result when the effects of an action are added to, or interact with, other effects in a particular place and within a particular time. It is the combination of these effects, and any resulting environmental degradation that is the focus of cumulative impact analysis. While impacts can be differentiated by direct, indirect and cumulative, the concept of cumulative impacts takes into account all disturbances since cumulative impacts result in the compounding of the effects of all actions over time.

For this cumulative effects analysis, the primary tool to sum the cumulative effects for the hydrologic resource was the WATSED model. Given that there are limitations to the model, the model results were interpreted by the project hydrologist and evaluated in light of existing conditions and other activities that WATSED simply can not accurately model (e.g. road decommissioning projects). Using the model along with site specific data, the hydrologist determined how the selection of either the no action or action alternative would affect each watershed “Condition Class” and the pollutant of concern (temperature or sediment) as identified by the EPA for each watershed. In some instances (for example, sediment in the Kalispell basin), the pollutant of concern had a numerical value assigned that allowed for a Total

Maximum Daily Load for that specific pollutant in that specific stream. One of the outputs of the cumulative effects analysis is to determine what effect an alternative would have on the pollutants of concern for each basin.

WATSED Model

The WATSED Model was used as a tool for the watershed cumulative effects analysis. The model cumulatively sums up historical disturbances (e.g. fire, harvests and roads) and provides a relative value for determining equivalent clearcut acres, water yields and sediment yields. The WATSED Model has been calibrated for the Idaho Panhandle National Forests (USDA, 1981, R1/R4 Guide for Predicting Sediment Yields from Forested Watersheds; Patten, 1989; IPNF Forest Plan Monitoring and Evaluation Report, 2004; project file). The Regional database of past timber stand management activities and the GIS roads coverage were used as model input. WATSED spatially and temporally organizes typical watershed response relationships as a result of forest practices. Like any model, it simplifies extremely complex physical systems to generate specific quantitative values. These values cannot be assumed to represent actual in-stream sediment or flow levels. Monitoring has shown that WATSED produces reasonable values for water yield and conservative (over-) estimates of sediment routing (IPNF 2000 Monitoring and Evaluation Report, pp. 26-27; IPNF 2003 Report pp. 41-44, IPNF 2004 Report, pp 37, IPNF 2005/2006 Report , pp. 35 and 36). Limitations of the WATSED model, as well as procedures that were used for running the model for this project are presented in the project file. Therefore, model results are realistically limited to providing a means of comparison, not an absolute measure against verifiable standards.

The WATSED model was used to predict effects in Granite Creek, Kalispell Creek and Reeder Creek. The entire Granite Creek drainage could not be modeled because its size exceeds the limits of the WATSED model. Additionally, over the past two decades, management activities in Granite Creek have focused on watershed restoration and road maintenance. WATSED was not used for either the Boulder drainage or the Priest Lake Face area. Boulder was not modeled because the proposed activity in that basin includes only the removal of one road and the WATSED model can not estimate effects of road decommissioning. The WATSED model was not used for the Priest Lake face because the area does not even approximate a true watershed and therefore the model would not be an appropriate tool.

The data used to populate the model was based upon the District database. This database includes only roads that have been constructed both inside and outside of the NFS boundaries. Information on the amount and location of canopy disturbance due to residential development other than roads was not readily available. Therefore, the extensive residential development that has occurred downstream of the Forest boundary could not be modeled. Because the model will only be used as a means of comparison, including the downstream development would not have improved the accuracy of the model predictions. The residential development is considered qualitatively in the cumulative effects analysis. Additional information regarding the WATSED model is provided in the section of this watershed report that discusses “Models and Classifications”.

For this analysis, each of the three primary drainages had three model runs to compare potential sediment and water yield values: 1) The no action alternative, and 2) The no action alternative with a projected wildfire scenario (project file) and 3) The action alternative. The no action alternative was run based on having no changes in canopy closures and no increase in roads. The second modeling effort was an attempt to model a hypothetical wildfire within the project area. The wildfire scenario was modeled such that existing stands burned commensurate with the existing canopy. The burned stands were identified based on the fire specialist risk assessment. For the purpose of this comparison exercise, it was assumed that more dense stands would burn with a higher severity than would more open stands. The action alternative was modeled according to the action alternative design with the prescribed canopy removal, road construction and prescribed burning. In all three scenarios, the model was run from 1930 to 2050.

The length of time captured early disturbances and allowed for enough time post disturbance (after 2009) to evaluate the watershed's recovery.

Condition Class

Data on the physical condition and biological variables of each watershed and subwatershed are compiled and analyzed in assessing the perceived water quality and watershed integrity relative to undisturbed conditions. This condition class is a measure of cumulative hydrologic effects from past watershed activities.

The condition class analysis provides three status ratings (USFS 2000). Watersheds considered to be "not properly functioning" (NPF) are not capable of fully supporting beneficial uses without significant intervention and/or extremely long recovery periods, and often include aquatic resources that are seriously degraded or no longer viable. Watersheds that are "functioning at risk" (FAR) have high watershed integrity, but present or ongoing adverse disturbances are likely to compromise that integrity if they are not modified or corrected; or they have at least moderate watershed integrity that has been significantly compromised by adverse disturbances. Watersheds in "properly functioning condition" (PFC) have streams in dynamic equilibrium with their watersheds and fully support their integral biological system. The watersheds that are functioning at risk are the highest priority within the basin for watershed and aquatic restoration efforts.

Table 3-44. Condition class ratings of potentially affected streams.

Stream	*PFC Class*
Granite	FAR
Kalispell	FAR
Reeder	NPF/FAR

Total Maximum Daily Load

The effects of either the no action or action alternative would be assessed as to how either alternative would improve the existing TMDL status of the pollutant of concern in the specific analysis drainage. A thorough review of the TMDL status of the streams is presented in the previous section of this chapter in the Regulatory section titled "Clean Water Act".

Methodology for Analysis

Analysis Methods

The watershed analysis relied on data from field surveys, district fisheries and hydrology files, historical records, aerial photographs, Geographic Information Systems (GIS) analysis, published scientific literature (see references list), the North Zone Geographic Assessment (USDA draft in progress), the WATSED Model, WEPP Model and the Department of Environmental Quality (DEQ, Beneficial Use Reconnaissance Program [BURP] Studies). All supporting information can be found in the project file.

Effects of activities on watershed resources will be assessed with respect to watershed condition, water quality (sediment levels, thermal modifications, etc.) and beneficial uses, water yield and peak flows, and stream channel conditions. Throughout the analysis, areas were calculated using ARC GIS and were rounded off, which may cause slight discrepancies between resource analysis numbers.

Field Reviews

Streams within the project were surveyed by the Forest Service over several years. One of the primary goals of each survey was to identify sources of sediment delivery. In the three main watersheds, sediment

sources from naturally occurring mass failures were fairly rare and most often were associated with roads. In reviewing the other assessed drainages within the Lakeview Reeder project area, there were no major point sources (i.e. failed culverts, mass failures) of sediment identified on lands managed by the National Forests.

Table 3-45. Summary of stream reaches surveyed.

Stream/Stream Reaches	*Dates Surveyed*
Granite Creek	2002, 2005, 2007
Fedar	2004
Media	2003
Chanterelle Creek	1998
Reeder	1999, 2003, 2004, 2006
Reeder Lakes	2005
Indian Creek	2004
Kalispell Creek	2001, 2002, 2004
Nuisance Creek	2002
Hazard Creek	2002
Kita Creek	2002
North Fork Diamond	2002
Bath Creek	2005
Diamond Creek	2002

Models and Classifications

WATSED Model

The anticipated sediment and water yield runoff for the three primary drainages for this project were estimated from the methods documented in the R1/R4 Sediment Guides (USDA 1981), WATBAL Technical User Guide (Patten 1989) and WADA (USDA WADA (WATSED Automated Data Assembler), undated). The version calibrated for the Idaho Panhandle National Forests, known as WATSED, is an analysis tool that spatially and temporally organizes typical watershed response relationships as a result of forest practices. The estimated responses are combined with other sources of information and analyses to help determine the findings of probable effects.

WATSED estimates a series of anticipated annual values over a period of years. The model predicts an estimate of most likely mean annual sediment loads (reported as tons per square mile per year), and the expected sediment load modifications over time. The estimate of additional loading is expressed as a percent of the “natural” (i.e., historic mean load prior to significant development activities) sediment load, which is based on the history of disturbances and average climate patterns in the watershed. In this analysis, the existing condition represents the year 2007, which is before any anticipated disturbances related to the proposed activities.

The estimates of sediment and peak flow reflect how watersheds with similar conditions and landtypes have responded over time to a similar history of disturbance. WATSED is not intended or designed to model event-based processes and functions, or specific in-channel responses. It does, however, incorporate the results of those processes in the calibration of its driving coefficients. WATSED does not evaluate increases in sediment and peak flows specifically resulting from “rain-on-snow” or other

stochastic events, nor does it attempt to estimate in-channel and stream-bank erosion. Additionally, the model assesses roadwork as new construction, and, therefore, the sediment and water yield values are artificially inflated. Finally, the WATSED model does not allow for water yield recovery from roads as it does from vegetation treatments (Patten, retired IPNF Forest Hydrologist, personal comm.).

The Idaho Panhandle National Forests (IPNF) frequently validates the WATSED coefficients and estimates using long-term water quality monitoring networks on the IPNF (USDA 2004, 2003, 2000, 1999 and 1998).The model is a predictive tool and the values should not be used as absolute values, but rather as a comparison of possible alternatives. The forest management activities used to calibrate the model include standard BMPs and Soil and Water Conservation Practices; therefore, standard BMPs and Soil and Water Conservation Practices are necessary requirements for maintaining an effective confidence level in the model's use. Non-standard BMPs, management or natural disturbances not related to forest practices, and site-specific non-standard BMPs must be integrated into the final analysis to fully determine watershed response.

WATSED was designed to address and integrate a vast and complex array of landtypes and disturbances within the context of a watershed and to organize the evaluation according to rule sets established by the author and cooperators. In the case of WATSED, the rule sets reflect watershed processes and functions based on research, data and analyses collected locally and regionally. Forest Plan monitoring reports (USDA 2003, 2000, 1999 and 1998) describe how the calibration and validation of WATSED have been an annual process on the forest and where changes have been made.

The model, however, also includes simplifying assumptions, and does not include all possible controlling factors. Therefore, the use of models is to provide one set of information to the technical user who, along with knowledge of the model and its limitations, other models, data, analysis, experience and judgment, must integrate all those sources to make the appropriate findings and conclusions. Recent validation of WATSED runs indicated that the WATSED measured responses were accurate for flow, but appeared to overestimate sediment loads (USDA 2000). To date, the WATSED model is the most appropriate tool for hydrologists to use when assessing cumulative effects in snowmelt dominated, mountainous watersheds (R. Patten, personal communication).

WEPP Model

The Watershed Erosion Prediction Project (WEPP) model is a physically based soil erosion model that provides estimates of soil erosion and sediment yield considering site-specific information about soil texture, climate, ground cover, and topographic settings (Elliot et al. 2000). The WEPP model's assumptions, strengths and weaknesses are disclosed in Elliot et al. 2000. WEPP differs from some other erosion and sedimentation models by accounting for sediment transport distance and gradient in predicting the amount of eroded soil that will be delivered to stream channels. Research has demonstrated that the distance from an erosion source to the stream and the steepness of the intervening slope largely determine the amount of sediment delivered to stream channels (Ketcheson and Megahan 1996). WEPP was used to estimate average annual erosion and sediment yield from specific road improvements planned under the Lakeview Reeder project. WEPP was also used to estimate erosion and sediment yield from improving crossings on FS Road 2231 in the Reeder Creek drainage. Actual erosion rates are highly variable due to local variations in climate and other factors, so values predicted by any model are only a single estimate of a highly variable process. Thirty-year averages from WEPP model runs are useful for comparing the relative effects between different actions, but should not be considered predictions of absolute sediment quantities.

Equivalent Clearcut Acres

The equivalent clearcut acres value, or ECA, was used as a coarse filter to identify watersheds that may be at a higher risk for increases in water yield which could, in turn, affect stream channel condition. ECA

levels above 25 to 30 percent (Stednick, 1996) indicated a risk of instream erosion related to increases in streamflows. When ECA levels were estimated at or greater than 25 to 30 percent, additional analysis was used to evaluate water yield levels. Additional analysis to further evaluate the ECA levels included the water yield and sediment yield values produced by the WATSED model.

Equivalent Clearcut Acres is defined as the area that has been clearcut or the equivalency of a partial cut to a clearcut. This process involves three steps, selecting past events (harvest and fires) that cause reductions in crown cover and contribute to ECA; allow for gradual recovery over time and then calculate the percentage of the watershed affected. The less crown cover reduction from an activity, the less it contributes to ECA. For the purposes of the Lakeview Reeder watershed analysis, the ECA value was determined using the WATSED model.

Other models were considered for determining the ECA value but the WATSED model was selected because it has the ability to mathematically calculate cumulative ECA recovery along with the new ECA values A recent publication by Ager and Clifton (2005) provided a software model that was developed for Oregon and Washington forests. After reviewing the model, it appeared that both the WATSED model ECA calculations and the 2005 ECA model calculations were premised on the similar variables.

All ECA models/calculations have inherent limitations. Some of these limitations are listed below.

- Both models use the TSMRS database that is a good representation of past vegetation management activities on National Forest lands. Even so, some harvest my have occurred that is not accurately recorded or some harvests may have been overlooked completely.
- Both models assume that the undisturbed condition is fully stocked when in reality some stands at historic conditions were not fully stocked.
- Attempts to quantify harvest history of private land are not always exact. Still within the Lakeview Reeder CEA, only a very small percentage of the area is privately owned. According to the GIS data, about 9 percent of the CEA is privately owned.
- The ECA analysis is a relative index of change and not an absolute result. It is not be used independently. Instead, it is used in combination with surveys, on the ground review and professional judgment to determine what the effects from the proposed activities may have on channel conditions and water quality.

Even though the ECA analysis has weaknesses it is reasonable to use because, it provides a means to identify risk to stream channel conditions from past harvest.

Rosgen Stream Classification

There are several streamtypes within the analysis area, the primary channels have been classified and that data is located in the project file. For the Lakeview Reeder Assessment, the Rosgen methodology was chosen as a means of classifying the streams. The Rosgen methodology (Rosgen 1996) is based on field measurement of physical stream parameters such as slope, sinuosity, valley confinement, substrate size distribution, floodplain width. As a generalization, most of the headwater streams within the project area are A and B Rosgen Channels. “A” streams are characterized by narrow floodplains, fairly straight streams with high gradients (greater than 4 percent water surface slopes). An example of this type of stream in the project area is found in Indian Creek. “A” streams have step/pool morphologies and are capable of transporting sediment throughout the year. Because the “A” channels are usually very steep and transport sediment, they range from being normally stable to unstable depending upon geology and disturbance. “B” stream types have more gentle gradients, typically between two and four percent, access a floodplain are moderately sinuous. An example of this type of stream is found in the upper third of the mainstem of Reeder Creek. “B” streams typically carry sediment throughout the period of high flow and

deposit it during low flows. According to Rosgen (1996), the “B” channel type is considered relatively stable and relies upon large woody debris and rock for that stability. Each of the three primary drainages has a considerable amount of “C” channel types. These are the pool-riffle streams that meander, are of low gradient and are common in wide valleys. Both Granite and Kalispell have extensive reaches of C channel within the project area. “C” channel forms are susceptible to shifts both laterally and vertically in response to changes in water and sediment yields. However, well vegetated riparian zones adjacent to C channel types reduce adverse impacts of water and sediment yields. Within the Reeder Creek drainage, there is a considerable amount of “E” channel types. The “E” channels have low to moderate sinuosity, gentle to moderately steep channel gradients and very low channel width to depth rations. Generally this channel form is extremely stable unless the channel banks are disturbed and there are significant changes in sediment and water yields.

Existing Condition

Watershed conditions are not based on a single parameter but rather upon a compilation of a wide variety of parameters. For the purposes of this analysis, physical stream conditions coupled with an analysis of aerial photos and historical data provide the background that was needed to present the existing condition of the affected watersheds. The following narrative presents key information for each primary drainage. At the end of the existing condition narrative is a table showing a comparison of the various drainages and key characteristics (Table 1-36).

Granite Creek: This drainage is a fifth order tributary to Priest Lake and includes about 67,000 acres and 172 miles of streams. The watershed originates in the Pend Oreille range in the State of Washington and flows downstream into Idaho and ultimately into Priest Lake. The watershed ranges in elevation from 6,253 feet on Grassy Top Mountain down to 2,440 at the shoreline of Priest Lake and averages 2,075 feet to about 7,000 feet, and receives an average of 55 inches of precipitation per year in the higher elevations and 35 inches near the lake. Average annual flow from Granite Creek into Priest Lake is 148,170 acre feet (WY 94-95). The underlying geology is a mix of glaciated belts, glaciated granitics and glacial outwash. The watershed has been strongly influenced by the continental glaciation. Upstream of the confluence of the North and South Fork drainages, the Granite Creek watershed appears to be properly functioning. However, downstream of the confluence, the mainstem is listed as Functioning at Risk primarily due to the effects of land use and developments.

Granite Creek was surveyed several times over the past decade. From the mouth of Granite Creek to the confluence of the North and South Fork Granite Creeks, there are 8 distinct channel breaks. The following is a brief review of the channel typing for Granite Creek beginning at Priest Lake and moving upstream.

At the mouth of Granite Creek, there is still evidence of the sediment moved into the lake from Granite Creek during the high flows of 1996 (Cobb). For almost 2000 meters, the channel typing alternates between a C3 and C4 channel types. This type of channel is fairly sinuous and has a low gradient. The substrate of the C3 and C4 channels are dominated by gravels and cobbles. The C channel typing ends near Kerr Lake, where the channel gets a bit steeper and the substrate a bit larger. In the reach near the Fedar confluence, the channel is predominantly a B3 channel type. Continuing upstream, the channel alternates between a B3 and a B1 channel type from the vicinity of Kerr Lake until just downstream of the Dusty confluence. This portion of Granite is fairly entrenched and as an average stream gradient of 2 percent upstream of the confluence with Dusty, Granite’s gradient decreases and sinuosity increases to become a C4 channel type. There is some channel migration near the confluence with Packer Creek. Where the landforms become steeper, near the 311 bridge crossing, Granite Creek takes on the characteristics of a B4c channel. This type of channel has the classic B attributes for sinuosity and width to depth ratio, but has a lower stream gradient. This reach may be responding to higher inputs of sediment than it is able to transport. Upstream of the B4c reach is a C4 reach that continues until the confluence of both the North and South Forks of Granite Creek.

Overall, Granite Creek is a fairly stable stream (see surveys) that does have some problems with elevated sediment deposition and lack of incorporated large organic debris with the live stream channels. The lack of large organic debris is most likely linked to historical logging that removed the largest recruitment trees and the high water yields that move all but the largest sized material.

Fedar Creek: Fedar, one of the major named tributaries that flows into Granite Creek was surveyed in 2004 by Cobb and by Weidich (et al). The proposed action alternative has a considerable amount of burning proposed in this drainage. The headwaters of Fedar began in a spring upwelling zone, located near the 3,600 foot elevation. From the spring downstream, the channel type is an E channel with limited B channel reaches. From the elevation of 3560 feet, the channel steepens to 18 percent with boulders and cascades and was typed out as an A4a+ Rosgen reach. This reach continues for over 900 meters and extends downstream to the 1340A road crossing. From this point downstream for 800 meters, the channel gradient drops to 4 percent and becomes B4 channel type. Moving downstream the next channel type is a C4 reach and remains so until joining Granite Creek.

During 1927 the Dalkena Lumber Company logged the fire-killed timber in Fedar drainage. The timber from Fedar Creek area was dumped in Granite Creek just below where the Fedar Creek Road crosses Granite Creek. It was floated down Granite into Priest Lake during the spring flood (USDA, 1976).

TMDL Status of Granite Creek: Granite Creek is not listed for sediment as a pollutant of concern. However the stream is listed for temperature exceedence in the 2002 303(d) listing issued by the EPA (approved in December 2005).

Kalispell Creek: The Kalispell drainage encompasses about 25,000 acres with the mainstem measuring approximately 12 miles in length from its headwaters to its confluence with Priest Lake (Watershed Map). The watershed is one of ten major tributaries to Priest Lake. Geologically, the Kalispell drainage is complex. The northern half of the basin was modified by the last glaciation, while the southern half of the basin is unglaciated. The underlying geology in the headwaters is a blend of granite and Belt Series rocks. In the lower elevations, glacial outwash is most prevalent. There is a wide range of soils types and associated stability.

The stream types for the mainstem of Kalispell Creek range from the relatively low gradients channel in the valley bottoms to the very steep bedrock chutes in the headwaters. Beginning at the confluence of Kalispell Creek and Priest Lake, the channel is a C4 channel type with a considerable amount of recent beaver activity. Moving upstream to just behind the Priest Lake Ranger Station, the channel gradient increases a bit and the stream type is a B4c: In this reach the substrate is slightly larger and there are more conifers are lining the banks of the channel. The next reach break is located far upstream near the Indian Mountain Road 1362. This reach is classified as an F3b. The channel is artificially contained in this segment by FS Road 308. The encroachment of Road 308 has caused this channel to shift from a B4 channel type to an F3b. Where the 308 road pulls away from the channel, the reach changes to a stable B5c. According to the field notes, this reach has numerous small channels that are created by small pieces of wood diverting the stream flows. Continuing upstream, the channel gradient drops slightly and becomes a C4 channel. Beavers in this reach are creating multiple channels across the valley floor. The riparian zone is a mix of grasses, deciduous shrubs and conifers. This C4 channel type changes fairly abruptly into a very steep A4 channel type near the junction with Chute Creek. Between Chute Creek and Deerhorn Creek, the mainstem of Kalispell becomes more meadow like and is characterized as a stable E4 channel with very well vegetated banks. From this reach upstream, the mainstem is a mix of A and B channels that end near Kalispell Rock.

The existing condition of Kalispell Creek is a function of historical disturbances within the drainage. Since the 1920s, the Kalispell Basin has been heavily impacted by wildfires, railroads, logging and road construction. The major impacts to the Kalispell Basin ecosystem began in 1926 when a wildfire ignited

in the upper end of the watershed. The extensive fire killed most of the stands but did not burn up the timber. In an effort to salvage the extensive timber, the Diamond Match Company constructed an in-between gage railroad extending from Kalispell Bay on Priest Lake, up Kalispell Creek to Deerhorn Creek in the extreme upper part of the drainage, a distance of approximately 17 miles. A considerable amount of the railroad was located in the riparian zone. The logs were transported by rail to boomed areas in Kalispell Bay. In 1935, the Federal Government had the CCC workers snag all of the 1926 burn areas and prepared to have a broadcast burn in 1939 over the affected area. However, in August of 1935; a dry lightning storm ignited the woods again and ended up burning about 9,300 acres. After the fires of 1930s the CCC men planted large tracts of land with off-site ponderosa pines and non-blister rust resistant white pine. About the same time as the planting was accomplished, the USFS pioneered roads into the basin and began harvesting. Both the planted white pine and ponderosa pine began dying at about 55 years of age. As a result of this widespread historic manipulation, vegetative recovery has been extremely slow in the basin.

A review of the District's historical aerial photo collection confirmed what was described in the old journals. The earliest photos dating back from 1932 showed that after the 1926 fire, there were still pockets of standing timber and the riparian zone was relative untouched. However, the 1955 aerial photos showed that after the 1939 fire and the subsequent salvage efforts, the basin was basically denuded in the headwaters. The photos clearly show the 1939 burn was so intense that even riparian zones were denuded of standing trees.

The historic railroads, chutes, roads and logging and planting transformed the riparian zone along many reaches of Kalispell Creek and her tributaries. For site specific information, please refer to the project file.

Currently, one part of the original transportation system continues to adversely impact Kalispell Creek: a section of the 308 Road. The 308 road was originally part of the railroad/road that provided the main access up into the Kalispell Basin. IDEQ and the Forest Service (Forest Service, 2003) have concluded that the hydrologic function of Kalispell Creek is compromised by the current location of about 3.0 miles of Forest Service Road 308. Currently, of the 3.0 miles of road within 200 feet of the stream, about 0.9 miles of this road is within 50 feet of the stream and is therefore physically impinging on the original floodplain. This impingement of the road onto the floodplain denies the stream full use of its floodplain reduces the capacity in the floodplain and alters the ability of the stream to dissipate energy. Estimates suggest that removing about 3 miles of Road 308 (where it closely parallels the creek) could reduce sediment delivery to Kalispell Creek by 200-400 tons[20] over 10 years. In addition to removing the 308 road, the restoration project also includes placement of 20 inchannel structures. These inchannel structures would be large woody debris complexes that would replace the wood that is missing from the channel because of earlier logging, roading and wildfire. These large woody debris structures would be carefully engineered and placed with machinery during periods of low flow. Ultimately, these structures would provide both fish habitat and improve the resiliency of the channel to increases in sediment and/or water yield increases. The third part of the 308 road removal project, is the development of an alternate transportation route into Kalispell basin. The proposal would construct about 1.8 mile of road to the north of the proposed 308 Road project to link two existing roads and allow long term access into the larger Kalispell basin.

Within the confines of the project area, the lower reaches of Kalispell Creek display the impacts of the disturbances that occurred immediately adjacent to the lower reaches as well as what occurred upstream

[20] This estimate assumes an annual erosion rate of between 1/8 and ¼ of an inch per year from a three mile road that is 16 feet wide. This does not include the incidental road failures at culverts that could produce hundreds of tons from one discrete source. Culvert failures in the past have produced almost 700 tons of sediment from location (Estimate a failure of a culvert that is 4 feet deep, damaged road width of 5 feet, road width of 16 feet and weight estimate of 2.16 tons/yd3.)

in the headwaters of the large Kalispell Basin. The stream within the project area has a very high width to depth ratio as one would expect in a stream that is transporting excessive amount of sediment. Home construction along the riparian zone in the lower reaches of Kalispell Creek has compounded the problem by removing streamside vegetation and by attempts to stabilize the streams by removing the large organic debris. Over the past five years, beaver activity has surged in the mainstem of Kalispell Creek, resulting in extensive areas where the stream is backed up for several hundred feet. These beaver "impoundments" are slowing the movement of sediment and slowing runoff during peak events. In the spring freshet of 2008, several of the larger beaver impoundments in the lower third of Kalispell Creek failed and left behind sand deposits over 100 feet away from the live channel.

In summary, the Kalispell Creek watershed has experienced considerable disturbances over the past 90 years. However, we are seeing some improvement in stream function because of beaver activity. Still the stream has a long way to go to become truly resilient to future disturbances. Removing the encroaching segment of Road 308 would be a significant step towards improving the ability of the stream to fully function hydrologically.

TMDL Status of Kalispell Creek: Since 1997, the Idaho Department of Environmental Quality (IDEQ) has been gathering data to discern if Kalispell Creek is fully supporting beneficial uses. The outcome of the IDEQ studies suggests that Kalispell Creek is not fully supporting beneficial uses because of artificially high sediment yields. In October 2001, the IDEQ completed a sub-basin assessment of Kalispell Creek. The assessment concluded that Kalispell Creek does not provide "Full Support of cold water biota beneficial use". DEQ reported that the watershed is impaired "due to chronic sediment conditions" (IDEQ 2001). IDEQ's findings resulted in designation of Kalispell Creek within Idaho under Section 303(d) of the Clean Water Act as water quality limited for sedimentation. However the stream is listed for temperature exceedence in the 2002 303(d) listing issued by the EPA (approved in December 2005). A similar listing has not yet been established for the portion of Kalispell Creek in Washington.

Reeder Creek: This watershed is a second order watershed of 8,454 acres. Within the watershed, 32 percent is privately managed and the balance is managed by the Forest Service. Geologically the Reeder Creek watershed was heavily influenced by glaciation. The headwaters of the basin flow into Bismark Meadows, which was likely an ancient lake. During the spring, Reeder Creek floods Bismark Meadows and from there slowly releases nutrient enriched water down stream to Priest Lake. The lower reaches of Reeder Creek cut through glacial outwash in a relatively narrow stream bottom.

The drainage can be divided into three primary sections. The first section is from the confluence with Priest Lake upstream to Highway 57. The second is through the extensive meadow complex known as Bismark Meadows. The third primary section is from the top of the meadows upstream into the steeper headwaters. The following is a summary of the various hydrologic surveys conducted within the Reeder Creek drainages, beginning at the confluence with Priest Lake.

The first few hundred yards of Reeder Creek are fairly steep and function as a B5 channel type. The substrate in this section is a mix of cobbles, sands and gravels. However, within a very short distance, the channel type changes markedly into an E5 channel type as it flows through the marshy/meadows. The surveyors described most of this section as very marshy, with an overall Rosgen typing on an E5 (Wingert 1999 and Weidich, 2004). In this reach, Reeder Creek is mainly a low gradient channel (0.4 -1 percent slope) and its vegetation consists of alders and willows with some conifer overstory and the stream bottom is sand-silt. According to both Wingert (2004) and Cobb (2006), the E5 channel type continues upstream beyond the Highway 57 crossing until just about one mile south of the 2231 Road Crossing. The meadows and channel above the Highway 57 crossing is the location of the large scale restoration by the NRCS that was completed in July 2004. It is within this reach that the stream had historically been straightened and ditched. The NRCS reconstructed the stream channels and markedly improved the form and function of the Bismark Meadows (Project file). Further upstream, beyond the NRCS restoration

project, the next reach is about one mile long and is classified as a C4 channel type (Weidich 2004 and Cobb 2006). The stream reach begins upstream of the NRCS restoration and ends at Road 2231. This C4 reach is functioning properly however large woody debris seems to be lacking in this reach because of past harvesting and wildfires. Upstream of Road 2231, the channel is a mix of B4 and A4 channels. These channels are characterized by step pools and tend to be fairly steep. The surveyors reported that these reaches were stable. Northeast of the headwaters is a chain of small Reeder lakes. Only the lower most lakes are hydrologically connected via surface water to Reeder Creek. A total of seven Reeder lakes were surveyed in 2005 (Schrempp et al.) and the area was field reviewed by Cobb and Hixson in 2005.

Other tributaries to Reeder Creek were surveyed in anticipation of the Lakeview Reeder Project.

Lakeview Mountain tributaries: Most of these drainages flow off the north face of Lakeview Mountain directly into Reeder downstream of Highway 57. These streams tend to be steep Rosgen A channels and are not fish bearing. Near the top of Lakeview Mountain, a meadow provides the headwaters for one of the larger perennial tributaries flowing off Lakeview Mountain. These streams are stable as evidenced by field reviews (Weidich and Cobb, 2004). Two tributaries located in the lower third of the drainage were surveyed in anticipation of crossing these two creeks with a new road (Hixson and Weidich, 2004).

Indian Creek: This stream is the primary tributary to Reeder Creek and originates off of Indian Mountain. The channel was surveyed in June of 2003 by Cobb. The survey began in the headwaters and terminated in Bismark Meadows at the confluence with Reeder Creek. The headwaters of Indian Creek are extremely steep and are a Rosgen A+ channel type. The channel does have limited segments that flow subsurface as the stream winds its way down the hill slope from Indian Mountain. Moving downstream, the channel gradient gradually becomes gentler and turns into a Rosgen B Channel type. Indian Creek flows into Reeder Creek at the top end of Bismark meadows as a Rosgen C channel type. This channel is relatively stable, though it has been adversely impacted by earlier timber harvesting in the riparian zones and there are opportunities to remove excess roads within the drainage.

TMDL Status of Reeder Creek: According to the DEQ's 2002 303(d) list, the stream does not fully support salmonid spawning and coldwater biota (DEQ 2005). The mainstem of Reeder Creek is listed as a 303 D stream for stream temperature in the integrated report for 2002 TMDL [21]. Additionally, the stream has an approved TMDL for sediment reduction within the larger watershed (April 2003). The TMDL plan suggests that the watershed restoration project (WRP) completed by NRCS would serve as the primary project to reduce sediment within the basin. Furthermore, the author of the April 2003 TMDL suggests that there are few opportunities on Forest Service managed lands to effectively reduce sediment delivery. The Forest Service is limited because most of the roads within Reeder Creek are located more than 200 feet from any live water. In a 2001 DEQ report, it is suggested that fecal coliform bacteria counts are borderline too high near the mouth of Reeder Creek.

Boulder Creek: Boulder Creek flows into the Hughes Fork that ultimately flows into the Upper Priest River. This watershed is 5,824 acres and is completely managed by the Forest Service. Boulder Creek is a fairly steep channel that is underlain by belts and glacial till. Boulder Creek is predominantly a transport channel (Rosgen B Channel Type) with very little C channel except near the confluence with the Hughes Fork. Road density in the drainage is around 3.4 mi/mi^2. Over half of the basin is in the sensitive rain-on-snow zone. Harvesting has occurred in the basin, though very little has taken place in the past twenty years. Given the past land management, the watershed is considered to be Functioning at Risk.

Priest Lake and the Priest Lake Shoreline: Priest Lake is an oligotrophic lake that covers 23,300 acres. The management of public lands within the Priest Lake Basin is divided roughly in half. The eastern shoreline under public ownership is largely managed by the Idaho Department of Lands, whereas the

[21] http://www.deq.state.id.us/water/data_reports/surface_water/monitoring/integrated_report_2002_final_sec5.pdf.

public land on the western shores are managed by the Forest Service. Around the Priest Lake shoreline, roughly 25 percent of the land is privately owned. The Lakeview Reeder project area begins in the south at the mouth of Kalispell Creek and ends in the north across from the Twin Islands. This portion of the project includes about 11.5 miles of Priest Lake shoreline. Within that geographical area, three of the primary drainages flow into Priest Lake: Kalispell, Reeder and Granite. Within this portion of the shoreline, Priest Lake is a mix of both private and publicly owned lands. The private land is mostly developed with high density homes. Within the Lakeview Reeder Project Area, private home construction is concentrated in two primary areas. The first area extends from Kalispell Creek north to Indian Rock and the second area extends from Elkins Resort north to Copper Bay. The remaining shoreline is relatively undeveloped.

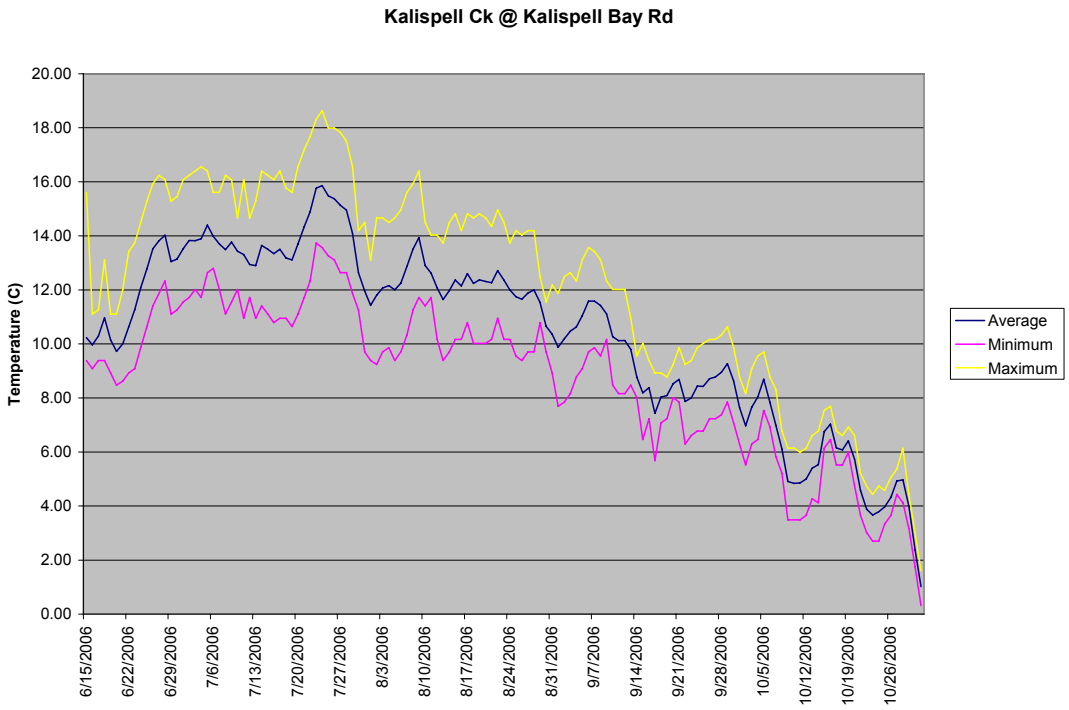
Table 3-46. Summary Hydrologic Information on affected Watersheds: Granite, Kalispell and Reeder

Landscape/Geographical Characteristic	*Granite Creek*	*Kalispell Creek*	*Reeder Creek*	*Boulder Creek*
Watershed Area (acres)	63,552	25,216	8,959	5,840
Watershed Area (mi^2)	99.3	39.4	14.0	9.1
Federal Ownership (%)	91	95	70	100
Stream Density (mi/mi^2)	0.8	0.8	1.4	1.6
Rain-on-Snow Zone (%)	64	71	39	52
Road Density ($miles/mi^2$)	2.9 (4.6 for focused Granite CEA)	2.8	4.3	3.4
RHCA[a] Roads ($miles/mi^2$)	1.2	3.8	2.9	1.4
Entire Watershed Mod to High Sensitive (acres)	11,405 (18%)	2,524 (10%)	662 (7%)	1,775 (30%)
CUMULATIVE EFFECTS ANALYSIS AREA				
Focused CEA Watershed Acres (% of larger watershed)	22,478 (35%)	25,234 (100%)	8,932 (100%)	5,824 (100%)
Focused CEA Mod to High Sensitive (acres)	2,184 (10%)	5,551 (22%)	418 (5%)	693 (12%)

[a] RHCA = riparian habitat conservation area

Stream Temperatures

Since 2001, the Priest Lake Ranger District has been gathering temperature data using electronic data sensors (a.k.a. HOBOS). Originally, the use of the sensors was limited to just a couple of sites, but over the past seven years, the data sampling has expanded from two sites in 2001 to up to 18 sites in some years depending upon the availability of the instrumentation. Temperature data begin in 2002 for both Kalispell and Granite Creek and in 2004 for Reeder Creek. Though the USFS has gathered temperature data for a number of years, it was determined that the most critical data for this particular analysis was the most recent data from the lowest site for each of the three primary drainages. The data is presented in the following figure (Kalispell Creek, 2006 and Granite and Reeder, 2007).


Kalispell Ck @ Kalispell Bay Rd
Temperature (C)
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
6/15/2006
6/22/2006
6/29/2006
7/6/2006
7/13/2006
7/20/2006
7/27/2006
8/3/2006
8/10/2006
8/17/2006
8/24/2006
8/31/2006
9/7/2006
9/14/2006
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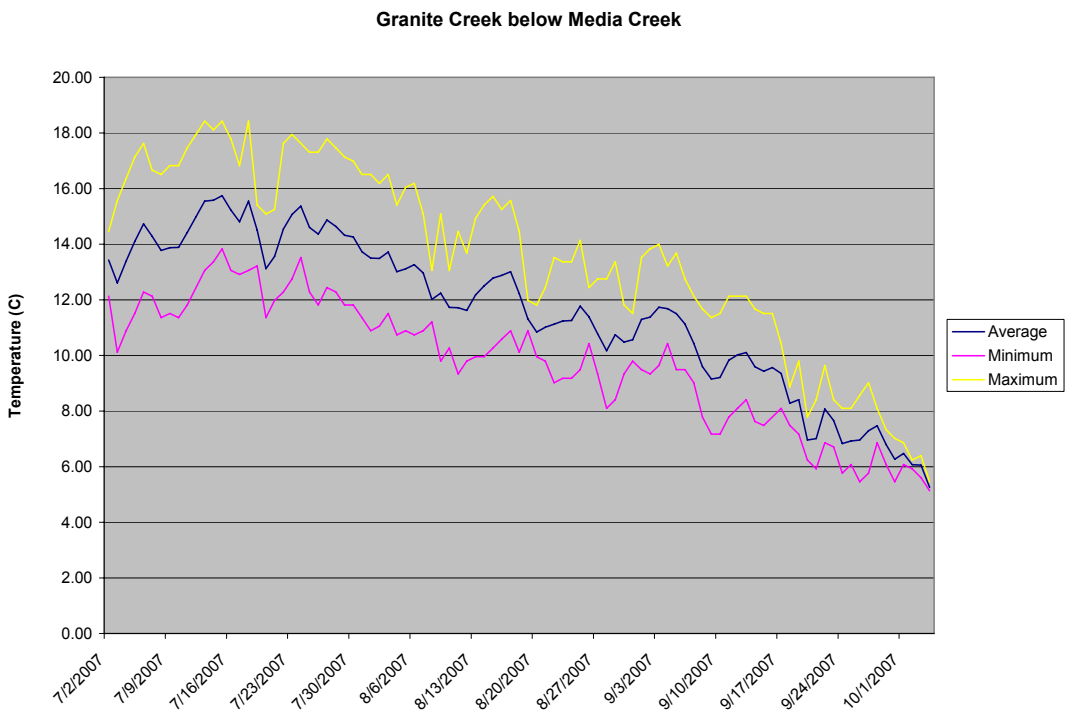
9/28/2006
10/5/2006
10/12/2006
10/19/2006
10/26/2006
Average
Minimum
Maximum


Granite Creek below Media Creek
Temperature (C)
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
7/2/2007
7/9/2007
7/16/2007
7/23/2007
7/30/2007
8/6/2007
8/13/2007
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9/24/2007
10/1/2007
Average
Minimum
Maximum

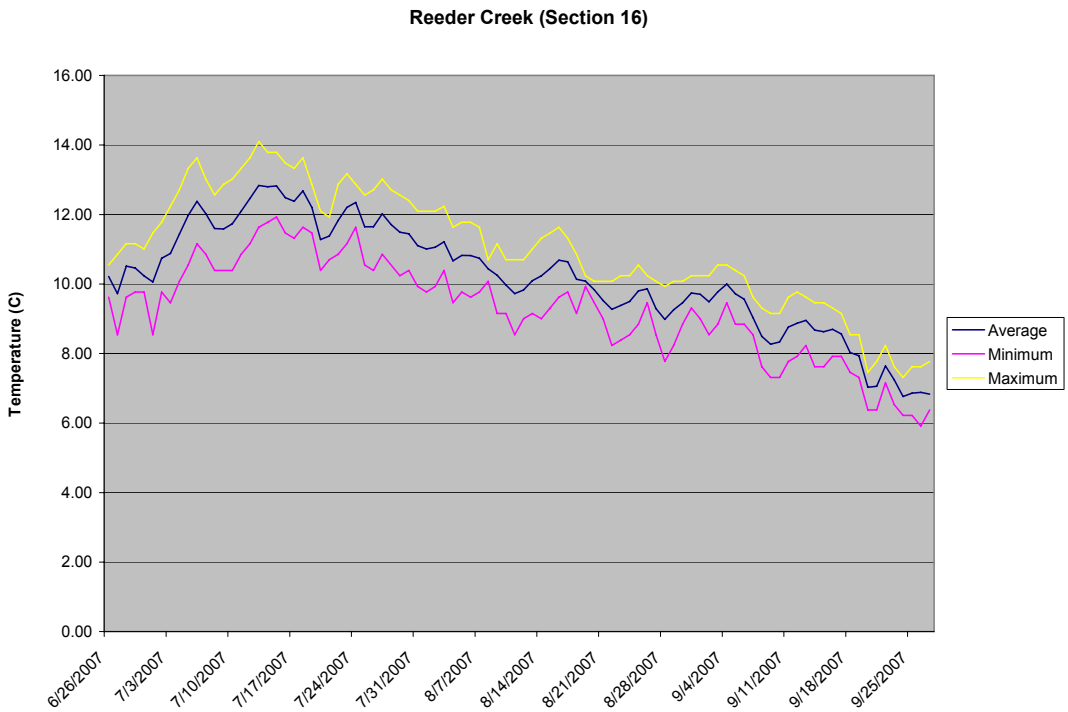


Figure 3-37. Stream temperature data for Kalispell, Reeder, and Granite Creeks.

As evidenced from the data presented above, the seven day maximum average is 17.89° C for Kalispell, 18° C for Granite Creek and 13.68° C for Reeder Creek. These values exceed the value of 10° C daily max EPA bull trout criteria and the 9° C Idaho daily mean cutthroat criteria.

Unique Wetlands

A hydrologic review of the Lakeview Reeder Project would not be complete without addressing the uniqueness and importance of wetlands in the area. Wetlands throughout the area moderate high flows, act as water sources during periods of low stream flow and drought, recharge basin aquifers, and provide valuable aquatic refugia and habitat for fish and other aquatic life forms. The hydrologies of all three basins are complex systems of groundwater and surface water. Throughout the basins, the ground water is recharged as surface water moves underground. Similarly, the groundwater augments the streams during low flow periods (i.e. drought). The relatively cold-water temperatures found throughout the headwaters of Kalispell and Granite basins may be attributed to the abundant underlying aquifer. It is apparent from historical data and aerial photo interpretations that Kalispell Basin once boasted considerably more wetlands than what are present today. The wetlands within Kalispell have diminished because of the lack of beaver, the change in vegetation, and shifts in land use patterns. Currently, the largest wetlands in the Kalispell basin are found in Mountain Meadows, Deerhorn Meadows and the Potholes. Numerous smaller wetlands are found throughout the drainage in North Fork Diamond, Bath, Hungry, Mush, mainstem Kalispell, and Nuisance Creeks. Historically (post-glacial), the large meadow located between Kalispell Creek and Reeder Creek was one large wetland that allowed the water from both creeks to intermingle. This meadow, now known as Bismark Meadows has since been ditched and water no longer flows between the Reeder and Kalispell Basins. Most of the water in the Bismark Meadows contributes to Reeder Creek either via surface or groundwater movement. Since the turn of the century, the Bismark Meadow area was ditched, ranched and cultivated. The result was that the meadow was not fully

functioning as a wetland should. Recognizing the need for restoring the wetlands, federal funds were secured through the USDA Natural Resource Conservation Service (NRCS) and the wetland was restored in 2004. The work completed by the NRCS normalized the hydrology in the meadows and revitalized the form and function of the wetland complex. Large notable meadows in the Granite Creek basin are located outside of the project area but include the meadows lining both the North Fork of Granite and the South Fork of Granite. Like the meadows/wetlands in both Kalispell and Reeder, these unique areas moderate stream flows and enhance the ability of the streams to moderate sediment yields.

Environmental Consequences

This effects analysis for environmental consequences evaluates each project alternative's potential impacts to water resources including water quality and natural channel processes. Direct, indirect, and cumulative effects of the proposed action are discussed with respect to watershed condition, water quality, beneficial uses, water yield, and stream channel conditions. Direct effects are those effects that are directly caused by the action to a resource. For example direct delivery of sediment to a stream would be a direct effect. Indirect effects are those effects that are separated in terms of time and space. An example of an indirect effect may be an increase in water yield causing instability downstream. Cumulative effects are a summation of past, present and reasonable foreseeable actions along with the proposed actions. For there to be cumulative effects, there must be a direct and/or indirect effect.

Cumulative watershed effects are scale-dependent and the magnitude of change in water and sediment yield is inversely proportional to stream-order (Macdonald, 1989). The scale of the Lakeview Reeder Project area in relation to the much larger Kalispell, Reeder and Granite would tend to render any effects beyond the temporal and spatial boundaries of the direct and indirect effects analysis area as not measurable. Therefore, cumulative watershed effects will be analyzed at two levels for the Lakeview Reeder Project. The more inclusive CEA review will look at the entire Kalispell, Reeder and Granite Creek drainages and the Boulder Creek drainage. In the larger CEA area, the effects of the proposed road work outside of the project boundary will be assessed and presented. The second level of cumulative effects analysis will focus on the more directly affected portions of Kalispell and Reeder watersheds, the lower third of the Granite Creek watershed, a portion of the Priest Lake shoreline that is not draining into one of the afore named drainages and Boulder Creek. In the more focused CEA analysis, the effects outside of the project area will be cumulatively assessed with the activities proposed for Lakeview Reeder and the other reasonably foreseeable activities (as presented in the Reasonably Foreseeable Activities Report Document dated January 30, 2008). The terminus of both the larger and the focused CEA areas for Granite, Reeder and Kalispell would be the shoreline of Priest Lake that abuts the project area. The terminus of the CEA for Boulder Creek is the stream's confluence with Hughes Fork. The boundaries for the two levels of CEA and the project area are presented in Figure1-21. The focused CEA includes 59,593 acres (93.1 mi2) of land under mixed ownership. The cumulative effects analysis area for the Lakeview Reeder Project is logically based on the projected effects of the proposed activities and the reasonable terminus of all possible effects.

Two alternatives have been analyzed for the Lakeview Reeder project. Alternative 1 is the No Action alternative that would not include any timber harvest, prescribed burning in the project area units or road improvement work. Alternative 2 proposes treatment of hazardous fuels and forest vegetation over 3,864 acres in one of four methods: thinning, regenerating, burning and piling and burning. The specific vegetation treatment varies depending upon the site-specific conditions that occur in each of the forest stands. In addition to the fuel and vegetation treatments, considerable road improvement and road removal work is planned: 25.5 miles of decommissioning and 4.7 miles of reconditioning. To access the proposed treatment sites, 4.5 miles of road are proposed for new construction. The new road construction is almost equally divided between Kalispell and Reeder Creek drainages. Two new culverts are proposed on a new road in the Reeder Creek basin.

Hydrologic response to land use is highly variable and dependent on numerous site factors such as elevation, aspect, slope, soils, landforms, flow regimes, channel type, etc. It is important to examine hydrologic changes within the context of those factors and then translate them into potential changes to water yield, erosion, water quality, and ultimately aquatic habitat and beneficial uses. In Chapter 2 of this document, Water Quality is identified as a "key issue." Specific "Issue Indicators" were developed to evaluate the effects of the alternatives upon water quality and other related aquatic resources.

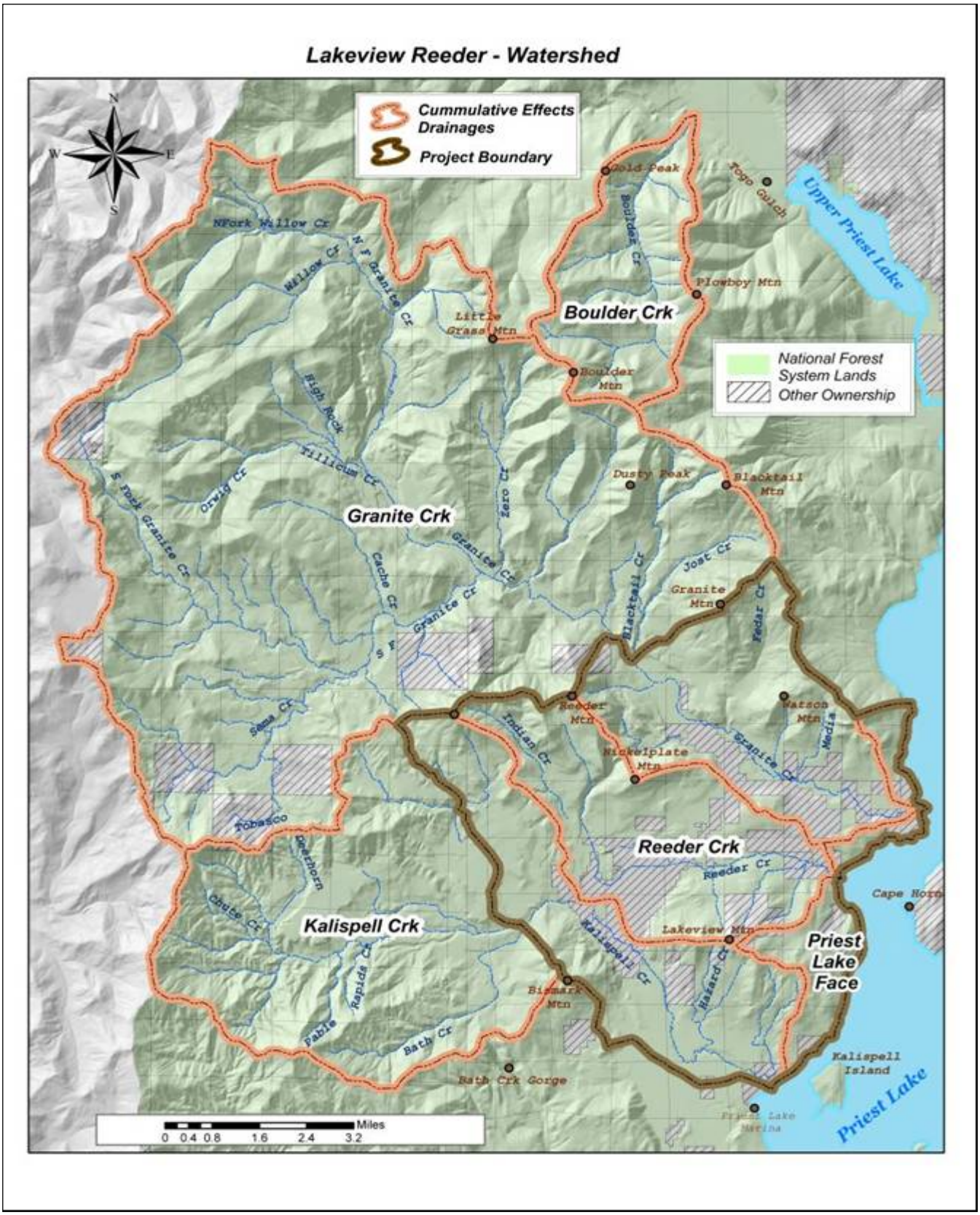


Figure 3-38. Cumulative Effects Analysis Area and delineation of Project Area

Alternative 1—No Action

Direct Effects-Indirect Effects of No Action

There would be no activity (timber harvesting, road building or restoration work) proposed under this alternative, and therefore no direct effect to any of the issue indicators.

However in terms of indirect effects, choosing to take no action would affect the issue indicators by possibly increasing the risk of disturbance from wildfire. Without treating at least some to the areas at highest risk, the risk of high severity fire would continue to increase. In all basins, the effects of wildfire would be similar. The areas with high wildfire hazard will have the greatest potential for lethal wildfire (i.e. greater than 90 percent of trees killed). This risk would be greatest where heavy fuel loadings and low dense crowns could lead to severe fire (i.e. crown fire). According to the fire behavior specialist, under severe conditions, there is currently a potential for active crown fire or passive crown fire over 55 percent of the area. Furthermore, under the no action alternative, the green standing timber that is diseased or subject to bark beetles or other insect attacks would not be removed. These trees would eventually die and add to the fuel loading.

Lethal fires in the project area would likely cause surface erosion, leading to increases in sediment loading in project area streams. This would be especially detrimental to both Reeder Creek and Kalispell Creek because of their TMDL listings for sediment. Under this scenario, it is unlikely that water quality in terms of sediment would be maintained or improved in any one of the three primary drainages. Wildfires across springs used for domestic water supplies could adversely impact water quality if fire residue reached the water sources. There would most likely be no change to the quantity of water available to wells.

A lethal wildfire can potentially consume all of the organic material across the landscape including the woody debris within the streams. Channel conditions can be affected although the extent of the damage depends on the area burned. In the worst case scenario where all of the of the high wildfire fire hazard acres burned in a lethal fire, channel conditions could be detrimentally affected to the degree that fish habitat is adversely modified within the project area. The loss of riparian vegetation would expose the streams to greater solar radiation causing increased water temperatures in the summer and higher likelihood of anchor ice formation in the winters leading to higher rates of fish mortality.

While the effects of wildfire are shared across the project area, other indirect effects are more specific to the unique analysis areas. The following narrative describes the indirect and cumulative effects of Alternative 1 to each unique analysis area in light of the four watershed based issue indicators.

Water Yield

Issue indicators: Change in ECA acres, predicted water yield increases (WATSED Model outputs), predicted percent of increased risk for rain-on-snow events and projected changes in road density.

Under the no action alternative, there would be no timber removal or road work that could change existing ECA values, rain-on-snow risks or road densities. However, in the event of wildfire, then ECA values and rain-on-snow risks would increase amplifying water yield in the streams.

Table 3-47. Water yield effects of wildfire under the no action alternative by drainage.

Kalispell Creek	Given the limited amount of the drainage within the project areas, the impact of a wildfire in the lower most reaches of the basin would be minimal. In this portion of the channel, the extensive beaver dams would greatly diminish the potentially adverse impacts of either sediment or water yield increases. However, if a wildfire consumed the top end of the drainage, the stream may not have the resiliency to balance the potential increases in water yield. According to the WATSED model outputs, the increase in water yield, from a wildfire in the Kalispell Basin, would be an increase in peak annual water yields of 18% above existing. This level of increase in peak annual water yields would result in an increased level of inchannel and channel bank erosion along with the possible failure of existing older beaver dams. Assuming many of the existing beaver dams failed, a considerable amount of sediment would move downstream and be deposited in the lake
Reeder Creek	Within the lower reaches of Reeder Creek, wildfire could cause adverse impacts to the stream. Fuel loading is so high that if an intense stand replacing wildfire did occur then water yield could exceed the capacity of the channel downstream of Highway 57. An intense wildfire upstream of Highway 57 and/or Bismark Meadows would most likely have almost all effects diminished as any increases in water or sediment yield would be held in check by the natural wetland processes within Bismark Meadows. According to the WATSED model outputs, the increase in water yield from a wildfire in Reeder Basin, would be an increase in peak annual water yields of 16% above existing. This level of increase in peak annual water yields would result in an increased level of inchannel and channel bank erosion along with the possible failure of existing older beaver dams. Assuming many of the existing beaver dams failed, a considerable amount of sediment would move downstream and be deposited in the lake.
Granite Creek	While the mainstem of Granite Creek and its tributaries would be able to withstand some increases in water yield. According to the WATSED model outputs, the increase in water yield from a wildfire in the Granite Basin, would be an increase in peak annual water yields of 21% above existing. Depending upon the conditions a the time, an increase of this magnitude during peak runoff could cause channel instability (e.g. failed banks, failed beaver dams, movement and redistribution of existing large woody debris). In the lower reaches of Granite Creek, the channel is predominantly a C channel type with a mix of cobbles, gravels and sands. Depending upon the intensity of a potential wildfire, water yields could increase in Granite Creek. With high water yields, the C channels of Granite Creek would mobilize the gravels and sands that would move down the channel getting trapped behind obstructions or moving all the way down to Priest Lake where the sediment would drop out in the slack water of Priest Lake. This extra sand and gravel would be redistributed by the lake and could augment beaches around the lake. One of biggest concerns with potential increases in water yield is that the crossing on Road 1340 downstream on Fedar Creek is currently undersized and is currently at risk of failing. Increasing water yield in this drainage from a large fire in the Fedar drainage could easily exceed the existing culvert capacity and result in a road failure at this crossing.
Boulder Creek	Given that no fuel reduction/timber treatments are planned for this area, there would be no change in water yield with the no action alternative. The wildfire scenario was not run for this drainage because there was no need to compare to the timber removal proposed in the other drainages.
Priest Lake Face	This section of the Priest Lake Shoreline a wildfire would increase water yield off of the slopes. Because, the soils underlying this area are fairly thin and rocky, the runoff would be flashier until brush reestablishes on the slope.

Sediment Yield

Issue indicators: Predicted sediment yield increases (WATSED Model) and road density on sensitive land types in miles per square mile.

With the no action alternative, sediment yields could increase because of missed opportunities to improve roads and remove excess roads. Sediment yields could also increase because of the unchanged and elevated risk for an intensive wildfire in the project area. With the no action alternative, there would be no timber removal or road work that could alter existing sediment yields. Similarly, there would be no improvements to the drainages either. None of the proposed 25.5 miles of road would be removed, and the risk of sediment delivery would remain elevated. Leaving these excess roads on the landscape would lead to even greater problems if wildfires moved through the project area. For all three primary basins, road maintenance proposed with the Lakeview Reeder Project would not occur. Without basic road maintenance, there is an elevated risk of road failure and ultimately an increased risk of sediment delivery to the streams. Additionally for all three basins, there is an elevated risk for intense wildfires under Alternative 1. Intense wildfires can increase the risk of road failures because of increased water and sediment yields. Many reports have documented increased culvert failures post fire because of the increased runoff which often exceeds existing culvert capacities (PNW 2007). The following narrative for sediment yield increases builds upon the previous water yield discussion.

Table 3-48. Sediment yield effects under the no action alternative by drainage

Kalispell Creek	The single greatest reduction in sediment yield in the Kalispell Basin would not occur under the No Action Alternative. That single project is the proposed removal of 3.0 miles of Road 308. If Road 308 remains in the riparian zone, it will continue to contribute hundreds of tons of sediment to Kalispell Creek each year. Other road activities that would not take place under the No Action Alternative would include the following road work: 1.8 miles of new road construction as part of the 308 reroute; 11.8 miles of road decommissioning; 3.4 miles of road maintenance and 2.6 miles of road reconstruction. Also, with the threat of wildfire, sediment delivery to the streams would increase if an intense fire swept through the basin. However, because of the extensive beaver dams within the mainstem, the sediment would drop out behind inchannel obstructions. The sediment could move down to Priest Lake if a large runoff occurred prior to the sediment becoming stabilized by vegetation of the floodplains. According to the WATSED model outputs, the increase in sediment yield from a wildfire in the Kalispell Basin, would be an increase of 194% above existing levels[22].
Reeder Creek	With the no action alternative, road reconstruction, road maintenance, new construction or decommissioning would NOT occur. The majority of the 10.6 miles of road maintenance work in the Reeder Creek watershed was proposed to occur above the Bismark Meadows and the majority of the 6.0 miles of decommissioning was scheduled to occur below the meadows near Lakeview Mountain. Similarly, under the no action, there would be NO new road construction (2.6 miles) or reconstruction (2.0 miles) as proposed in the action alterative in the lower reaches of Reeder Creek. With the no action alternative, roads that are currently delivering sediment or at risk of delivering sediment will remain in place. The risk of wildfire across the landscape will remain unchanged. While the proposed action may increase sediment at new stream crossings, the risk of increased sediment from the new stream crossings would be markedly less than the amount of sediment that would be delivered when a single road failed or if an intense wildfire burned across the face of Lakeview Mountain. According to the WATSED model outputs, the increase in sediment yield from a wildfire in the Reeder Basin would be an increase of 122% above existing levels[23]. The 122% increase above existing levels would equate to about 831 tons of sediment being mobilized[24], (background sediment is 331 tons of the 831 tons that would be mobilized). The amount of sediment that would be generated from a road failure would vary depending upon time of year of failure as well as depth of fill and routing to a stream course. For the sake of discussion assume that if a typical road crossing failed, it would likely produce at a minimum 205 tons of sediment. [25]

[22] The modeled wildfire was based on burning those areas with the highest risk of wildfire as predicted by the Fire Specialist assigned to this project.
[23] The modeled wildfire was based on burning those areas with the highest risk of wildfire as predicted by the Fire Specialist assigned to this project.
[24] The calculations are based on a background level of sediment in Reeder Creek being 331 tons/year. According to the WATSED model, the sediment yield in Reeder Creek is currently 29% above background levels. With the wildfire scenario, the projected sediment yield in Reeder Creek would increase from the current level of 29% to a high to 151% or an increase of 122% above existing levels. The amount of sediment that Reeder Creek would be transporting would increase from existing level of 427 tons to a total of 831 tons: an increase of 404 tons.
[25] Assuming a live crossing has 4 feet of fill overburden and a fill width of 40 feet on a road 16 feet wide, then the volume from just the road crossing would be 95 yd^3 or 205 tons.

Granite Creek	Ten miles of roads in Granite Creek would not be decommissioned and one mile would not be reconditioned or maintained. Most of the road mileage proposed for maintenance/reconstruction is in lower Granite Creek. If these untreated roads fail there is a potential to deliver large volumes of sediment to the tributaries and or mainstem of Granite Creek . Depending upon whether the roads fail collectively or not would determine how well the channels could accommodate the increased sediment yields. In the worse case scenario, simultaneous failure of these roads would cause the mainstem of Granite Creek to likely carve new channels in its alluvial floodplain. While carving new channels is a normal process, the amount of instantaneous delivery of sediment to Granite Creek would not be normal. It is likely that infrastructure and property would be damaged if Granite Creek was forced to carve new channels where homes and roads currently exist. As mentioned in the water yield discussion, there is an elevated risk of the Road 1340 failing at the Fedar Crossing. If such a failure occurred, hundreds of tons of sediment would move down Fedar Creek and deposit in Granite Creek. Once the main crossing failed, not only would the material in the crossing be delivered to the stream but so would tons of fine sediment stored upstream of the crossing be mobilized as the channel would erode upstream. The mainstem of Granite Creek is fairly stable and should be able to withstand some increases in sediment yield. With the no action alternative, the risk of wildfire would remain undiminished. According to the WATSED model outputs, the increase in sediment yield from a wildfire in the Granite Creek basin would be an increase of 199% above existing levels[26].
Boulder Creek	Road 1014 would remain on the landscape and would not be treated. Over time, the road crossings could fail, because of the limited funding to adequately maintain the road. Without regular road maintenance of Road 1014, there is an increased risk that should any crossings on this road fail, then large volumes of sediment would be delivered to the mainstem of Boulder Creek.
Priest Lake Face	Under the no action alternative, none of the proposed road maintenance (3.0 miles) would occur within the Priest Lake Face. Most of the roads proposed for maintenance under the action alternative are located on the parcel of land located between Reeder Bay and Ledgewood Bay. The roads proposed for maintenance would have drainage structures cleaned; surfaces regraded and limited surfacing with gravel. Left untreated under Alternative A, these roads would continue to degrade and contribute sediment to the small streams and ditch lines flowing into Priest Lake.

Hydrologic Function

Issue indicators: Ability of channel to balance water and sediment yields

Choosing the no action alternative could adversely impact the ability of the channels to balance water and sediment yields. As discussed earlier, it is recognized that there would be no timber or road treatments with the no-action alternative. However, choosing the no-action alternative does not equate to having no effects. If the project area were to burn in an intense wildfire, it is likely that the ability of the channels to balance water and sediment yields would be compromised. While the channels evolved with wildfire, most likely the earlier wildfires did not consume all of the organic material (Zack and Morgan 1994). Rather when fires occurred historically there was often a patchy mosaic of intensities. If an intense fire were to occur in the project area now with the current conditions, the effects of a wildfire would be different than what was observed historically. The Fire and Fuels section suggests that because of increased fuel loading, a wildfire today has the potential to be fairly intense and that the extent of the fire could cover much of the project area.

[26] The modeled wildfire was based on burning those areas with the highest risk of wildfire as predicted by the Fire Specialist assigned to this project.

Riparian Function

Issue indicators: Equivalent clearcut area (ECA) within RHCAs, domestic water sources, riparian road density in miles per square mile.

Implementing the no-action Alternative would not alter the existing ECA values or the riparian road densities. Similarly there would be no impact to the domestic water sources. However, if the No Action Alternative were selected and a wildfire burned through the project area, there is an increased probability that ECA values would increase and there is a high likelihood that domestic water sources could be adversely impacted. According to the best estimates supplied by the Fuels Specialist, the amount of acreage that could burn in the worse case scenario in each drainage are as follows: Kalispell (13,115 acres that equates to 8,626 ECAs), Reeder (6,090 acres that equates to 3, 997 ECAs) and Granite (14,007 acres that equates to 9,202 ECAs). There would be no change with this alternative to riparian road densities.

All adverse impacts of the fire would be based on having an intense fire burn through most of the project area with high fuel loading and minimal soil moisture. If such a fire burned through the project area, then trees would be consumed and the value of equivalent clearcut acres would increase correspondingly. Fires burning upstream or across domestic water sources would be detrimental if groundwater recharge areas were damaged by intense burning and/or if sediment and ash laden runoff from the burned areas plugged water intakes. These impacts would only occur under the most severe fire situations. Most of the domestic water sources would likely be affected by an extensive wildfire. The effects could include increased nutrients and sedimentation for surface water users and/or increased recharge of aquifers providing water.

Water Temperature

Issue indicators: Riparian disturbance: riparian ECAs and riparian road densities.

Recognizing that water temperature is directly related to the shading provided by the riparian zone, this analysis used riparian zone disturbance, riparian ECAs and riparian road densities as a surrogate for measuring the potential to impact stream temperatures. With the no-action alternative (no roads or logging), there would be no disturbance of the riparian zone and therefore no change in riparian ECAs or riparian road densities However, if a wildfire burned through the project area, then riparian cover would decrease and water temperatures would likely increase.

Cumulative Effects- No Action

Issue indicator: WATSED results and interpretation, Properly Functioning Condition (PFC) analysis and trend and effect on TMDL pollutants.

The past, present and reasonably foreseeable actions (RFA) identified in each of the basins have been assessed for possible impacts to water resources: specifically the effect to water and sediment yields. The list of RFA is located in Appendix B of this document. For the purposes of discussion the activities are grouped as the following: Fire, Timber Harvests, Noxious Weeds, Roads, Trails and Recreation, Stream enhancement, Residential Development and Land Exchanges, Climate Change and Mining. The WATSED model was able to model the past and potential impacts of fires, timber harvesting and road construction. No models were used to assess noxious weeds, trails and recreation, stream enhancement, residential development, land development, climate change and mining. Much of the discussion presented earlier in the Existing Condition discussion is a summation of the effects of the past activities.

Past, Present and Reasonably Foreseeable Activities:

Fire: Initially, these large wildfires caused an influx of nutrients, sediment, and woody debris into the streams which detrimentally impacted water quality. However, since the last large fires in Reeder and Granite Creeks, the water quality and fish habitat improved as the sediments flushed out, stream banks re-vegetated and woody debris provided cover. Today, in Reeder and Granite Creeks, the impacts of these fires are not significant to the aquatics resource because the resource has since recovered from the

detrimental effects. However, in Kalispell Creek, the large historic wildfires coupled with the logging and roading left a legacy of challenges in that specific basin. As stated in the existing condition section of this report, the Kalispell channel is still lacking adequate pieces of large woody debris and still has a considerable volume of sand dominated bedload that exceeds what is believed to be background levels. For the purposes of this discussion, it is recognized that in the Kalispell Basin, the effects of historic wildfire still overlap in time and space and will be included in the effects analysis. However for both Granite and Reeder Creeks, there will be no further effects discussion regarding the impacts of past wildfires on the aquatics resource.

In the absence of large wildfires as a result of fire suppression efforts, the influx of nutrients, sediment, and woody debris into the streams which detrimentally impact water quality and fish habitat for a short time has not occurred. Fire suppression tactics utilizing aerial retardant near streams, temporary stream crossings, or streams as control barriers may have impacted water quality. However, these impacts tend to be localized, occur in short duration pulses, can no longer be detected and occur on an insignificant amount of land in relation to the larger watershed.

With or without the proposed treatments, large fires still have a chance of igniting in or burning through the project area.

Timber Harvest: Harvests on private land have the potential to affect hill slope hydrology and could result in sediment reaching streams.

The effects of timber harvesting on water resources has changed markedly over the years (see Appendix B, “Comparison of Past and Current Land Management Practices” for further information). Today, the impacts to water resources is greatly reduced because of implementation of watershed Best Management Practices, the Inland Native Fish Strategy, and changes in harvest practices and objectives (Jill Cobb, Hydrologist
January 18, 2008: Iron Honey Response Document in Project File). An individual analysis of past timber harvest projects would not further aide in the analysis because the aquatic specialists effects analysis are based upon the existing conditions. The existing conditions are the result of all past activities in the basins. The effects of past timber harvesting on the watersheds varies by basin. Overall, it likely that while the timber harvesting itself did not cause adverse impacts to the streams, the transportation infrastructure required to support the logging was most damaging to the streams.

The aquatics analysis focused on past timber harvests for the entire watershed analysis area but only harvest twenty five years old or less because in this area harvested lands older than that are considered hydrologically recovered (USDA 1974). An important point to note is that only a limited amount of information exists for timber sales that occurred before 1950. In general, only acres harvested, year and type of treatment are recorded for these sales. Beginning around 1950, additional information on logging systems and fuel treatments were recorded as well. Therefore, for sales occurring prior to 1950, only the effects on vegetation can be discussed.
In addition, those activities recorded in stand exams prior to 1950 are not documented on historic timber sale maps or in historic records. This may be attributed to the fact that many of these activities were road side salvages or individual small sales from blowdown events that were not appropriate to record with larger timber sales. This indicates that these sales, because of their small size and limited scope individually and cumulatively, did not have a significant effect on other resources and this lack of information is probably not important.

Additionally, some stands had more than one harvest entry. Therefore, when two or more treatments were recorded for the same stand, data from the most significant treatment was used for this analysis. For example, if a stand had a thinning in 1960 and shelterwood seed cut in 1980, the shelterwood seed cut

was used for the analysis because it is the more influential treatment in terms of changes in forest type and stand structure, impacts to soils, and influence on water yield and sediment delivery.

Between the years 2008 and 2012, the Stimson Timber Company plans to log 961 acres in T61N, R5W, Sections 25 and 35. These parcels of land are located in Reeder and Kalispell watersheds. Private logging may still occur in small isolated areas throughout the basins mostly connected with clearing trees for home sites. Effects of these actions on aquatic resources are expected to be minimal but, still there is a potential to affect hill slope hydrology which could result in sediment reaching streams.

Timber Stand Improvement: Timber stand improvement (TSI) refers to activities such as weed and release, pruning, and pre-commercial thinning, which improve the growth and vigor of a stand by reducing inferior characteristics and reallocating resources. These activities are generally minor in terms of ground disturbance. Past TSI activities have affected the aquatic resources in terms of water yield and ability of a stand to increase in growth after thinning operations. While it is possible that pre-commercial thinning may increase water yield, the amount of increase would likely be almost negligible. On a positive note, thinning trees from overstocked stands can allow the remaining trees to reach desirable sizes more quickly with the added benefit of producing more shade along streams and larger diameter material that can be recruited to the stream channels.

According to District plans, only a very small percentage of any one of the drainage are planned for thinning. Any effect from this limited thinning would not be observable. Therefore, there will be no further effects discussion regarding the impacts of TSI activities on aquatics.

Noxious Weeds: Weed treatment within the Priest Lake Ranger District did not begin in earnest until after the Priest Lake Noxious Weed EIS that was completed in February 1997. Since that time, District personnel have maintained an active spray program that includes treatment within the project area. Some private property is also aggressively treated for noxious weeds. The effects of noxious weeds on hydrologic function are limited and were addressed in the Priest Lake Noxious Weed Control Project FEIS (USDA 1997). However, if the noxious weed populations replaced large acreages of native vegetation, then there could be adverse impacts from increased erosion and water yield resulting in potential erosion and water yield. Currently the spread of the noxious weeds is not great enough to have adversely impacted water or sediment yields.

Ongoing and foreseeable noxious weed treatments not associated with the project would include herbicide application and release of biological control agents. Specific treatments and locations are presented in the Reasonably Foreseeable section located in Appendix B of this document.

Roads: The topic of “road activities” includes road construction, maintenance, abandonment and removal. From the time roads are constructed, roads can adversely impact watershed conditions (Gucinski, 2000). Historically, many of the roads within the project area were built adjacent to streams with little or no best management practices. The outcome was that tons of sediment was delivered to the streams when many of these early roads were constructed. Road maintenance, like road construction, was not historically accomplished with best management practices. Often times, the intent of road maintenance was to make the roads drivable, and there was little to no concern about the effects of maintenance on other resources. For example early road grading did not attempt to avoid grading sediment into ditches or streams, whereas today, grading avoids sediment delivery to any water body. Road abandonment is a more recent phenomenon. Over the past twenty years, more miles of roads are being unintentionally abandoned. Often, these roads were constructed for early logging, but overtime, the roads become overgrown and no longer maintained because of limited funding. In some instances, these abandoned roads fail and deliver large volumes of sediment to the streams resulting in having pools filled and/or spawning habitat compromised by fines. Finally, like road abandonment, road removal has also increased in the past 20 years. As resource managers determine which roads are excess to their

transportation needs and as funding becomes available, road prisms are "treated" and the roads are removed from the landscape. Depending upon the specific site and the long term goals for the road, the treatment prescription will vary. However, in most instances, the hydrologist will at the minimum remove all culverts and unstable fills, construct cross drains to avoid concentrating runoff and deeply rip roads to improve site infiltration and revegetate. In most instances, an earthen barrier or some other physical barrier will prevent motorized access to the treated road. Despite using best management practices to minimize the delivery of sediment to streams during the road removal process, there is often some sediment delivered to the stream. Still the volume of sediment delivered to the stream during the removal process is far less than the amount delivered when a culvert or road segment fails. Within the focused CEA area approximately 43 miles of road have been decommissioned or put into storage. The effects of these decommissioning efforts on the aquatic resource have been to normalize slope hydrology and reduce the risk of road failure.

Road and bridge repair work may come up as conditions change. In 2010, there are plans to replace/improve abutments, wing walls and decking on the bridge crossing over Granite Creek on Road 638. The effects on the aquatic resource from these improvements are expected to be minimal. Other than that project, there are no immediate plans for any other major transportation activities in any of the watershed cumulative effects analysis area. Minor maintenance such as grading and brushing would occur as needed. The effects of these maintenance activities would be minimal because they would adhere to the measures prescribed in the IPNF's Road Maintenance Programmatic Guidance dated 2004.

Near future (or recent) road decommissioning is proposed under three separate contracts: Dusty Road Decommissioning and Hungry Deer Watershed Restoration. For all of the road decommissioning and storage work, all pipes and unstable slopes would be recontoured and disturbed sites would be revegetated, The Dusty Road Decommissioning project (completed in June 2008) treated 5.6 miles of road including all or portions of the following roads: 1341B, 1373A, 1373 and 1376A. The Hungry Deer project is scheduled for 2009. The Hungry Deer project would treat approximately 5.0 miles of abandoned road (Roads 2119 and 2120) which would be put into storage. The effect on the aquatic resource from these road decommissioning efforts are predicted to be a benefit to aquatics because slope hydrology would be normalized and abandoned drainage features would be removed.

Trails and Recreation: In the Priest Lake area, trails lead recreationalists along the lake shoreline and up to the top of local peaks. Like the roads, the greatest impact of the trails was at the time of construction. Since that time, the trails are relatively stable and only have minimal soil disturbance for long term maintenance. Recreational users can be divided into motorized and non-motorized. The non-motorized trails have little to no impact on water quality because there are usually only minimal rilling associated with hiking though rills can develop on trails where bikes are permitted[27]. However, the motorized trail users, especially those operating during wetter times of the year, can increase delivery to streams from rill erosion and damaging stream crossings. Still the damage tends to be localized and is often corrected by District staff as funding becomes available.

There are no plans to create any new trails, with the exception of creating new hiking prisms[28] over the decommissioned portions of Road 1014. The effect on water quality of the new hiking prisms would be minimal because of the use of best management practices. All existing trails will continue to be maintained as funding becomes available.

[27] The rills observed on trails used by bicyclists tend to be shorter and less deep than the rills developed by motorized traffic.

[28] The hiking prism on Road 1014 would not be considered an official Forest Service Trail. Instead it is simply a path for users to access the area once the road is removed.

Stream enhancement: For many years, fish biologists and hydrologists worked in the streams to "enhance" current conditions. Sometimes, their work included pulling out large organic debris and other times, their work focused on replacing large organic debris. In other instances, early hydrologists believed that vegetation slowing down the flow of water in the streams should be removed. In hindsight, most aquatic specialists agree that some early enhancement practices were not beneficial to the streams. Like many of our early management approaches (i.e. logging and road construction), our practices have evolved and no longer take place without careful scrutiny and planning. The science of stream enhancement has evolved considerably over the past 20 years.

Currently there are plans to install approximately 20 structures in the Kalispell drainage. The structures would be installed as part of the upcoming Hungry Deer watershed restoration project. The effects on the aquatic resource from these activities are expected to improved fish habitat, improved channel structure and improved channel resiliency. The Hungry Deer Project is scheduled to occur in 2009.

Ditching of Bismark Meadows and subsequent restoration: The mainstem of Reeder Creek flows through Bismark Meadows prior to crossing under Highway 57. Early in the settlement of the Nordman area (1930s and 1940s), homesteaders ditched the wetland to improve agricultural opportunities in the meadows. The ditches were deep and extensive and they effectively routed water quickly through the meadows downstream. The result of the ditching was that the form and function of the natural wetland system was compromised. Instead of allowing the spring runoff to slowly flood the meadow where sediment would settle out and groundwater could be recharged, the sediment laden water rushed downstream. In the summer of 2004, the Natural Resource Conservation Service restored the meadows hydrology by filling the ditches, revegetating the meadow with native wetland species and allowing the spring runoff to flood the entire wetland complex as it had for thousands of years prior to the ditching by early settlers. The Bismark meadow restoration effectively naturalized the hydrology of the meadow, which is demonstrated by the seasonal flooding of the larger meadow every spring, accompanied by an attenuation of the spring runoff peaks. Flooding Bismark meadow and attenuating the peak runoff allowed for water to recharge the larger aquifer and likely maintained higher base flows longer into the fall months. With the lower spring peak flows and higher base flows, more habitat is available during normally low flow periods (late summer and early fall).

Residential Development and National Forest Service Land Sales: Over the past fifty years, home development has escalated dramatically. Very little private property along the lakeshore is now undeveloped and most is densely developed. The high density housing reduces site infiltration and thus increases water yields. Similarly, some home sites have been developed by filling wetlands. In the field reviews for this project, it was observed that many private property owners adjacent to the streams have removed much of the riparian vegetation in misguided efforts to improve the channels. The results have been increased channel and bank erosion and loss of critical riparian vegetation, resulting in a decrease in channel stability.

Within the Granite-Reeder Sewer District Area a decision has been made to sell 80 acres of NFS land for development of a community sewer system. This exchange was analyzed in an Environmental Assessment called Granite Reeder Sewer District Land Exchange that was released for public comment in December 2007. The effect of this project on water resources within the project area is expected to be minimal on Forest Service Managed Lands. However, on privately managed lands, there is an increased risk for sediment delivery to the streams from exposed soils.

With the increasing popularity of the Priest Lake area, it is anticipated that home development would continue at a steady pace. With the increasing amount of home development and subdivision of property, it is likely that water yields would increase off of these homesites during spring runoff and summer thunderstorms, and infiltration would decrease. Ditch capacity along County and private roads may be

exceeded during these periodic runoff events resulting in potential, road/ditch failures. If the ditches are compromised, roads and ditches will erode and deliver sediment to water bodies.

Mining: Early miners explored the shoreline of Priest Lake and a few of the prominent ridges (e.g. Nickleplate and Lakeview Mountain). Like road construction, much of this early work was completed without concerns for protecting soils and water. However, unlike roads that were kept open and used for many years, all of the historic mining ceased decades ago. Currently, there is no effect to water or sediment yields from the historic mining activities because the exposed soils are stabilized with vegetation.

There are no known plans for future mining within the CEA.

Summation of No Action Alternative

The cumulative effects of past and present activities created the current hydrologic conditions. Considering all of the past and present activities, those activities that had the greatest effects were roads and fire. Research and field observations show that the single greatest impact to the hydrology of the three primary streams within the project area has been roads. The second greatest impact to the basins (especially Kalispell) has been wildfire. While fire is a natural disturbance with which the streams have evolved, the frequency and intensity of relatively large recent fires (especially in Kalispell) coupled with relatively heavy roading has created a condition where the stream resiliency was tested. It appears that while Granite and Reeder Creek watersheds have largely recovered from past fires, Kalispell Creek is still affected by the increased bedload delivered during the fires in the early 20th century.

While all of the previous activities did impact sediment and water yield in each of the three primary drainages, none of them had as much of an impact as did the roading and wildfires. In Reeder Creek, the timing of the water yield was significantly altered in Bismark Meadows with the construction of a series of ditches to allow for agricultural activities. A field review conducted in 2006 by Cobb and Dunne, noted that the restoration in Bismark Meadows completely turned around the mainstem of Reeder Creek and now the channel is hydrologically stable and functioning well (Project file field notes).

WATSED Model

One of the tools used in the watershed analysis is the WATSED model. Though the values of the model are not absolutes, it does provide a framework for helping to refine our understanding of existing conditions based on cumulative effects in terms of sediment yields, water yields and equivalent clearcut acres. According to the WATSED values, the current levels of sediment yields for Granite Creek appear much higher than do the values for either Kalispell or Reeder Creek. While the WATSED Model does tend to overestimate sediment loads, water yield estimates were fairly accurate (USDA 2000). In reviewing the WATSED model outputs, it appears that over 125 miles of roads were constructed between 1950 and 1971 in Granite Creek and the values never fully recover because the model limitations to show complete recovery. Another 40 miles of road were built between 1977 and 1988.

Table 3-49. Existing values for percent sediment yield increase above baseline, percent increase in annual peak water yields and total for equivalent clearcut acres.

Watershed	*Existing Sediment (Percent)*	*Existing Water Yields (Percent)*	*ECAs (percent)*
Kalispell	27	1	859 (3.4%)
Reeder	29	3	450 (5%)
Granite	49	2	1241 (5.5%)

The WATSED model was used as the basis for the cumulative effects analysis. Though the model used the TSMRS database for historical timber data and District records for the wildfire and road information, the model did not take into account the other historical disturbances such as mining, restoration, ditching, and residential development.

The sediment yields for Kalispell and Reeder Creek are somewhat higher than what is occurring in the Granite Creek drainage, based on field reviews (Project File). Currently both Kalispell and Reeder Creeks have extensive areas where beaver have ponded up the streams and caused sediment to settle out behind the obstructions. In Granite Creek the elevated sediment yields are from the earlier roads that the model could never fully recover. Still sediment sources in all three drainages continue to exist. Thought there are very limited sediment sources, the greatest non-point sediment sources are ditchlines and road surfaces. Vehicle traffic on native surface roads increases the delivery of sediment to both ditches and stream crossings (McDonald, 2005).

Water yields are relatively stable for all three primary drainages because so little new roads or new timber harvesting has occurred in any of these drainages over the last 25 years.

The Equivalent Clearcut Acres for the three primary drainages suggests that Reeder Creek and Granite Creek have relatively high openings for the drainage. As the literature suggests, openings in excess of 25 percent may indicate elevated levels of water yield. In the case of both Reeder Creek, the elevated ECA values may be attributed to natural openings (e.g. Bismark Meadows) The field surveys of Reeder Creek demonstrate Bismark Meadows and the adjoining wetlands are fully functioning and that water yield is not a problem in Reeder Creek because the meadows and wetlands serve to attenuate high spring runoff and slowly release the runoff into the mainstem channel. In Granite Creek, the ECA value is likely pushing the level where the stream may experience some increased inchannel erosion from amplified water yield from the high percentage of openings. From the recent field reviews, it appears that currently the water yield in Granite Creek is not normally a problem for the channel. However, as demonstrated in the 1996 high spring runoff, this stream is currently lacking the large woody debris needed to provide structure and resiliency to the channel during high spring runoff. Without the large woody debris component.in the channel, Granite Creek's ability to accommodate elevated streamflows is limited. It is the professional opinion of the project hydrologist (Jill Cobb) that the stability of Granite Creek would definitely be exceeded if the ECA values were to rise significantly, such as in response to a large wildfire.

Stream Condition Class:

Modeling completed in 2004 for the IPNF Forest Plan revision indicates that Granite and Kalispell Creeks are "functioning at risk", due the level of management that has previously occurred (project file). Watersheds that are "functioning at risk" have adequate physical, hydrologic and water quality integrity; however, present or ongoing adverse disturbances are likely to compromise that integrity if those disturbances are not modified or corrected (project file). In that same 2004 assessment, Reeder Creek was considered to be "Not Properly Functioning". This assessment was completed prior to the large scale restoration by the NRCS in the Bismark Meadows. Based on the survey completed since the NRCS work was finalized, Reeder Creek has moved from being a NPFC to a FAR drainage.

TMDL Listing:

With the implementation of the no action alternative, there would be no change in the current TMDL listings and/or recoveries of the listed streams. Stream temperatures would not change for Kalispell, Reeder or Granite Creeks because there would be no change in riparian openings from road or timber treatments. However, if a wildfire were to occur, there could be some increase in riparian openings. Still with the randomness of fire, it is almost impossible to predict to what extent a fire would affect the riparian vegetation. Sediment, also recognized for the purposes of this analysis as the "pollutant of

concern," listed for Kalispell and Reeder would not improve because no road improvements or watershed enhancement work would take place. High risk culverts and riparian roads would remain at risk for delivering future sediment. Similarly road crossings that are currently point sources of sediment could not be corrected under this decision document.

Alternative 2—Proposed Action

With the proposed action, timber harvests, fuel treatments and road work would occur to some degree in one of the five subdrainages: Kalispell, Reeder, Granite, Boulder and the Priest Lake face drainages. As displayed in the following table, the majority of the timber harvesting is occurring in Reeder Creek, and the majority of road removal occurs in the Kalispell drainage.

Table 3-50. Proposed action alternative treatment.

Drainages	*Acres of Timber Treatment*	*Acres of Burning*	*Increases in ECAs[29] (acres)*	*Miles of proposed road removal*
Kalispell	81	None	56	12
Granite	55	553	33	10
Reeder	2,098	405	1429	0
Priest Lake Face	159	461	97	0
Boulder	None	None	None	3.4

In addition to treating timber, the proposed action alternative includes specific mitigation projects and other projects that are opportunities.

- The projects that would directly mitigate effects to water resources include:
  - Removing approximately 3.0 miles of the 308 riparian road (and associated roads)
  - Installing 20 inchannel structures in Kalispell Creek
  - Reducing sediment at specific road crossings in Reeder Creek (13256UA, 1356UD and 2231)
  - Replacing the current crossing at Fedar Creek on Road 1347
  - Improving fish passage barrier at Reeder Creek on Road 2231.
  - Obliterating the following roads: 657, 638B and C, 337B, 1362C and D, 1373, 1014, 1323 and 1323A, 1351, 502 and part of the 1340 spurs.
- The opportunities that are identified with this project include the following:
  - Removing fish barriers on Fedar Creek at Road 1347, Packer Creek on Road 1373 and Zero Creek on Road 1376,
  - Restructuring part of the stream in Kalispell Creek (removing decadent alders)

All of the mitigation and opportunities are more thoroughly described Chapter 2 of this document.

[29] The ECA value is from the WATSED model outputs

Direct Effects-Indirect Effects of Proposed Action

Water Yield

Issue indicators: Change in ECA in acres, predicted water yield increases (WATSED Model outputs), predicted percent of Increased risk for rain-on-snow events and projected changes in road density in miles per square mile.

As discussed in the previous sections on water yield, many variables can affect water yield. For the purposes of this effects analysis, the focus will be upon the potential to increase water yield and the effects of any potential water yield increases. Surrogate measures for water yield include 1) increases in equivalent clearcut acres, 2) increases in openings in those zones most prone to rain-on-snow events and 3) changes in road densities.

Equivalent Clearcut Acres: Within the focused cumulative effects analysis area, the equivalent clearcut acres (ECA) for the project area would increase slightly from the existing condition with implementation of the Action Alternative. The ECA values would increase very slightly in Granite, Kalispell and the Priest Lake Face (see Table 1-40). The increase in ECAs for Reeder Creek would be 1429 ECAs (WATSED Model). According to the WATSED model, this would increase the ECA value in Reeder Creek from an existing 5 percent ECA to as high as 13 percent ECA in 2009 and 21 percent ECA in 2010.

While the total number of acres proposed for treatment is 3,864 acres, some of those acres proposed for treatment are already considered hydrologic openings because the existing vegetation is not 25 feet tall or 25 years of age.

Rain-on-snow Response: The rain-on-snow response was assessed by reviewing how many new openings would be created in the most sensitive elevational zone of 3,000 to 4,500 feet AND how many miles of road would be removed from the primary zone for rain-on-snow events. The increase in treated acres in the zone most prone to rain-on-snow (within the focused CEA) would be 912 acres. Another 951 acres would be opened in the transitory ROS zone. These values were further broken down by basin (Table 1-41). The increase in openings within the elevational band that is most sensitive to rain on snow could increase water yield to the streams during a rain on snow event. Recognizing that the channels evolved with rain on snow events, it is not anticipated that the increase in openings would adversely affect channel stability. The amount of increase predicted are so small for Kalispell, Granite, Priest Lake Face and Boulder that it is anticipated that runoff would be no different than current conditions. In Reeder Creek the amount of potential openings in the critical rain on snow zone could cause very slight increases in the amount of time that water would remain high. Because of the ability of the Reeder meadows to store runoff, it is expected that the increase in runoff from the rain on snow events could last longer, but the peaks themselves would not be discernibly higher. The amount of road that would be removed in the critical rain on snow zone is 18 miles (8.6 miles in Kalispell and 9.4 miles in Granite). Removing these roads would eliminate the existing culvert crossings that could fail during a rain on snow event. Culvert crossings are especially prone to failure during rain on snow events because often they clog with snow and debris and quickly exceed their design capacities.

Table 3-51. Acres of treatment in rain-on-snow zones.

Drainages	*Acres of Treatment in zone most sensitive to Rain-on-snow events*	*Acres of Treatment in Transitory Rain-on-snow zone*
Kalispell	79	None
Granite	343	84
Reeder	490	806
Priest Lake Face	0	61
Boulder	None	None

Road Densities: With the implementation of the Action Alternative (including both mitigation and opportunity road removals),18.0 miles of the 25.5 miles of the proposed road decommissioning would occur in the landforms identified as most prone to rain-on-snow. The 25.5 miles of road decommissioning includes 3.4 miles of roadwork outside of the focused CEA.

Focused CEA: Within the focused CEA, there is a total of 352 miles of road. This mileage equates to a road density of 3.78 mi/mi2 (includes closed and open roads). The total mileage of roads currently within the rain-on-snow zone is 187 miles. Road removals within the critical band of 3000 to 4500 feet would reduce the risk of culvert failures in those areas prone to high discharge events. With the proposed action, we would be removing a total of 22 miles from the focused CEA: 18.2 miles of the 22 miles are within the critical rain-on-snow zone and 10.2 miles of the 22 miles are on landforms with a high to moderate risk for sediment delivery to streams.

Boulder Drainage: In the Boulder drainage, a total of 3.4 miles of road would be removed: including about 1.0 miles of road in the critical rain-on-snow zone and about 0.8 miles of road that is identified as having a moderate risk for sediment delivery.

Table 3-52. Road Densities and Miles of Road Decommissioning by drainage.

Drainages	*Existing Road Densities (mi/mi^2)*	*Post Treatment Road Densities (mi/mi^2)*	*Total miles of proposed road decommissioning*
Kalispell	2.8	2.5	12
Granite	4.6	4.3	10
Reeder	4.3	4.5	0
Boulder	3.34	3.0	3.4

Table 3-53. Water yield – effects of the action alternative by drainage

Kalispell Creek	The Lakeview Reeder Project proposes treating 95 acres in the Kalispell drainage and removing 12 miles of road. The treatment of 95 acres in the lower Kalispell Basin will not affect water yield. The timber treatment for the 95 acres would be primarily a commercial thin with about 45% removal of existing trees and water yield would not be affected because of the very limited vegetation treatments. The removal of 12 miles of road would improve site infiltration and hydrologic connectivity resulting in normalized slope hydrology and considerably improved riparian function because of the improved access to the floodplain with the removal of Road 308 from the floodplain.
Reeder Creek	The proposed timber treatment of 2098 acres and burning of 405 acres within Reeder Creek would increase annual water yield peaks to 9% (a 6% increase above existing). The treatments are focused in two primary areas within Reeder Creek. With the proposed action, about 2.5 miles of road would be constructed along the base of the north side of Lakeview Mountain. There is no proposed road decommissioning within the Reeder basin. About half of the timber and burning treatments are located north and west of Nordman and includes treatments near Reeder Lakes and Indian Creek. The large eco burning unit proposed to the west of Reeder Lakes would not increase water yield enough to cause damage to the chain of lakes. In field surveys, the channels and lakes were considered to be stable because field reviews did not document signs of instability in the channel (e.g. unstable channel banks, signs of active erosion) and therefore is it unlikely that this level of predicted water yield of 14% would damage the stream (Project File: Indian and Reeder Field Reviews). In the Indian Creek drainage, the project would include 55 acres of eco burning and 122 acres of timber removal. As described in the existing condition, Indian Creek is stable and would not react adversely to the amount of openings that would be created. All of the timber treatments within the Reeder Basin upstream of the Highway 57 crossing would flow into the E channels within the restored Bismark Meadows. Because E channels have evolved with extensive flooding, there is little concern for any damage to the meadows or channels from any increase in water yield from the adjacent slopes. All channels would be protected with INFISH buffer strips (Rosgen, 1996). Downstream of the Highway 57 crossing is the second concentration of timber and burning treatments within Reeder Creek basin. These activities are located on the north face of Lakeview Mountain and include timber treatments, burning and road construction and/or reconstruction. The drainages flowing off the north face of Lakeview Mountain are mostly steep channels that flow into the E channel of Reeder Creek. The channels will be protected by prescribed INFISH buffer strips. The water draining off the treated slopes would move into an E channel type that is capable of handling the increased water yield (Rosgen, 1996). In both instances, the E channel types making up the preponderance of the mainstem of Reeder Creek will easily accommodate the increases in water yield. With the increased water yields and the large natural reservoir created when Bismark Meadows was restored, the hydrograph for Reeder Creek would not likely have a higher peak, but rather a longer runoff period as the meadows slowly released the water downstream.
Granite Creek	Within the larger Granite Creek basin, the proposed timber and burning treatments include 53 acres of timber treatments and 553 acres of burning. The timber treatment is focused in a strip of timber located on both sides of the FS Road 302, just east of Reeder Lakes. The prescription for the timber treatment is a mix of irregular shelterwood and commercial thin. According to the WATSED model projections, water yield in Granite Creek would not increase. The model run did not have the sensitivity to recognize the light burning proposed in the brush fields within the Granite Creek drainage (see WATSED outputs in project file). The amounts of timber treatments were also too small to be recognized by the WATSED model and thus no water yield increases were predicted. The majority of the burning is prescribed for the Fedar drainage. This burn will be an ecoburn and will increase openings by 13% (D.Cobb, 3/25/08 memo). The projected amount of opening was so minimal that the WATSED model did not even recognize it as a disturbance (see WATSED outputs in project file). These model outputs are reasonable based on the professional judgement of the project hydrologist. The proposed burning in Fedar would cover about 225 acres in the middle third of the drainage. Downstream of the burning, the stream channel is a stable B4 channel that eventually flows into a C4 reach. The B4 channel would not be adversely affected by any increase in water yield and the C4 channel is marshy and already is prone to spring flooding. Increasing water yield to either of these reaches would not destabilize the stream because of the inherent channel conditions (e.g. flat, marshy, prone to flooding). There is a concern with the existing crossing on the 1340 road at the Fedar crossing. This

	crossing is already compromised by undersized culverts and each year for the past five years, the culverts have had to be mechanically cleaned of beaver dams. It is part of the mitigation for the Lakeview Reeder Project to replace this crossing with either a bridge or a much larger stream simulation culvert crossing. The effect of this mitigation on water yield would be a significant reduction in the risk of having this crossing failure. If this crossing were to fail, hundreds of cubic yards of material could be mobilized down Fedar Creek and some of the material would reach the mainstem of Granite Creek. The implementation of the action alternative would slightly increase water yields in Fedar Creek but only if the ecoburn is hot enough to consume most of the vegetation within the burning boundary. Given the southern exposure of the slope, there is a chance that the a considerable amount of the vegetation will be consumed during the burn operations. The decommissioning of 10 miles of road would improve infiltration and disperse water across the slopes. As the slope hydrology is normalized, runoff would be less flashy during peak events and more water would infiltrate the soils to recharge the aquifer that supplies water to the streams during the low flow months. There would be no increase in water yield in Granite Creek with the implementation of the action alternative (Project File).
Boulder Creek	Given that no fuel reduction/timber treatments are planned for this area, the only slight impact to water yield from the proposed action is the decommissioning of Road 1014. Like the other decommissioned roads, treating this road would improve slope hydrology by increasing infiltration and dispersing the natural runoff across the slope rather than concentrating it into ditch lines and culverts. There would be no measurable change in water yield within Boulder Creek, but the slope hydrology would be more normalized.
Priest Lake Face	Within the Priest Lake Face area the action alternative would burn 159 acres and complete timber treatments on another 461 acres. The amount of canopy that would be removed is so small that only 97 new ECAs would be created from the project implementation. This level of increase in openings would not produce measurable runoff in this area, whereas a wildfire would likely increase water yield off of the slopes.

Sediment Yield

Issue indicators: Sediment models (WATSED Model) and road density on sensitive land types in miles per square mile.

Sediment generation from timber and road work is anticipated with the implementation of the action alternative. However, it is unlikely that during timber operations measurable amounts of sediment would actually move into channels. The prescribed INFISH buffers coupled with the site specific BMPs would almost eliminate the chance of sediment coming off of the harvest units and being delivered to the streams. However there is more of a risk of sediment delivery to the streams from the proposed fuel treatments and road work. New road construction and reconstruction would be implemented using site specific BMPs, including those listed in Chapter 2 and in the BMP Appendix. These BMPs are highly effective at reducing sediment yield (Seyedbagheri 1996). Within the Reeder Creek drainage, two new stream crossings would be installed and about six new crossings over wet draws would be installed, resulting in about 28 to 40 pounds of sediment delivery (Foltz 2007). In the Kalispell drainage, no new stream crossings would be installed and two seasonal draws would be crossed with the relocated road segment, with between 7 and 10 pounds of sediment delivery anticipated with the installation of the crossings over the two seasonal draws (Foltz 2007). All proposed road removal work is defined as either mitigation or opportunities in Chapter 2 of this document.

In terms of timber treatments, the risk for sediment delivery is slightly higher for those small streams where burning alone is planned because fire may back into the riparian zones during the broadcast burning operations. Still the amount of burning in the RHCAs would be small and with since the burns will be conducted during the cooler times of the year, it is not anticipated that the fires would be hot enough to consume much of the slash near the channels. Because the broadcast burning would not consume much slash and soil would not be disturbed, the risk for sediment delivery would be minimal. Any sediment that reach the streams would be minimal and would only travel a minimal distance downslope because of in channel features. It is likely that the sediment would settle out in less than 100

to 300 feet, depending on slope, stream size and physical obstructions. Research conducted by Glaza and Elliot in 2007 on the Priest River Experimental Forest on the Priest River Ranger District found minimal sediment and runoff from the burned over headwater drainages. Of the ten replicated studies (Glaza and Elliot 2007), only one of the drainages had any measurable sediment erosion and it was very minimal. The researcher proposed that the one watershed with minimal increased water and sediment yield could have had more shallow soils and a larger watershed from which the runoff was generated. The study closely mimicked the proposed treatments for Lakeview Reeder burning. Like the study in 2007, the burns proposed under Lakeview Reeder would not be so hot as to remove the duff layer and the drainages proposed for burning tend to be the smaller first order drainages with deeper soils. Therefore, it is anticipated that the increase in sediment and water yield from the units proposed for burning under the Lakeview Reeder Project would be minimal

The decommissioning for selected roads would take place when stream flows are low and would maximize the use of BMPs such as described in Chapter 2 and in the Appendix listing BMPs to minimize sediment delivery to stream courses. Research completed by Foltz et al. (2007) compared the effects of culvert removals and provided data regarding sediment concentrations and turbidities during and after operations. According to Foltz's research, all of the locations exceeded the State of Idaho's turbidity levels for the instantaneous criterion of 50 NTU. Peak turbidity values ranged from 620 to 27,000 NTUs immediately below the crossing for a few minutes. However, moving 810 meters downstream, the researchers did not find any elevated levels of turbidity. It appears that the sediment settles out within the 810 feet below each crossing. In addition to the NTU documentation, Foltz's research evaluated the short term impacts of culvert removals and mitigation measures. The study showed that culvert removals generated between 5.7 and 374.8 lb per crossing. Using straw bales as mitigation reduced the average sediment yield at stream crossing removal from an unmitigated average of 147.7 lb to a mitigated average of 3.5 lb. In summary, the research clearly documented that when a culvert is removed, the State of Idaho's standards may be exceeded in the short term (few hours) but the effects are short lived both temporally and spatially. Some of the research supporting this study was conducted on the Priest Lake Ranger District of the Idaho Panhandle in the summer of 2005.

Typically the act of removing a road from use includes ripping and/or recontouring the road prism. This action alone may increase erosion off of the treated area if the exposed soils are not protected with mulch. Studies have documented that mulching immediately after ripping or recontouring a road prism will markedly reduce erosion. A study on the Priest Lake Ranger District (that began in 2005 and is still ongoing) suggests that mulching exposed soils will reduce sediment yield by 80 percent with straw or wood mulch (Foltz and Copeland, 2007). This study further determined that wood strands statistically out performed conventional straw mulch and wood shreds for both how long the material remained effective as well as the amount of actual erosion control.

The DEQ analysis for the TMDL for Kalispell Creek determined that relocation of the Kalispell 308 road for about 3 miles would reduce sediment delivery to the stream by 200 to 400 tons over the course of about 10 years (project file). The calculations for sediment reduction vary between models. The DEQ analysis for the TMDL suggested that for Kalispell Creek the road sediment for Road 308 equated to 9.0 tons/mile/year or 0.7 tons/crossing/year.

The proposed road reconstruction, maintenance and stream crossing improvements would reduce point sources of sediment. Researchers (Sugden 2007, Burroughs and King 1989) have found that surface improvements (i.e. surface rocking, grading) and ditch treatments can significantly reduce the volume of sediment transported off the road, into the ditchline and down to the culvert crossing. At selected sites identified in the list of mitigation measures, existing stream crossings would be improved to reduce sediment delivery using one or a combination of techniques, including but not limited to rocking over the approaches, installing relief pipes in the ditchlines to route runoff over the forest floor and away from the streams, replacing undersized culverts to reduce the risk of failure, and installing ditch dams to slow the

movement of runoff and trap sediment. During all implementation work, established best management practices would be applied to reduce the risk of sediment delivery to the streams.

In the two locations where new stream crossings are proposed (Reeder Creek), both crossings were surveyed and found to be stable. The streamflow at both crossings was discontinuous and could be described as "intermittent pocket water" (Hixson 2008 and Weidich 2004). At each of the two crossings, 42 inch culverts would be placed to convey water efficiently under the road. An existing ford exists on the current road and it too would have a 42 inch culvert installed to convey water. This crossing is a seasonal stream that has considerable flow in the spring freshet. In the short-term, it is assumed that the amount of sediment generated at the time of disturbance would be comparable to the amount of sediment generated when a culvert is removed. Based on Foltz 2007 research on sediment generated when culverts are removed, it is estimated that approximately 3.5 pounds of sediment would be delivered at each stream crossing at the time that the new crossings are installed.

Table 3-54. Sediment yield – effects of the action alternative by drainage.

Kalispell Creek	The single greatest reduction in sediment reduction in the Kalispell Basin would be the removal of 3.0 miles of Road 308. With the removal of Road 308, approximately 200 to 400 tons of sediment (generated over a 10 year period) would not reach Kalispell Creek. As part of the action alternative, following road work would take place: 1.8 miles of new road construction as part of the 308 reroute; 11.8 miles of road decommissioning; 3.4 miles of road maintenance and 2.6 miles of road reconstruction. There would be a limited increase in sediment delivery from the removal of the 308 road. At each of the 38 culvert removals, approximately 3.5 pounds (Foltz 2007) of sediment would be generated from the culvert extraction. This increase in sediment from culvert extractions would be short lived and would likely drop out after about one half mile (Foltz 2007) because of in channel obstructions and roughness on the channel and floodplain. Additionally, where the road and stream are closely aligned (approximately 0.5 mile), there would be a period of a year or two whereby there could be an increase in sediment delivery as the stream re-accesses its floodplain where the road was formerly located. As the stream accesses its floodplain, some sediment would drop out behind obstructions both on the floodplain and in the channel. It is not anticipated that much sediment (less than 51.8 tons) [30] would be eroded off the treated 0.5 miles of riparian road because of prescribe best management practices. If ½ of this sediment would settle out behind the obstructions on the floodplain and in the channel, then the sediment would move through the system to obstructions downstream. This amount of sand delivery in this sand dominated system is relatively small and will be short lived because much of the bedload will settle out naturally. The removal of the 308 road would provide a long term net reduction in chronic sediment delivery to Kalispell Creek. The remaining 2.5 miles of Road 308 that would be obliterated is generally not close enough to the active channel to have direct delivery of sediment to the channel. This increase in sediment from culvert extractions would be short lived and would likely drop out behind obstructions after about one half mile (Foltz 2007). The installation of 20 inchannel structures would have a short term localized increase in turbidity levels in the stream as the structures are placed. The cause for the increased turbidity would be the minor bank excavation and placement of the large pieces of wood in the channel. Based on local experience with other inchannel woody debris placement (Project File, Willow Creek 2005), it is anticipated that the amount of turbidity experienced would last between 15 minutes and 1 hour. With the 95 acres of proposed treatments, the threat of wildfire would decrease slightly. According to the WATSED model outputs, the increase in sediment yield from the proposed timber treatments in the Kalispell Basin would be an increase of 1% above existing levels. One

[30] Assume 0.5 miles of riparian road, eroding 6 inches laterally and 6 inches deep for the entire distance. That would equal a volume of 2640 feet x 0.5 feet x 0.5 feet = 660 ft3 or 24 cubic yards or 2.16 tons/cubic yard. This equates to 51.8 tons, or one and three quarter dump truck loads.

of the units, (number 125) would have treatment within the RHCA. The proposed unit is above Road 308, but within 100 feet of Kalispell Creek. Unit 125 is located on a flat above Road 308 and about 100 feet from Kalispell Creek. Treatment of the timber in this unit would not affect any of the RMOs defined in the InFish guidance. None of the trees in the unit would ever contribute LWD or shade to Kalispell Creek. In summary, removing timber in Unit 125 would not adversely affect the attainment of RMOs in Kalispell Creek.

The calculations for sediment comparison are based on a background level of sediment in Kalispell Creek being 859 tons/year. According to the WATSED model, the sediment yield in Kalispell Creek is currently 27% above background levels (or 1090 tons of sediment). The projected sediment increase from a wildfire would be 194% increase above existing, or 808 tons of sediment for a total sediment yield of 1,898 tons. With the implementation of the action alternative, sediment yield would increase from an existing level of 1090 tons to 1100 tons, an increase of about 10 tons. The increase would be attributed to the proposed harvesting and road work in Kalispell Basin.

Background Sediment (tons)	**Existing Sediment (tons)**	**Wildfire Sediment (tons)**	**Proposed Action (tons)**
859	1090	1989	1100

Sediment comparisons for Kalispell Creek with various scenarios (WATSED Model)

Reeder Creek

With the action alternative, there would be some areas where sediment would increase and others where point sources of sediment would be eliminated. According to the WATSED model outputs, the increase in sediment yield from the proposed action in the Reeder Basin would be an increase of 14% above existing levels, or an increase of 142 tons above existing levels. The sediment increases would be associated with the proposed burning, activities associated with timber treatments and road improvements. With the action alternative, there would be 405 acres of burning and 2,098 acres of timber treatments and specific road improvements (outlined in Chapter 2). The following effects analysis focuses on the potential for sediment delivery from these proposed activities.

As discussed earlier, the burning could minimally increase soil erosion in a very few locations. This amount of sediment would not adversely impact either the first order streams or the mainstem of Reeder Creek, because burning would not occur adjacent to streams except in only very occasional units where broadcast burns may creep (or back) into the riparian zones. The proposed burning (and timber treatments) would markedly reduce the risk of wildfire across the landscape. As described in the no action alternative section, a wildfire could produce far more sediment than would be generated if the action alternative were implemented.

The proposed timber treatments in Reeder Creek are mostly commercial thins and irregular shelter wood harvests. About 90% of the timber treatments are located on sites with a low sediment delivery potential. The remaining treatments are located on high or moderate risk sites for sediment delivery potential. Using the design BMPs listed in Chapter 2, the BMP Appendix and InFish buffers, the risk of sediment delivery would be minimized and sediment delivery to Reeder Creek would be highly unlikely site specific BMPS would include some of the following measures: restricting logging operations to times when soils are dry or protected by snow and using “light on the land” machinery (e.g. harvester forwarders). Research by Belt and O’Laughlin (1995) looked at typical logging and road construction operations and the effects of those operations on sediment movement. Their research documented that sediment rarely traveled beyond 300 feet over a forested floor. Therefore, given the use of BMPs and InFish buffers, it is extremely unlikely that any sediment would move through the units and be delivered to any stream course.

In three of the proposed units within Reeder watershed, there would be select treatments within the RHCA buffers adjacent to the proposed units. Each of these units was field reviewed by the project hydrologist to insure that riparian management objectives (RMOs) would be met or enhanced with the treatments. All documentation for the InFish modification is located in the project file.

There is a considerable amount of road improvements proposed in the Reeder Creek watershed. The majority of the 12.67 miles of road maintenance work in Reeder is proposed to occur above the Bismark Meadows. In addition to the road maintenance, there would be 2.6 miles of new road construction and reconstruction of 2.0 miles in the lower reaches of Reeder Creek.

The proposed stream crossing and surfacing of stream crossing approaches at Indian and Reeder Creek Crossings on Road 2231 would not cause any increase in sediment delivery to the streams. The new and replacement crossings on Roads 2516 (at Indian Creek) [31] and 1356 UD (three unnamed Tributaries to Reeder) [32] would result in minimal and short term (less than 1 or 2 hours) increases in sediment delivery to the streams. With the exception of the crossing at 2516, all three of the new proposed crossings would be on streams that during times of low flow have only limited pocket water and not a continuous flowing channel (Project File, Field Notes). All of the new crossings would be designed to convey a 100 year return interval flow event. In summary, the proposed action may increase short term sediment delivery at new stream crossings and during the road improvement work and new road construction.

It is unlikely that any sediment would actually reach Reeder Creek mainstem from either the burning or the timber treatments. Given the prescribed INFISH buffers and site specific Best Management Practices, such as those described in Chapter II, the chance of sediment delivery to the streams is minimal. The risk for sediment delivery is slightly higher for those small streams where broadcast burning alone is planned. In those burn units, there are no designated stream buffers and fire may back into the riparian zones. However, since no soil will be disturbed, any sediment that reaches the streams would be minimal and would only travel a minimal distance downslope (less than 100 to 300 feet, depending on slope, stream size and physical obstructions).

Background Sediment (tons)	**Existing Sediment (tons)**	**Wildfire Sediment (tons)**	**Proposed Action (tons)**
331	427	831	473

Sediment comparisons for Reeder Creek with various scenarios (WATSED Model)

The calculations for sediment comparison are based on a background level of sediment in Reeder Creek being 331 tons/year. According to the WATSED model, the sediment yield in Reeder Creek is currently 29% above background levels or 427 tons of sediment. The projected sediment increase from a wildfire would be 404 tons above existing, or 831 tons of sediment. The projected sediment increase from implementing the action alternative would be 46 tons above existing, or 473 tons of sediment. Similarly, the amount of projected increases in sediment would be far less with the action alternative (46 tons) , than it would be if one of the larger crossings (205 tons)[33] on any one of the roads failed. With the action alternative, roads that are currently delivering sediment or at risk of delivering sediment would be improved and the risk of wildfire would be markedly reduced. In summary, with the implementation of the action alternative, the amount of sediment that Reeder Creek would be transporting would increase from existing level of 427 tons to a total of 473 tons: an increase of 46 tons.

Granite Creek	With the implementation of the action alternative, 55 acres would have timber harvesting and 553 acres would be burned. Additionally 10 miles of road (listed in Chapter 2) would be decommissioned, the larger crossing on Fedar Creek would be replaced and one mile of road would be reconditioned/maintained. According to the WATSED model values, sediment yields under the action alternative would not increase sediment yields in Granite Creek above existing

[31] The crossing on Road 2516 is currently a 36 inch cmp and has a 35% rustline. This pipe would be replaced with a 60 inch culvert

[32] Of the three new crossings on Road 1356UD, one crossing is now a drivable ford and the remaining two crossings are proposed as part of new construction. All three of the new pipes would be 42 inch culverts

[33] Assuming a live crossing has 4 feet of fill overburden and a fill width of 40 feet on a road 16 feet wide, then the volume from just the road crossing would be 95 yd^3 or 205 tons.

<table>
<tr><td></td><td>levels (Project File, WATSED Outputs).

<table>
<tr><th>Background Sediment (tons)</th><th>Existing Sediment (tons)</th><th>Wildfire Sediment (tons)</th><th>Proposed Action (tons)</th></tr>
<tr><td>1049</td><td>1563</td><td>2591</td><td>1563 (No change from existing</td></tr>
</table>
Sediment comparisons for Granite Creek with various scenarios (WATSED Model)

The burning and timber harvesting would not increase sediment delivery to the streams. All of the area proposed for treatment (except for about 65 acres) is located on soil types with a low risk for sediment delivery. The 65 acres of moderate risk soils are proposed for burning. The probability of sediment delivery during burning and timber harvesting was discussed thoroughly in the Reeder Creek assessment and holds true here as well.
Most of the roads (1.1 miles) proposed for maintenance/reconstruction are in lower Granite Creek. The roads proposed for decommissioning are listed in Chapter 2 of this document. Most of these roads proposed for decommissioning are in some state of closure already (e.g. partially failed culverts or brushed closed and abandoned). Once these road removals and improvements take place, the potential to deliver sediment to the streams would be significantly reduced. There would be a limited amount of sediment delivery to the streams with the removal of the culverts because of the proposed design features. On average, each culvert removal could increase sediment about 3.5 lbs per crossing (Foltz 2007). This increase in sediment would be short lived and would likely drop out after about one half mile (Foltz 2007).

With the action alternative, the risk of wildfire in Granite Creek would be slightly diminished and the risk of road failures would be markedly diminished. There would be limited increases in sediment delivery to the smaller streams where culverts are removed as part of the road removal effort. However, the sediment would settle out quickly behind in channel obstructions and on the floodplains, so there would be no increase in sediment delivery to the mainstem of Granite Creek with the implementation of the action alternative.</td></tr>
<tr><td>Boulder Creek</td><td>Road 1014 would be treated by removing all culverts, ditches and unstable slopes. Treating this road would remove the risk of future road failures and thereby reduce the potential for sediment delivery to the stream in the long term. Short-term impacts to water quality from decommissioning activities would be limited increases in sediment delivery to the smaller streams where culverts are removed as part of the road removal effort. However, the sediment would settle out quickly behind inchannel obstructions and on the floodplain, so there would be no increase in sediment delivery to the mainstem of Boulder Creek with the implementation of the action alternative.</td></tr>
<tr><td>Priest Lake Face</td><td>Under the action alternative, 159 acres would have timber treatments, 461 acres would have burning and road maintenance would take place over 3.0 miles. Most of the 3.0 miles of roads proposed for maintenance under the action alternative are located on the parcel of land located between Reeder Bay and Ledgewood Bay. The roads proposed for maintenance would have drainage structures cleaned; surfaces regraded and limited surfacing with gravel. Once treated, the sediment yield off these roads would be markedly reduced because research shows that over the long-term, road maintenance reduces the potential for road failures, which in turn reduce the potential for sediment delivery to the streams (Seyedbagheri 1996). Because of the light treatments proposed for both the timber harvesting and the burning, there is little to no risk of any increases in sediment delivery to any water bodies. The proposed treatments would consist of thinning overstocked stands and piling and burning slash. These relatively light activities are not expected to result in sediment delivery because soil disturbance would be minimal. All but 31 acres of the proposed treatments is on land types characterized as having a low risk for sediment delivery. The 31 acres that are on landforms with a moderate risk are proposed for an ecoburn and is not anticipated to yield any sediment. The WATSED model was not used for the analysis of the Priest Lake Face treatments because the area designated as the Priest Lake Face does not approximate a true watershed.</td></tr>
</table>

Overall, the effects on sediment yield from implementation of the action alternative are a short term increase in water yield where road removals and improvements are proposed. The proposed timber and

fuel treatments have been designed to minimize soil disturbance (e.g. using a harvester forwarder on a slash mat) and maintain slash on the ground between the proposed treatments and any water bodies (Belt, 1992). In comparing the effects of the wildfire to the proposed action alternative, there is a notable overall improvement in reduced risk for sediment delivery to the streams. The action alternative reduces the risk for a large scale potentially damaging wildfire and reduces the risk of increased sediment delivery through specific road improvements and elimination of roads deemed excess to the long term needs of the Forest Service. In summary, there would be a net improvement in water quality with the implementation of the action alternative.

Hydrologic Function

Issue indicators: Ability of channel to balance water and sediment yields

Implementing the action alternative would not adversely impact the ability of the channels to balance water and sediment yields. As discussed in both the water yield and sediment portion of the effects analysis, neither sediment or water yields are anticipated to become out of balance in any one of the affected subdrainages. Therefore, since the sediment and water yields would remain in balance, the proposed timber and burning would not affect hydrologic function. The proposed road removals would positively affect hydrologic function because with the deep ripping, recontouring and culvert removals slope hydrology that had been altered for many years would become more naturalized as water is dispersed across the landscape (Luce 1997). Dispersing the water and improving infiltration would improve the resiliency of the watersheds to future disturbances such as fire or rain-on-snow events. The placement of 20 inchannel structures adjacent to the removal of the 308 road in Kalispell Creek would provide the stream with the large woody debris component that it currently lacks. This would improve hydrologic function of that portion of Kalispell Creek.

Riparian Function

Issue indicators: Equivalent clearcut area (ECA) within RHCAs, domestic water sources, riparian road density in miles per square mile.

Implementing the action alternative would not measurably alter the existing riparian ECA values. Many of the units proposed under Lakeview Reeder are dissected by small unnamed and often seasonally flowing streams. Sale boundaries carefully avoided treatment in almost all of the draws and/or streams. However, there is a limited amount of treatment proposed within the RHCAs of four units located within Reeder and Kalispell drainages. Working closely with the timber specialist and the fish biologist (See Fisheries Section: Tables 46, 47 and 48), the hydrologist assessed the RMOs for each stream segment adjacent to those units with treatment needs within the RHCA buffers. In each instance the hydrologist determined if proposed treatments would maintain, enhance or retard the attainment of the RMOS. The hydrologist personally field reviewed each of the proposed units where treatments were proposed in the existing RHCAs. Using existing data (see Tables 46, 47 and 48 in the fisheries section summarizing fish habitat conditions for each of the three primary drainages) and site specific field reviews, vegetative treatments were proposed in a total of four units. Three of the four proposed RHCA treatment units are located in the Reeder Creek drainage. The three units in the Reeder Creek drainage are Units 4, 44 and 72. Within Kalispell, only Unit 125 has treatment proposed within the RHCA boundaries.

In order to insure that RMOs would be maintained and/or enhanced with the proposed treatments, the hydrologist developed specific treatment measures. For example, mechanized equipment would be minimized to prevent any impacts to soils. No larger diameter (greater than 12 inch) recruitable trees would be removed from the riparian zones and only the smaller diameter material would be removed that would not affect shading to the streams. Removing the smaller diameter material would give more growing space to the remaining trees which in turn could produce larger trees because of more available nutrients and water. Tto prevent any increases in stream temperatures, no shade trees would be removed on the south and/or western exposures. Some woody debris will be left on site to capture sediment

moving down slope and therefore it is expected that none of the proposed treatments in the RHCA would increase sediment delivery. In summary, the treatment of the few stands within the RHCA boundaries would enhance the attainment of the Riparian Management Objectives through the following:. 1) Overtime, streams would have larger sized woody debris available for recruitment, 2) More large wood recruitment would likely lead to increased pool frequency and quality, 3) Shading would not change and therefore, water temperatures would not increase and 4) Physical channel components (e.g. stability, width depth ratios and amount of undercut banks) would not be affected.

All of the domestic water sources would be protected through the design criteria outlined in Chapter 2 of this document. There would no increase in nutrients or sedimentation for surface water users. There could be a small increase in overall volume of available groundwater as it is likely that the groundwater recharge could increase for a few years after treatment and before the vegetation gets well established again across the landscape.

There would be reduction in riparian road miles with the implementation of the action alternative. The proposed removal of 3.9 miles of riparian roads would provide a net benefit to the riparian zones form and function. The roads proposed for removal in the riparian zone are FS Roads 308 in the Kalispell basin and Road 1014 in Boulder Creek. None of the other roads proposed for removal actually parallel a stream. The removal of Road 308 will allow the main stem of Kalispell Creek to reclaim its floodplain and encourage more recruitment of large woody debris (LWD) to the stream. The proposed road removal for Road 1014 would not affect the floodplain as much as it would benefit riparian function (e.g. shading, LWD recruitment). The riparian road mileage would decrease for the Kalispell and Boulder drainages by 3.0 and .87 miles, respectively.

Water Temperature

Issue indicators: Riparian disturbance, riparian ECAs and riparian road densities.

Recognizing that water temperature is directly related to the shading provided by the riparian zone, this analysis used riparian zone disturbance, riparian ECAs and riparian road densities as a surrogate for measuring the potential to impact stream temperatures. With the action alternative, there would be minimal disturbance of the riparian zone but no measurable change in riparian ECAs[34]. A decrease in riparian road densities would be realized with the removal of Road 308 in Kalispell Creek and Road 1014 in Boulder Creek. Post treatment of the road removals, all exposed surfaces would be planted to hasten vegetative recovery/shading along the stream course and reduce potential sediment delivery off of treated slopes.

Cumulative Effects- Proposed Action

Issue indicator: WATSED results and interpretation, Properly Functioning Condition (PFC) analysis and trend and effect on TMDL pollutants.

The discussion for the no action alternative sets the stage for the cumulative effects discussion for the action alternative. In the earlier discussion for the no action alternative, all foreseeable and current activities (listed in Chapter 2) were addressed independently and cumulatively using the WATSED model. The following narrative discusses the cumulative effects of the proposed action alternative upon the watershed resources. The WATSED model was used to provide a base of comparison between the no action and action alternatives. The direct and indirect effects discussed earlier regarding the water yield, sediment yield, hydrologic function, riparian function and water temperatures are synthesized to determine possible changes to the functioning condition class should the action alternative be

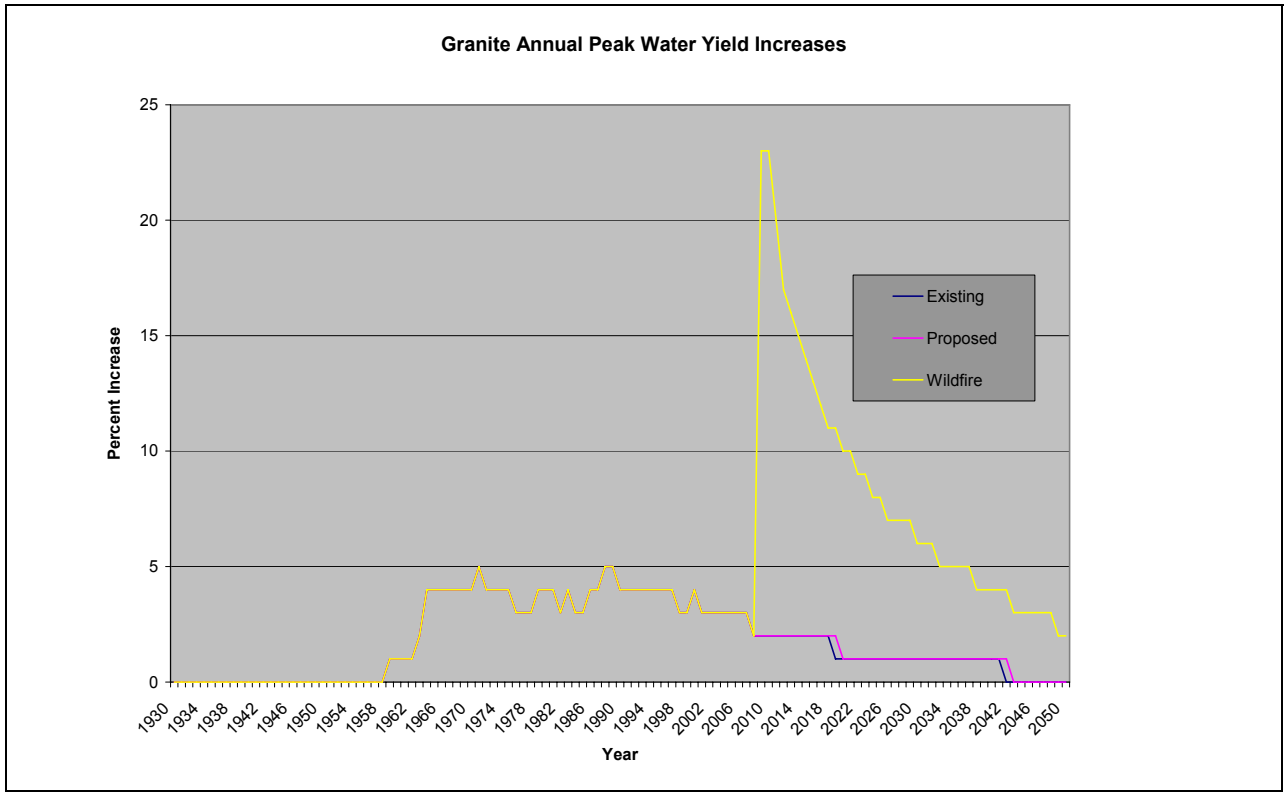
[34] See discussion under Riparian Function and the action alternative for a thorough discussion of the treatment in the RHCAs and potential effects to ECAs.

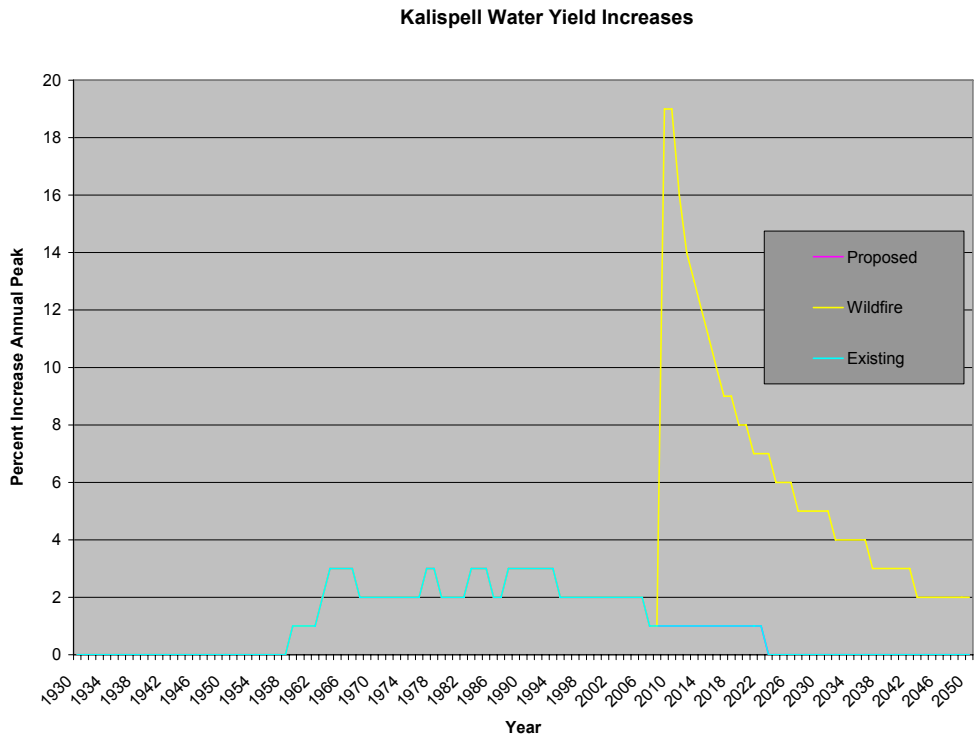
implemented. Both the WATSED results/interpretation and the effects on the condition class were considered for the effects analysis of the action alternative upon the trend for TMDL pollutant reduction.

WATSED Model

The WATSED Model was used to cumulatively assess the effects of the proposed action upon water yield, sediment delivery and equivalent clearcut acres.

Water Yield: Using the WATSED model, the proposed activities associated with the action alternative were added to the WATSED model run used to evaluate the no action alternative. Recall, that earlier in this analysis, the WATSED model output was presented that incorporated all of the past, present and reasonably foreseeable actions. According to the WATSED model results, the action alternative, in conjunction with past, present, and reasonably foreseeable actions could increase water yields above existing levels by 6 percent in Reeder Creek, while there would be no measurable increases in Granite and Kalispell Creeks (Figure 1-22). The 6 percent increase in water yield for Reeder Creek would not destabilize the channel because it could easily be assimilated within Bismark Meadows and the wetlands surrounding the dominant E channels through which Reeder Creek flows thereby moderating high flows.





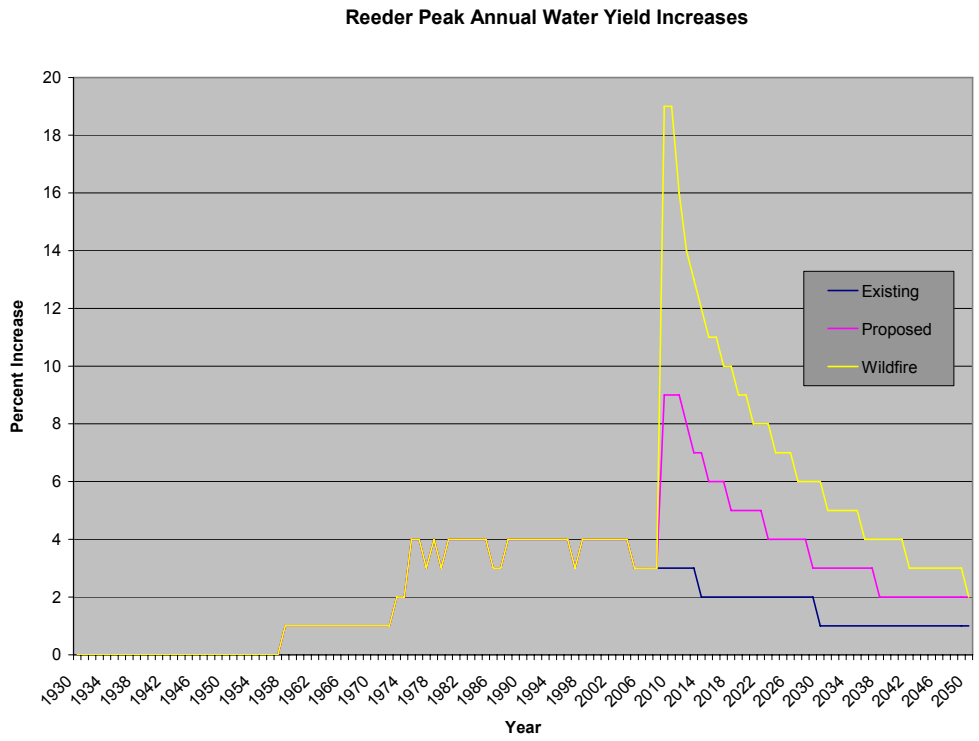


Figure 3-39. Water yield modeling results for cumulative effects.

Sediment Yield: Using the WATSED model as the primary tool to sum cumulative effects of past, present and reasonably foreseeable activities, the WATSED model results suggest that the action alternative could increase sediment yields above existing levels by 14 percent in Reeder Creek, none in Granite Creek and 1 percent in Kalispell Creek. The 14 percent increase in sediment yield for Reeder Creek would not destabilize the channel and could easily be assimilated within Bismark Meadows and the wetlands surrounding the dominant E channels through which Reeder Creek flows. During spring freshets when the flows are highest, any sediment transported down the channels would be carried by the high flows over the floodplains. The sediment would drop out of the water columns as the water was slowed by natural barriers (i.e. shrubs or beaver dams). Because of the function of the E channel to annually access its floodplains and because of the number of beaver dams in Reeder Creek, it is unlikely any sediment would reach Priest Lake. Based upon professional judgment, monitoring, and research, in the smaller streams adjacent to the proposed units, the proposed BMPs (e.g. riparian buffers and site specific BMPS for road work) would markedly reduce the potential for any delivery to any of the stream courses. Still, if any sediment did reach a stream course, it would settle out prior to reaching any larger water body (Foltz 2007). No increases in sediment delivery to Granite Creek are anticipated. The projected one percent increase in Kalispell Creek would not be discernable in the channel. As described for the sediment effects to Reeder Creek, the prescribed BMPs would all but negate any possible delivery of sediment to Granite Creek and Kalispell Creek.

The proposed restoration projects in all three drainages would reduce the current sediment delivery to the streams and would reduce the risk of road failures that could deliver large volumes of sediment to the creeks. The WATSED model is not able to account for road decommissioning, culvert upgrades or road surfacing. Therefore the benefit of the road improvements are not included in the values generated via the WATSED model output. The benefits from the road removals are addressed in the direct and indirect analysis for both fisheries and watershed. In terms of cumulative effects, the removal of over 25 miles of road (and associated drainage features), plus the upgrading of select culverts and target road surfacing will provide a net benefit to the aquatic resources and an overall long-term improvement to water quality. A summary of the sediment increases coupled with the improvements is presented below by drainage.

Table 3-55. Effects of the Action Alternative on various water quality measures

Drainage	Kalispell	Reeder	Granite	Boulder
Projected increase in sediment yield with action alternative	+10 tons	+46 tons	0	0
Planned miles of road removal	-12 miles	0	-10	-3.4
Planned miles of road improvement (maintenance and reconstruction)	8.2 mile	12.7 miles	1.1 miles	0
Planned miles of new road (Temp and Perm)	+1.8 miles	+2.5 miles	+.2 miles	0
Number of Crossings Removed on decommissioned roads	-57	0	-44	-22
Estimated sediment increase with culvert removals (3.5 lbs/crossing)	+200 lbs	0	+154 lbs	+77 lbs
Number or Crossings Improved/replaced	0	7	5	0

In conclusion, each drainage would have some increase in sediment yield associated with the proposed action alternative. In Kalispell, the proposed timber and burning operations could increase sediment an estimated 10 tons, but that amount is more than offset by the 200 to 400 tons reduction that would occur with the removal of Road 308. In Granite Creek, there are no predicted increases in sediment associated with the timber or burning activities, but the proposed road improvements will include the removal of 44 crossings that will reduce the risk of future sediment delivery to the streams. The WATSED model suggests that sediment yield for Reeder Creek would be around 46 tons over existing conditions. This amount of increase is likely much higher than what would happen because of the prescribed InFish buffers and site specific BMPs. The improvement of seven crossings within the Reeder watershed will reduce the probability of future road failures and the 12.7 miles of planned road improvements will eliminate sediment delivery from existing sources. As described earlier, Reeder Creek's large meadow complex with the fully functioning E channels would be able to process the relatively short lived increase in sediment. The Boulder Creek drainage would not have any sediment increases from timber or burning, but would have short lived increases in sediment delivery from the removal of Road 1014.

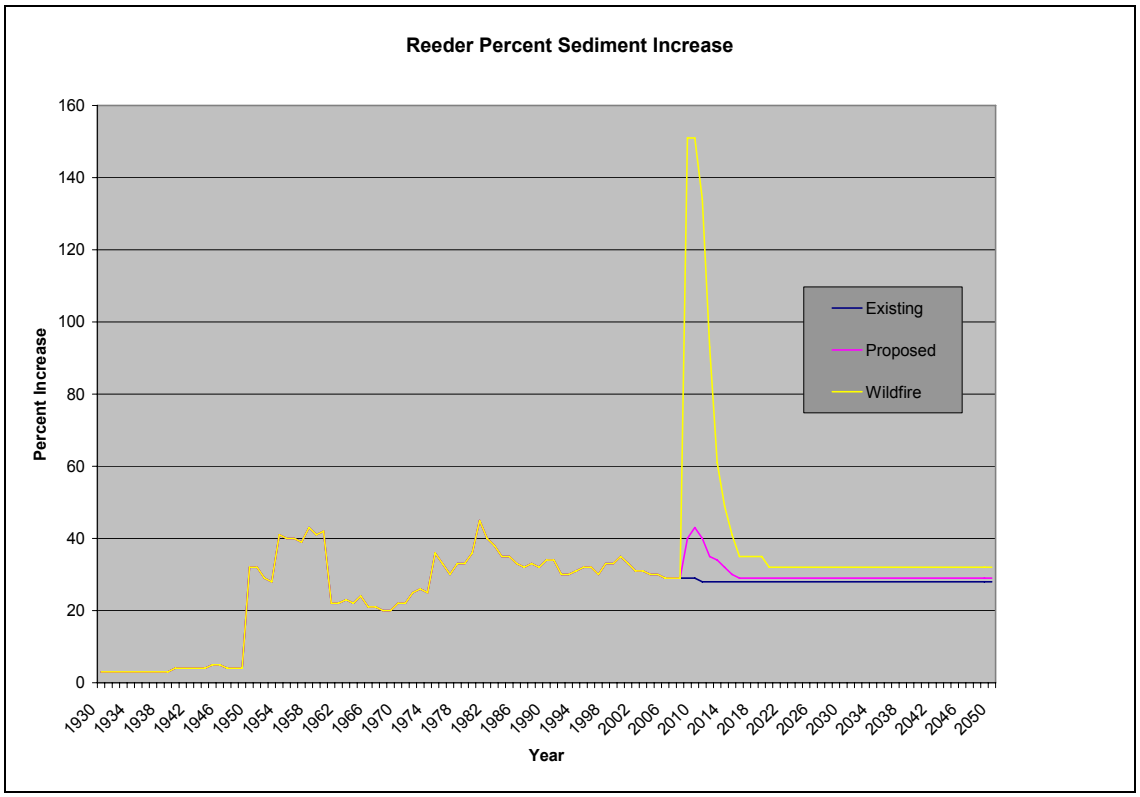
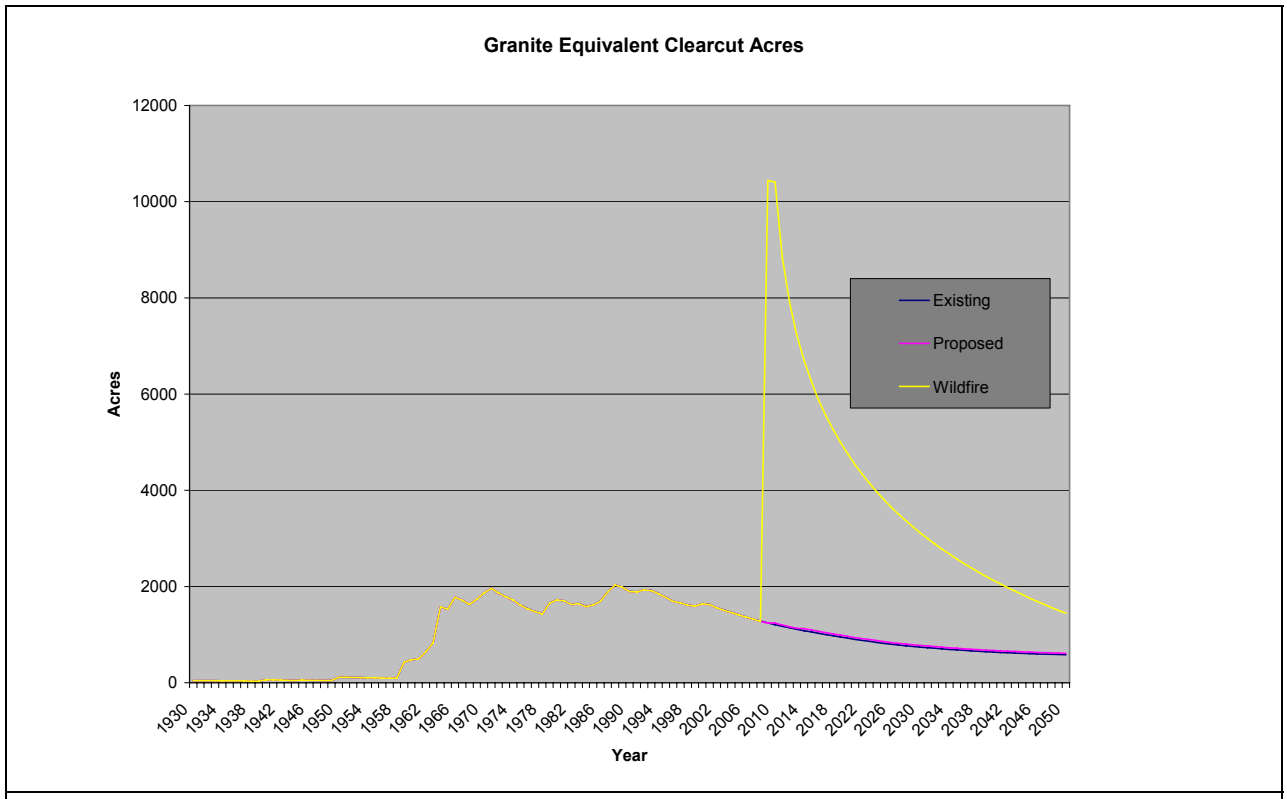
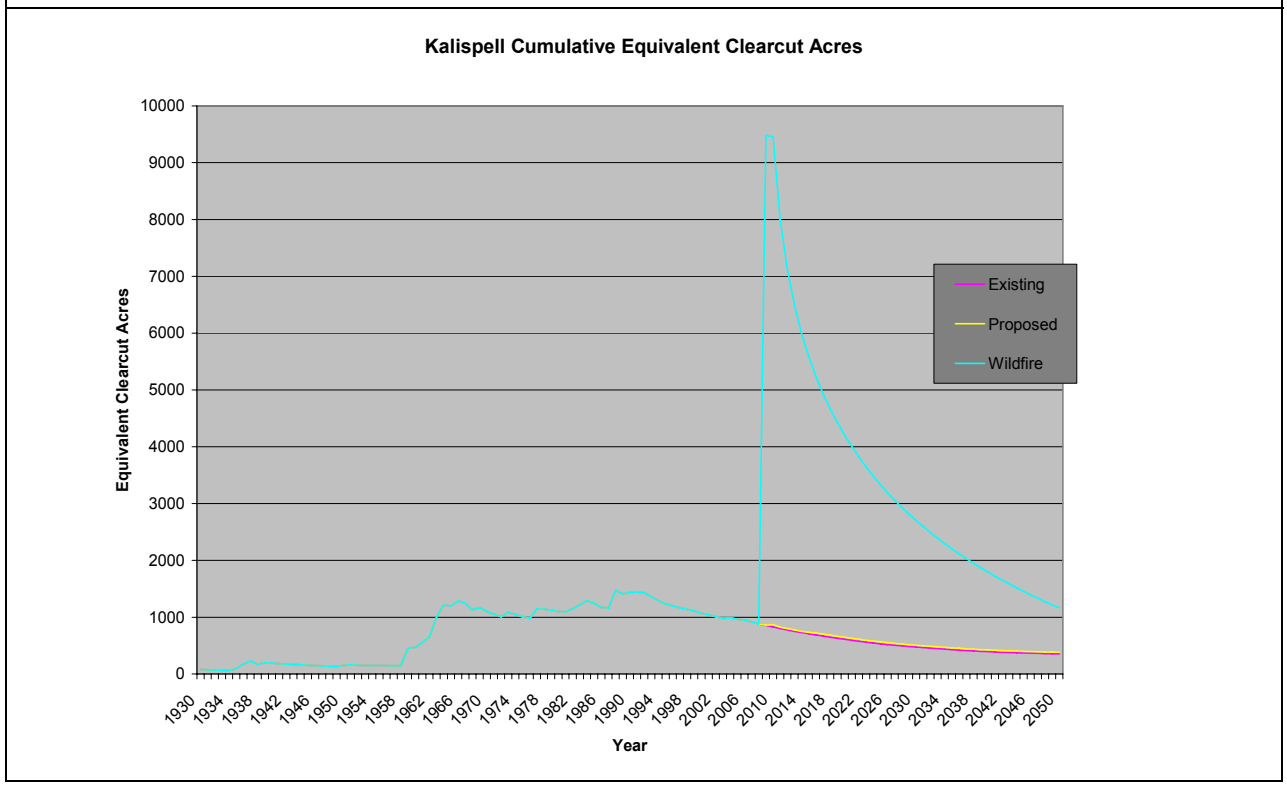


Figure 3-40. Sediment modeling results for cumulative effects

Equivalent Clearcut Acres: The WATSED model was used as a primary tool to sum the cumulative ECA values from the past, present and reasonably foreseeable activities along with the proposed activities under the Lakeview Reeder project. According to the WATSED model results, the action alternative, in conjunction with past, present, and foreseeable actions could increase ECA values from a current level of 5 percent to 13 percent in Reeder Creek, no increase in ECA values would be realized in either Granite or Kalispell Creeks. (Figure 1-24). The 8 percent increase in ECA values for Reeder Creek would not destabilize the channel. As described in the section under the water yield discussion, the channels and meadows would be able to adapt to the projected increases in water yield.


Granite Equivalent Clearcut Acres
Acres
Year
Existing
Proposed
Wildfire


Kalispell Cumulative Equivalent Clearcut Acres
Equivalent Clearcut Acres
Year
Existing
Proposed
Wildfire

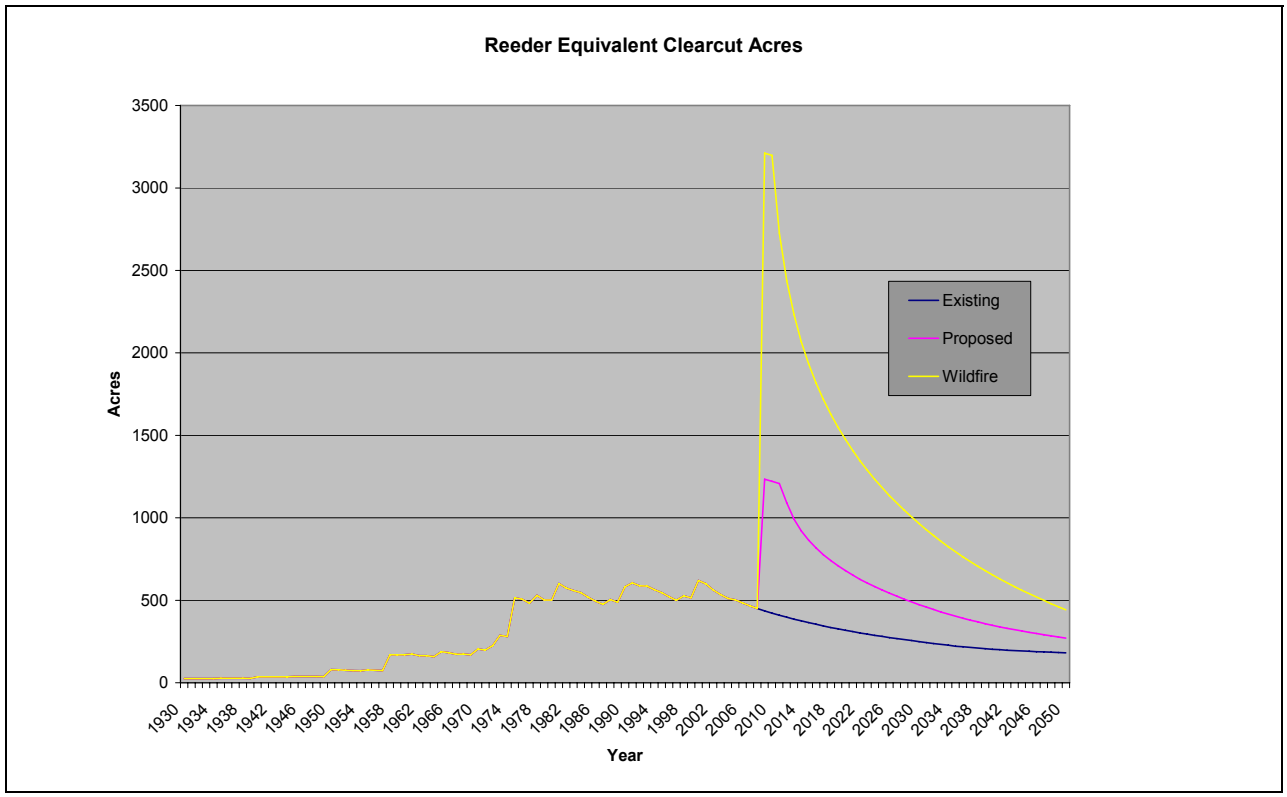


Figure 3-41. Equivalent clearcut acres (ECA).

Stream Condition Class

The implementation of the action alternative would not alter the current stream condition class. As described in the existing condition section of this analysis, Granite, Kalispell and Reeder were considered to be functioning at risk (FAR). The ranking of FAR for all three drainages was based on past disturbances within each of the drainages. For example, in Granite Creek, the primary disturbances have been road construction and riparian timber harvesting. In Kalispell, most of the legacy problems with the channel are attributed to the historically high levels of road and railroad construction, wildfires and riparian logging. The Reeder Creek watershed was compromised primarily by the historic ditching and agricultural activities within Bismark Meadows. With the implementation of the action alternative, Kalispell, Granite and Reeder drainages would remain FAR with a strong trend towards improving because of the proposed road removals, road improvements and inchannel structure enhancements. The large scale meadow restoration recently completed by the NRCS in Reeder Creek gave the drainage a tremendous boost towards recovering from a FAR to a Properly functioning condition class drainage.

TMDL Listing

With the implementation of the action alternative, there would be a measurable improvement in Kalispell Creek's TMDL sediment listing. With the removal of Road 308 from the riparian zone, it is estimated that between 200 and 400 tons of sediment could be prevented from entering Kalispell Creek over the next 10 years. The DEQ analysis for the TMDL suggested that for Kalispell Creek the road sediment for Road 308 equated to 9.0 tons/mile/year or 0.7 tons/crossing/year. . The official status of Reeder Creek has not been documented by the EPA with regards to how the Bismark Restoration effort reduced sediment delivery to the stream. Still, the field review by the Forest Service hydrologist observed absolute improvements (flooding meadows, complete elimination of old ditches, stable stream courses and well

vegetated with native plants) and thus the sediment pollutant issue will likely be dismissed in the next update of TMDLs by the State of Idaho and the EPA. There is no sediment TMDL for Granite Creek. The Temperature TMDL would not change for Kalispell, Reeder or Granite Creeks because no riparian shade would be altered under the action alternative.

Consistency with Forest Plan and Other Laws and Regulations

The Lakeview Reeder project proposed action includes considerations for potential cumulative effects, compliance with the Forest Plan, INFISH, the Clean Water Act, the ESA, and other regulatory requirements. The Lakeview Reeder project has been designed to 1) minimize the need for mitigation by avoiding adverse effects to water resources, and 2) enhance water resources through restoration efforts. By restoring fire-tolerant tree species' dominance, the project seeks to reduce the risk of a stand-replacing fire that could have significant effects on water yield, erosion, and water quality. Accomplishing this through a combination of selective timber harvesting and prescribed burning will minimize the reduction of vegetative cover. The implementation of the watershed restoration work (proposed as part of the action alternative) would improve water quality in all of the affected drainages.

Forest Plan

The Idaho Panhandle National Forests Plan identifies many of the fundamental requirements to mitigate the effects of forest management activities on water resources (USFS 1987). Complying with State water quality standards through the use of BMPs and monitoring to determine the effectiveness of BMPs are central mitigation requirements in the Forest Plan. A key component of the Forest Plan is to conduct fish, watershed and timber management activities to maximize the contribution of riparian vegetation to aquatic habitats. The Lakeview Reeder project has been designed to avoid adverse effects to water resources, thereby minimizing the need for mitigation. With the proposed action, specific watershed enhancement projects are planned to improve long-term water quality in each of the affected drainages. The proposed action alternative is consistent with the Forest Plan because adequate riparian buffers are provided and there are no anticipated long-term adverse direct, indirect, or cumulative effects on aquatic habitat. Because of the existing TMDL status of the drainages, specific mitigations were developed to improve aquatic conditions.

IPNF Forest Plan Standards:

The following are those IPNF Forest Plan Standards that are germane to the water resources portion of the Lakeview Reeder Project.

- State Water Quality Standards protective of water quality and beneficial uses would be followed with implementation of any alternative.
- State Standards for sediment and chemical constituents would continue to be met
- Idaho Forest Practices Rules (IDAPA 20.02.01) would be incorporated into any activities in the project area (Watershed Appendix, FSH 2509.22).
- In-stream flows would be maintained with any alternative (See Water Yield Discussion under the analysis of the action alternative).
- All public and private water systems that would be protected by any project activities through implementation of project design features (Chapter 2).
- Physical integrity of streams and existing biota would be maintained or improved with any alternative and riparian management objectives would be maintained or enhanced.

- Models have been used in conjunction with field data, monitoring results, research, and professional judgment to refine estimated effects of proposed activities and to make recommendations for management alternatives, design criteria, and mitigation measures.
- INFS Standards and Guidelines and RHCA buffers would be implemented with any alternative and would limit ground disturbance on floodplains and in riparian areas. Unmapped channels would be buffered 50 feet from project activities during sale layout (see Project File).
- INFS requirements for flood passage would be implemented with the action alternative where culverts are replaced.
- Project activities are consistent with management area direction to implement Best Management Practices (see Best Management Practices Appendix).

Inland Native Fish Strategy

The INFISH (see Chapter 2) amendments to the Forest Plan provide more stringent requirements to protect riparian areas (USFS 1995) than did the original IPNF Forests Plan (1987). To comply with INFISH, the Lakeview Reeder project designated RHCAs adjacent to where timber harvesting is planned. For Kalispell Creek, Reeder Creek, Indian Creek and Granite Creek (and all unnamed fish bearing streams), the RHCAs consist of the stream and the area on either side of the stream extending to: (1) the top of the inner gorge, (2) the outer edges of the 100-year floodplain, (3) the outer edges of riparian vegetation, (4) a distance equal to the height of two site-potential trees, or (5) 300 feet slope distance, whichever is greatest. For permanently flowing, non fish bearing streams; for wetlands exceeding one acre (e.g. Bismark Meadows), lakes (e.g. Priest Lake) or ponds (e.g. Reeder Lakes); the RHCAs would consist of the stream/wetland/lake/pond, and the area on either side of the stream/wetland/lake/pond extending from the edges of the active stream/wetland for 150 feet or the equivalent of a site-potential tree, whichever is greater. For seasonally flowing, or intermittent streams, the minimum RHCAs must include the area from the edge of the stream channel to a distance equal to half the height of one site-potential tree, or 50 feet slope distance, whichever is greater. A hydrologist will assist the project forester and marking crew with on-the-ground identification of channels that need protection. In the four units where treatment is planned within the RHCA boundaries, a thorough assessment of the potential treatments on riparian management objectives was completed (See Project File and the previous section addressing Riparian Function. The proposed action alternative reduces the potential for production and delivery of sediment to stream channels through proposed restoration activities and is consistent with INFISH standards.

Clean Water Act & State of Idaho Implementation

The no action and proposed action alternative would maintain the chemical, physical, and biological integrity of the streams in the project area, in adherence with 33 U.S.C. §1251. The proposed action would not impact the TMDL listing of the streams for unknown pollutants (sediment) or temperature. The proposed action would adhere to the Antidegradation Policy to provide water quality protection of existing uses (IDAPA 58.01.02.051).

Kalispell Creek and Reeder Creek both have approved Total Maximum Daily Loads (TMDL) for sediment. The action alternative is not expected to result in a net increase of sediment above existing levels. In fact, the proposed removal of almost three miles of Road 308 from the riparian zone of Kalispell Creek will produce a sizable net reduction in sediment delivery to the mainstem of Kalispell Creek. The estimated volume of sediment reduction is in the range of 200 to 400 tons (over 10 years) with the removal of the three miles of Road 308. According to the TMDL implementation plan (2001), removing just the 0.9 miles of the most encroaching section of Road 308 would reduce sediment by 165/tons/year (TMDL project file).

Road reconstruction and decommissioning proposed as part of management alternatives are expected to improve watershed conditions. Specifically, all or portions of following roads would be decommissioned: 502, 308, 308A, 337, 1110, 657, 1362C, 1362D, 1112A, 1112AUA, 1112B, 1112UA, 1376, 302D, 638B, 638C, 1356UC and 1014. The total amount of decommissioning would be 25.5 miles of road.

Under the action alternative, timber-harvesting revenues would provide for road drainage improvements to reduce sediment delivery from Forest Roads. Two culverts on 2516 (Indian Creek and Reeder Creek) and one crossing on 1347 (Fedar) would be improved to reduce the risk of continued road erosion at these locations., On Road 1356UD, a culvert (on a tributary to Reeder Cr.) would be installed to avoid additional sedimentation from the hauling.

All told, the action alternative would recondition 4.7 miles of road, maintain 18 miles of road, and decommission 25.5 miles of road. Reconditioning would include new gravel surface material, culvert clearing, and other maintenance activities that reduce risks of erosion. Maintenance would include basic grading and culvert and ditch clean out. Decommissioning would include removing drainage structures, restoring natural drainage channels and stabilizing exposed slopes.

Sediment: Indirect, short-term sediment generated by project activities would not reduce water quality or impair beneficial uses because the impacts would be short lived and would result in a long term benefit.(Idaho Code § 39-3601; 40 CFR 131.12).

Temperature: Thermal modifications in the streams and tributaries would not be exacerbated. RHCA buffers would allow riparian corridor canopies to increase and provide thermal buffering.

Executive Order No. 11988 and 11990, Floodplain and Wetland Protection

Project activities would not adversely affect floodplains or wetlands. The only activity associated with this project that would occur on a floodplain would be the removal of the Kalispell 308 Road. The removal of the 308 Road from the floodplain would have a positive effect on the form and function of the floodplain. Primary wetlands are mapped for the project area (see Botany). Any unmapped, smaller wetlands would have 100-foot RHCA buffers delineated in unit layout.

Monitoring

Should the action alternative be implemented, the following monitoring would be conducted to verify that the management activities are implemented as designed and effective in meeting the project and Forest Plan objectives, and to validate the assumptions and models used in planning. Following Appendix JJ of the Forest Plan, monitoring plans address three primary questions to demonstrate water quality protection:

- Are BMPs implemented as designed?
- Are the BMPs effective in controlling non-point sources of pollution?
- Are beneficial uses of water protected?

Baseline monitoring, implementation monitoring, and effectiveness monitoring are used to answer these questions. Baseline monitoring sites throughout the Forest have been established to provide representative samples of existing water quality conditions and long-term trends of stream systems. Implementation monitoring shows whether prescribed BMPs were implemented as designed and whether they are in accordance with Forest Plan standards and guidelines and project specifications. In practice, the timber sale administrator and engineering contracting officer's representative, with technical assistance from the district hydrologist, assure that timber harvesting and roadwork specifications are followed. Implementation monitoring would be documented in BMP inspection reports completed by the district hydrologist, reviewed by the Forest hydrologist, and submitted to the Idaho Bureau of Water Quality.

BMP effectiveness monitoring would follow at least one runoff season after BMP implementation. Monitoring would be correlated with watershed exams on the sale area through the fifth year after project implementation, based on available funding. The Forest Plan also includes monitoring of fish habitat and population trends to evaluate the impacts of forest management activities. Stream surveys typically include evaluations of pool conditions, habitat complexity, substrate size, and spawning conditions.

3.6 Fisheries

Introduction

Three native species of fish inhabit the streams of the Priest Lake Basin: bull trout (*Salvelinus confluentus*), westslope cutthroat trout (*Oncorhynchus clarki lewisi*), and shorthead sculpin (*Cottus confusus*). The Lakeview Reeder Project area contains habitat that is occupied by all species. This analysis focuses on impacts to bull trout and westslope cutthroat trout populations because they are either federally protected or have special status with USDA Forest Service or other agencies.

Regulatory Framework

The regulatory framework governing management of fisheries resources for the analysis is based on:

- *Forest Plan – Idaho Panhandle National Forest (IPNF)*
- *National Forest Management Act (NFMA)*
- *Endangered Species Act (ESA)*
- *Rules Pertaining to the Idaho Forest Practices Act (Title 38, Chapter 13, Idaho Code, 2000)*
- *Executive Order 12962 (Recreational Fishing)*
- *U.S. Fish and Wildlife Final Rule – Designation of Critical Habitat for the Bull Trout (CFR 50 Part 17)*
- *State of Idaho Governor's Bull Trout Plan*

The National Forest Management Act of 1976 (NFMA) requires that forests provide for diversity of plant and animal communities based on the suitability and capability of the specific land area. Direction is also included in the Idaho Panhandle National Forests Forest Plan (USDA 1987). The Inland Native Fish Strategy (INFS; USDA 1995) amended some Forest Plan direction regarding stream and fish habitat protections measures (see Fisheries Report).

Section 7 of the 1973 Endangered Species Act (ESA) includes direction that Federal agencies, in consultation with the U.S. Fish and Wildlife Service, will not authorize, fund, or conduct actions that are likely to jeopardize the continued existence of any threatened or endangered species or result in the destruction or adverse modification of their critical habitat. Within the project area, the Service lists one fish species as endangered or threatened that occurs and/or habitat exists within lands of the Idaho Panhandle National Forests (Biannual Forest Wide Species List: FWS 1-9-08-SP-0067; April 9, 2008). This species is the Columbia River Distinct Population Segment of bull trout (*Salvelinus confluentus*) which is listed as "threatened" (Federal Register, Volume 63, No. 111, June 10, 1998). Bull trout have been documented recently within only one of the watersheds in the Lakeview Reeder Project Area. Private lands along the Granite Creek, Kalispell Creek, and shoreline areas of Priest Lake are designated as critical habitat by the U.S. Fish & Wildlife Service (Federal Register, October 6, 2004, USFWS 2004 http//Pacific.fws.gov).

The Forest Service has agreements with the State of Idaho to implement Best Management Practices (BMPs) or Soil and Water Conservation Practices for all management activities. Proposed activities will be in compliance with the guidelines in the Soil and Water Conservation Handbook (USDA Forest Service 1988; FSM 2509.22), which outlines BMPs (see Appendix A). These practices and guidelines are designed to meet the intent of the water quality protection elements of the Idaho Forest Practices Act.

Executive Order 12962 (June 7, 1995) states objectives "to improve the quantity, function, sustainable productivity, and distribution of U.S. aquatic resources for increased recreational fishing opportunities by: (h) evaluating the effects of Federally funded, permitted, or authorized actions on aquatic systems and recreational fisheries and document those effects relative to the purpose of this order."

The mission of the Governor's Bull Trout Plan is to "…maintain and or restore complex interacting groups of bull trout populations throughout their native range in Idaho" (State of Idaho 1996). The Governor's Bull trout plan incorporates the entire Priest Lake drainage and its tributaries, which in this project would include Boulder, Granite, and Kalispell Creeks, and Priest Lake.

Analysis Area

The analysis area for fisheries focuses on fish-bearing waters across three separate watersheds, all of which are tributary to Priest Lake: Granite, Reeder, Kalispell and Boulder Creeks and their named and unmade tributaries. In addition, some areas of the Priest Lake shoreline were reviewed with this proposed project.

Table 3-56. List of watersheds within the analysis area.

Watershed	Streams	Lakes/Wetlands
Granite Creek	Fedar Creek, Lower Granite Creek	
Reeder Creek	Reeder Creek, Indian Creek	Bismark Meadows, Reeder Lakes
Kalispell Creek	Kalispell Creek, Nuisance Creek, Fox Creek, unnamed stream in T36N, R45E, Section 13 W.M.	Potholes Research Natural Area
Boulder Creek	Several Smaller Unnamed Tributaries	Boulder Meadows (Headwaters)

Granite and Kalispell Creeks are large drainages and upper reaches of these creeks contain several miles of fish habitat upstream of the project boundary. Detailed discussions of those areas are not provided for this analysis because this project has no bearing on the habitat conditions in those reaches. The analysis area for fisheries will include the same analysis area that derived sediment yield, water yield, and peak flow changes as modeled and defined in the Watershed Section (see Models and Classifications – pp. 19-21). In addition, these modeled results were utilized to disclose the anticipated impacts of this project on fisheries resources.

Methods of Effects Analysis

In order to sustain healthy bull trout and westslope cutthroat trout populations, watersheds and the habitats therein must have: clean river rocks[35], cold water temperatures, stable and complex habitats with adequate cover, large areas free from introduced fish species, and habitat connectivity for genetic conservation across generations and to allow for seasonal movements within generations. INS (1995) was adopted by the USDA-Forest Service, which established Riparian Management Objectives (RMOs) for continuing the persistence and promoting recovery of inland native fish. They are: (1) pool frequency, (2) water temperature, (3) large woody debris, (4) bank stability, (5) lower bank angle, and (6) width/depth ratios. Since the listing of bull trout in 1998, the species has received considerable attention aimed at

[35] This term refers to clean, inorganic streambed particles such as gravels, cobbles, and boulders that are free from sedimentation either from silt or sand deposition. Clean gravels provide suitable spawning material that will ensure high survival of larval trout. Clean substrates also produce higher quantities and diversity of macroinvertebrates upon which both native trout feed.

identifying the most critical habitat factors, strategies for conservation, and management recommendations. Rieman and McIntyre (1993) suggest five habitat characteristics that are particularly important for bull trout: (1) channel stability, (2) substrate composition, (3) cover, (4) stream temperature, and (5) migratory corridors. The Governor's Bull Trout Plan (1996) characterized the threats to bull trout as either historic or current habitat modification related to land uses: timber harvest, forest roads, grazing, mining, and dams/diversions. Habitat needs of bull trout are relatively similar to the needs of westslope cutthroat trout. The condensed the criteria list used to evaluate effects to fisheries for the Lakeview Reeder EA are:

- Sedimentation
- Water Temperature
- Habitat Quality (Complexity & Stability)
- Large Woody Debris
- Habitat Fragmentation

Each of the alternatives will be analyzed for its potential effects to these criteria. Data used to support this analysis have been collected (Table 3-57) and include:

- Fish surveys to detect fish presence, map species distributions, and evaluate invasion threat of non-native fish;
- Stream channel classification (Rosgen) to assess channel stability and substrate quality;
- Fish habitat inventories conducted to assess existing conditions;
- Temperature data from multiple monitoring sites and years to describe existing temperature regime;
- Culvert inventories to evaluate potential barriers to fish passage and the related sizes of habitat patches fragmented by inventoried barriers.

Table 3-57. Types and dates of fisheries resource surveys in the project area.

Stream	Fish Surveys	Fish Habitat Inventories	Stream Channel	Fish Passage	Temperature
Lower Granite Creek	1983, 2002, 2005	2002, 2007	2002, 2005	2003-2004	2001-2007
Fedar Creek	2004	2004	2004	2004	2006-2007
Reeder Creek	2002, 2004	Qualitative	1999	2004	
Bismark Meadows	2004	Qualitative	1999	N/A	2001-2007
Reeder Lakes	2005	2005	N/A	N/A	2001-2007
Indian Creek	2004	2004	2004	2004	2004
Boulder Creek	1992-2008	-	-	2004-2006	-
Kalispell Creek	1983, 2002, 2004	2002, 2004	2002, 2004	2004-2006	2001-2007
Nuisance Creek	None	2004	2004	2004-2006	-
Fox Cr - Potholes RNA	None	-	-	2004-2006	-
Diamond Flats (unnamed stream)	2002	2004	2004	2004-2007	2002-2004

Existing Condition

Fish Status and Distribution

In the Priest Lake Basin, fish species composition varies by individual drainage; however, three native fish species currently inhabit the streams within the basin, they are: bull trout (*Salvelinus confluentus*), westslope cutthroat trout (*Onchorhyncus clarki lewisi*), and shorthead sculpin (*Cottus confusus*). Though infrequent in data collection, native long-nosed dace (*Rhinichthys cataractae*), speckled dace (*Rhinichthys osculus*) and northern pike minnow (*Ptyocheilus oregonensis*) occur in the lowest reaches of streams in the analysis area. The invasive, non-native eastern brook trout (*Salvelinus fontinalis*) exists in nearly every stream in the analysis area.

The following sections describe the life histories, ecology, status, and project area distributions for bull trout, westslope cutthroat trout, and introduced species.

Bull Trout

Bull trout exhibit resident, fluvial and adfluvial life histories (Averett and MacPhee 1971, Bjornn and Liknes 1986, and Goetz 1989); however, the adfluvial life-history is the only documented form in the Priest Lake Basin. Resident populations remain in their natal streams throughout their life and exhibit the same annual life history cycle as fluvial and adfluvial fish (as described below), but adults remain in the tributaries throughout the year. Fluvial and adfluvial bull trout begin migrating to spawning tributaries in the spring and summer. These fish remain in staging areas in rivers and lakes during the summer and wait for the fall spawning period. Spawning occurs in clear streams that possess appropriate habitat characteristics with respect to substrate composition, water quality, and cover elements. Spawning adults that survive migrate back to rivers or lakes soon after spawning. Larval trout incubate, hatch, and absorb yolks for approximately 200 days while in spawning gravels during the fall and winter and fry do not emerge until spring. Juvenile fish remain in natal streams for three to five years before migrating downstream to more productive river or lake habitats. In late-fall, migratory fish that have not previously returned to rivers (fluvial) and lakes (adfluvial) migrate to deeper water where they congregate and over-winter (Bjornn 1957). These life history strategies allow bull trout populations to maintain a degree of resiliency to disturbance regimes that are inherent to geographic areas defined by their native distribution. Unlike many anadromous salmonids, which spawn once and die, bull trout are capable of multi-year spawning (Fraley and Shepard 1989).

Several factors have contributed to the decline of bull trout in waters of the Idaho Panhandle National Forests. Habitat degradation, interaction with exotic species, and fragmentation of habitat by dams and diversions have all been implicated (Rieman and McIntyre 1995). Bull trout are highly sensitive to environmental change (Rieman and McIntyre 1993) and are particularly intolerant of water temperatures above 15º C (Fraley and Shepard 1989). Substrate size and quality, the availability of cover, and stream channel stability are other habitat requirements linked to bull trout abundance (Rieman and McIntyre 1993). Bull trout embryo and fry survival decreases with increasing fine sediment levels in spawning gravels (Fraley and Shepard 1989). Juvenile bull trout are especially dependent upon stable cobble and boulder substrate for daytime cover and over-winter survival (Thurow 1997). Adult bull trout utilize pool habitats and under-cut stream banks, often in conjunction with large woody debris cover (Rieman and McIntyre 1993). Where bull trout are sympatric with non-native eastern brook trout (*Salvelinus fontinalis*), hybridization between the species has resulted in displacement of bull trout (Leary et al. 1993).

In Priest Lake, habitat loss related to dams and destructive land use; historic over-harvesting of fish; and change in species composition have severely reduced bull trout populations. Perhaps the greatest factor

most responsible for the continued decline of these bull trout populations in recent decades is the change in species composition in both the lakes and the streams (Idaho Department of Fish and Game 2007, Rieman et al. 1997, Rieman et al. 1979). The U.S. Fish Commission introduced lake trout (*Salvelinus namaycush*) into Priest and Upper Priest lakes in 1925. Prior the lake trout introduction, eastern brook trout were being stocked into most tributary streams by the early 1900s (U.S. Fish Commission 1890-1900). The establishment of kokanee (*Oncorhynchus nerka*) in both lakes in the past century coupled with the introduction of mysid shrimp (*Mysis relicta*) in the mid-1960s greatly changed the trophic pathways to favor growth of the lake trout and other non-native fish populations. Currently, IDFG considers the population of lake trout in Priest Lake as very dense and the bull trout population in Priest Lake as extremely depressed.

One of the last remaining strongholds of bull trout in the Priest Lake Basin exists in the Upper Priest Lake and River systems (IDFG redd count survey data (1985-86 and 1992-2008)). In over 10-years of bull trout redd count survey effort in Boulder Creek (1992-94, 1996-98, 2000, 2005, 2007-08) no bull trout redds have been accounted for in the watershed and appear absent. Historically, bull trout spawned and reared in portions of the Granite and Kalispell Creek basins. Bull trout are still observed in Granite Creek[36]; particularly in some of the middle reaches; however, numerous surveys[37] throughout the Kalispell drainage have not located bull trout in the drainage in well over 20 years. Historic bull trout use in Kalispell Creek was concentrated in the lower and middle reaches of the watershed (Figure 3-42). In Granite Creek, 1980s data show concentrations of spawning in North Fork of Granite Creek, from Tillicum Creek to Granite Falls, and juvenile bull trout throughout the mainstem and in tributaries[38], with over three-quarters of all bull trout occurring in North Fork of Granite Creek (Figure 3-42). By comparison in the early 1980s, habitat use in Kalispell Creek was an order of magnitude less than that of Granite Creek[39]. Current use is substantially less than historic levels for both watersheds. The lower section of Granite Creek within the Lakeview Reeder Project Area is primarily used as a migratory corridor and for staging bull trout; both spawners move upstream and outmigrants moving toward the lake. Bull trout do not use Reeder Creek for any portion of their life-history[40]. This population is also seasonally isolated from neighboring populations within the Lower Clark Fork Recovery Unit (e.g., East River, Lake Pend Oreille drainages, and the Lower Clark Fork River) by the Outlet Dam, located at the mouth of Priest Lake.

[36] Based upon personal communication between the KNRD and Fairchild (see Project File)
[37] Two fish surveys by David Irving (University of Idaho) from 1982 through 1984 documented the presence of age-2 to age-3 bull trout in the lowest (near mouth) and middle reaches of Kalispell Creek (M.S. Thesis).
[38] Juvenile bull trout were found in the lower most portions of Blacktail, Packer, Tillicum, S.F. Granite, N.F. Granite, and Lower Granite Creeks (Irving 1984).
[39] The total estimate of juvenile bull trout within Kalispell Creek was 167 individuals, whereas the total estimate for Granite Creek was 1,069 individuals.
[40] There is no evidence that indicates bull trout have ever occupied Reeder Creek.

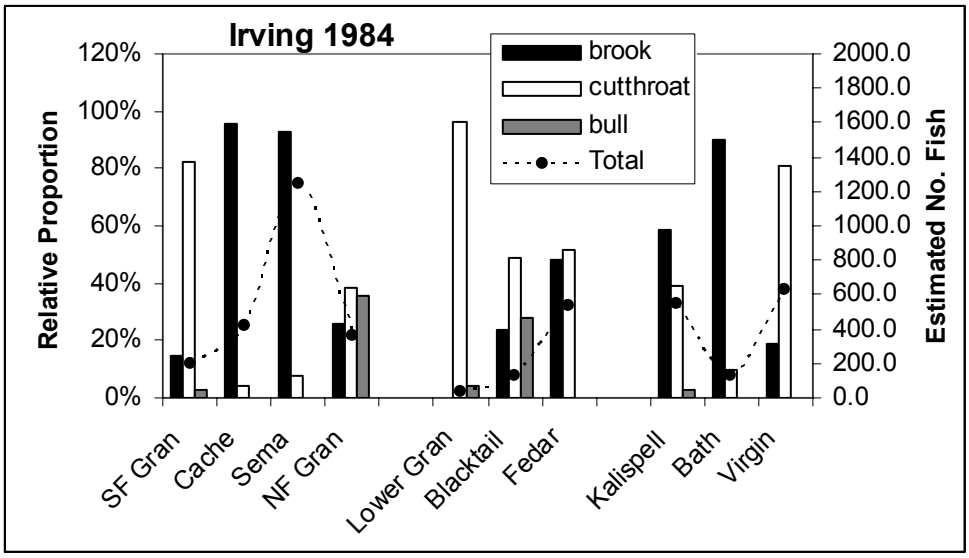


Figure 3-42. Fish composition of primary trout species in streams across the Lakeview Reeder project area approximately 25 years before present (Irving 1987).

Westslope Cutthroat Trout

Westslope cutthroat trout are known to exhibit both resident, fluvial and adfluvial migratory forms on the Idaho Panhandle National Forest. Westslope cutthroat spawn in the spring when temperatures range from 4-10º C, and fry typically emerge from the spawning beds in late July (McIntyre and Rieman 1995). It is notable that they are found in cold, nutrient-poor waters (Rieman and Apperson 1989). Migratory juveniles leave natal streams after two to three years and travel downstream as high water levels begin to recede. Westslope cutthroat generally utilize substrate less, and pools more, than bull trout. Pools are of particular importance as habitat, where westslope cutthroat this form of habitat more than 70 percent of the time (Mesa 1991). Most young westslope cutthroat trout use habitats with moderate temperatures between 7 and 16º C (McIntyre and Rieman 1995). Other key features of westslope cutthroat habitat are large woody debris (LWD) for persistent cover and habitat diversity as well as small headwater streams for spawning and early rearing.

Early reviews of the status of westslope cutthroat trout indicated huge reductions[41] in the subspecies across its anticipated range. Most intact populations of this subspecies of cutthroat trout reside in headwater streams (Benhke 1992). A 2002 population status review of westslope cutthroat trout (WCT) in Idaho determined that populations in northern Idaho have declined over their historic distribution with viable populations existing in only 36 percent of the original Idaho range. The primary cause of the decline was found to be habitat degradation (Rieman and Apperson 1989). However, interactions with non-native species and habitat fragmentation (dams, diversions, etc.) have played a role in the loss of cutthroat and perhaps worked synergistically to depress some populations. A broader examination across the western U.S. by this same group of scientists (Shepard et al. 2003) concluded that WCT currently occupy the majority of their historical range. Within the immediate area of this analysis, the risk factors to local cutthroat populations, in order from greatest to least, are interactions with non-native species, habitat fragmentation, and habitat degradation.

Approximately 2,000 adult migratory westslope cutthroat in Granite Creek were captured in 1947. Although not quantified, the overall abundance of cutthroat trout was substantially lower than that of the early 1900s and by 1957, Idaho Fish & Game had begun to document a decline in the abundance and

[41] Liknes and Graham (1988) concluded that westslope subspecies of cutthroat trout occupied less than 3 percent of its historic range.

related catch rates in the lake. It was concluded that this was a result of the successful establishment of brook trout (Bjornn 1957). Over the past 70 years, however, the cutthroat trout populations have been in decline. By the mid-1980s, several manipulative studies had been performed in Priest Lake tributaries to improve cutthroat numbers, but those efforts have had little success. Though westslope cutthroat maintained strongholds in some streams, in others watersheds sampled brook trout were over 90 percent of the fish community (Figure 3-42; from Irving 1987). Similar to bull trout, a variety of factors have led to the shift in fish assemblages from native to non-native.

Within the project area, Granite, Reeder, and Kalispell, and Boulder Creeks all contain westslope cutthroat trout that use habitat in portions of these watersheds for all life-history stages. Westslope cutthroat trout occupy significant portions and comprise a large proportion of the fish community (Figure 3-43) throughout areas of Granite Creek. Within tributaries to Granite, native cutthroat trout co-occur with eastern brook trout in lower reaches, dominate the fish community in upper reaches, and often occur in isolation above waterfalls. In Kalispell Creek, cutthroat trout are present, but comprise less than 30 percent of the total trout composition in the mainstem. Cutthroat trout are found in the upper portions of tributaries[42] where streambed particles are larger and thermal regime is cooler than in the mainstem of Kalispell Creek. Only one recent fish survey has detected westslope cutthroat trout in Reeder Creek[43]; however, older records indicate that they used Reeder Creek in the past.

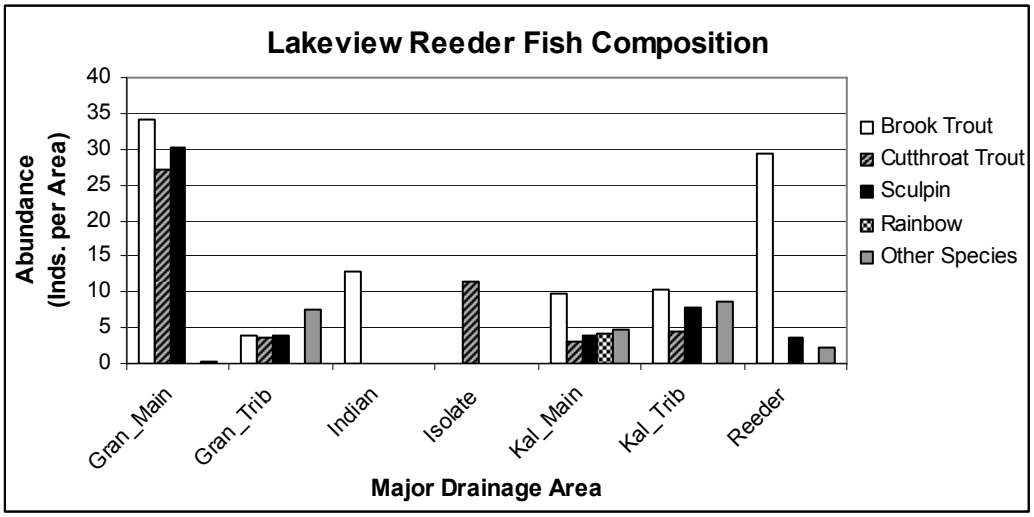


Figure 3-43. Relative abundances of native and non-native fish species in streams across the Lakeview Reeder project area. Westslope cutthroat trout and shorthead sculpin are the primary native species.

Introduced Species

Several species of non-native trout have been introduced into the Priest Lake basin (Idaho Department of Fish & Game 2008) and some pose great risks to native fish through competition for habitat and loss of genetic integrity. Lake trout, intentionally introduced into Priest Lake in 1925, have dramatically altered recruitment and survival of both native trout (see species discussion above) within the lake environment, and pose the greatest risk to the adfluvial forms that reside therein. The complete life-history of lake trout is confined to the lake environment and is given recognition in this section to its existence.

[42] Cutthroat trout have recently been collected from Pable Creek, unnamed Tributary in Section 27, Chute Creek, Deerhorn Creek, and upper Kalispell Creek above Kalispell Falls.

[43] Surveys performed by the USFS in 2002 and the Kalispell Natural Resources Department in 2003 throughout the Reeder Creek watershed, including Indian Creek did not locate cutthroat trout. One cutthroat trout was collected by KNRD in 2003 near Elkins Resort at the mouth of Reeder Creek.

Different varieties, like the Hayspur and Kamloops strains, of rainbow trout (*Oncorhynchus mykiss*) were stocked in Granite and Kalispell Creeks (Idaho Department of Fish & Game 2008). Although rainbow trout pose a risk to the genetic integrity of native cutthroat trout, this species is not widespread and abundance is relative low within the project area and therefore not considered a factor threatening the continued persistence of native bull trout and cutthroat trout. Further, linkages of land use practices, stream habitat conditions, and displacement of native trout by rainbow trout have not been found by scientists.

Perhaps the greatest number of individual fish stocked into Granite Creek, Kalispell Creek, and most of the large tributaries of these drainages were cutthroat trout of various origins[44]; some native to the basin (King's Lake variety) and other strains from entirely different genetic lines (Yellowstone cutthroat trout). Risks to the genetic integrity are unlikely, two road-stream crossings (each 36" CMPS) in Boulder Creek are planned to be removed through road decommissioning, were identified as perennial and questionable to have fish occupying them, consequence of this action may positively affect genetic exchange if habitat became occupied.

Eastern brook trout (*Salvelinus fontinalis*) are present in all three watersheds and are locally abundant in many areas. The presence of eastern brook trout is currently viewed as a major threat to the persistence of native cutthroat trout (Dunham et al. 2003) and poses significant risks to the recovery of bull trout (Rieman et al.1993, Rieman et al. 1997, USFWS 2002). Although records in the early 20th century are poor, brook trout were likely introduced into all three drainages by the1920s. Brook trout have now become a common occupant of these streams and in some areas overwhelm native trout populations. There are a few reaches in mainstem Granite Creek and naturally isolated tributaries in the Granite and Kalispell watersheds where native trout still dominate the fish assemblage (see Figure 3-43). The invasion of brook trout has advanced within the project area even in the past 2 decades (refer to Figure 3-42 and Figure 3-43). Some of the variation in observed dominance and distribution patterns of brook trout across these drainages can be attributed to variations in environmental factors, specifically temperature and sediment regimes. Land management practices can influence these temperature patterns and sediment regimes, which are strongly linked to the mechanisms by which brook trout displace native trout. These mechanisms of displacement are caused by lower survival of native trout than brook trout (Peterson and Fausch 2003a), annual patterns of migration[45] (Peterson and Fausch 2003b), and greater competitive advantages of brook trout over native cutthroat trout in seemingly poor habitat conditions[46] (Dunham et al. 2003). Similarly, brook trout tolerance of poor habitat conditions coupled with higher growth and survival than that of native trout has been implicated in losses of juvenile and resident bull trout (Rodtka and Volpe 2004, Rieman et al. 2006, MacMahon et al. 2007). In addition, brook trout can also potentially interbreed with bull trout, resulting in poor reproductive success and loss of genetic integrity at the population level (Leary et al. 1993, Rieman and McIntyre 1993).

Habitat and Channel Conditions

The following sections provide descriptions, qualitative assessments, and where possible quantitative comparisons for habitats in Granite, Reeder, Kalispell, and Boulder Creeks. These summaries have been compiled from a variety of data sources, including, but not limited to R1/R4 fish habitat data summaries (e.g., Pool Frequencies, Pool Quality, LWD frequencies, Habitat Diversity [Heterogeneity]) as well as

[44] Stocking records from Idaho Department of Fish & Game indicate that nearly 3 million cutthroat trout have been stocked into Priest Lake or its tributaries, including Granite and Kalispell Creeks (IDFG. 2008. http://fishandgame.idaho.gov/apps/stocking/).

[45] A study in Colorado found that the net movement of eastern brook trout was 80% upstream, whereas net movement of cutthroat trout was 65% downstream, resulting in constant influx of brook trout to upstream populations.

[46] Poor habitat conditions are defined as warmer water temperatures, greater fine sediment in the streambed, and greater substrate embeddedness.

streambed composition, streambank stability, stream temperature regimes, and general geomorphology. The metrics summarized herein relate back to the Riparian Management Objectives for INFS (1995) and serve as the baseline upon which the anticipated effects of the alternatives will be based.

Granite Creek

In general, the Forest categorizes this watershed as functioning at risk for both bull and westslope cutthroat trout because overall habitat quality varies from poor to excellent. The majority of bull trout spawning occurs upstream of the project area near the forks of Granite Creek and just below Granite Falls; however, anecdotal data have documented bull trout redds in lower Granite Creek. It is unlikely that bull trout use portions of Granite Creek near the mouth for spawning habitat because of the warmer thermal regime and absence of high quality spawning materials. Bull trout use the lowest portion of Granite Creek (near the mouth; within the immediate vicinity of the sewer-related activities) primarily as a migration corridor for both spawning adults and outmigrating juveniles. Thus, habitat qualities most critical near the mouth include holding areas that contain both deep (>1m) pools and complex physical attributes (i.e., large woody debris, undercut banks, etc.). Westslope cutthroat trout use the Lower Granite Creek as a migration corridor (adfluvial form), for limited spawning, and for rearing. Resident forms of westslope cutthroat trout use tributaries, like Fedar Creek, from the mouth to the headwaters for spawning, rearing, seasonal movements, and over-wintering.

Within the Granite watershed, Lower Granite Creek and Fedar Creek are the only known fish-bearing waters in the project area, although Media and Chanterelle Creeks may provide a minor amount of habitat for fish during spring runoff. The mouth and lower reach of Granite Creek lie on top of a large alluvial fan of glacial outwash where the landform is flat and gently sloping. Those conditions have created a classic meandering channel (Rosgen type stream classification is C4; < 2 percent slope) with point bars, a pool-riffle-run macrohabitat sequence, and bed materials dominated by gravel sediments. These meandering reaches are broken at points by steeper (> 3 percent slope) reaches that are dominated more by mixtures of cobbles and gravels as the valley upstream becomes narrower.

Lower Granite Creek has relatively low pool frequency and less than expected residual pool depths, and in some sections very high width to depth ratios (Table 3-58). Large woody debris occurs in sufficient number by count; however, because of the width of Granite Creek, the methods used during stream surveys do not adequately depict loadings of debris in the channel. Specifically, stable woody debris in lower reaches would need to be at least 50 feet long and of sufficient diameter (>24 in. diameter) to withstand the annual peak discharge[47], while simultaneously interacting with the bedload and positively affecting habitat form. Currently, there are few pieces of large wood debris that meet these criteria. In the three lowest reaches of Granite Creek, only a quarter of the pools in reach 1 (closest to mouth) are formed by large woody debris and reach 2 has no distinct pools aside from the occasional pocket pool. Substrate composition and distribution provides for good habitat forming materials; however, channel shape is

[47] Based on Embry equations regionally derived for north Idaho, the peak annual discharge for Granite Creek is 1830 cfs.

primarily broad and shallow and in the absence significant accumulations of woody debris, few high quality pools or complex habitats are formed. Riffle areas and pool tailouts are characterized by more coarse materials, dominated by coarse gravel (~ 30mm) and small cobbles (~ 150mm) with infrequently occurring boulders. Within the lower three reaches of Granite Creek, fine particles (< 6mm) comprise on average, 13 percent of the bed composition, whereas cobble embeddedness measures high in some sections[48]. The higher than desired embeddedness likely results from a lack of adequate-size woody debris that sorts streambed materials into functional groupings[49]. Overall, sediment is not a major factor limiting water quality, benthic stream productivity, or fish habitat in these sections of Granite Creek. Given this, it is not surprising that the overall physical habitat complexity and diversity (Table 3-58) of lower Granite Creek is moderately low and well below the desired future state. Fish passage is not an issue on the mainstem of Granite Creek; however, several tributaries have impassable road culverts that block access to valuable peripheral habitats adjacent to the mainstem.

Table 3-58. Summary of fish habitat conditions in the Granite Creek watershed.

Stream Section	Pool Freq.	Resid. Pool Depth	Habitat Diversity (H')	Percent Undercut Bank ± SE	Percent Stable Banks ± SE	Width to Depth Ratio	Large Woody Debris
Granite (1) Mouth to Kerr Lake	17.0	0.4	0.43	0.5% ± 0.4%	54% ± 2.0%	20	25% of pools formed by LWD
Granite (2) Kerr Lk to Snow Parking	None present	None present	0.37	0.2% ± 0.2%	82% ± 2.4%	43	No pools formed by LWD
Granite (3) Dusty Cr to Snow Parking	7.9	0.3	0.25	0.6% ± 0.5%	54% ± 3.7%	35	No pools formed by LWD
Fedar (1) Mouth to FS 1347	38.8	0.2	0.26	27% ± 9.6%	94% ± 5.7%	10	>90% of pools formed by LWD
Fedar (2) Beaver Meadow	27.7	0.2	0.20	26% ±12.8%	14% ± 8.3%	19	No pools formed by LWD
Fedar (3) Meadow to Headwaters	29.9	0.1	0.33	29% ± 9%	69% ± 7%	8	>50% of pools formed by LWD

Fedar Creek

Fedar Creek is a second order tributary to Granite Creek. Native cutthroat reside throughout this stream, but have the strongest populations in the steep headwater reaches where brook trout do not occur. Past land use and current legacies of those uses underlie some of the poor fish habitat conditions in this small

[48] Embeddedness transects in 2005 measured 28% and 46% cobble embeddedness (USFS unpublished data).
[49] Complex habitats formed by debris jams maintain hydraulic scour even under baseflow that clusters similar size particles into patches of substrate, rather than a homogeneous mixture all sizes.

watershed. Geomorphically, this stream has a moderately steep, confined channel with a beaver meadow in the middle reach. A poorly designed road crossing traverses the downstream end of the meadow which acts as a fish passage barrier and facilitates flooding caused by beavers. Pool frequencies are less than half of the desire future condition (USDA Forest Service 1995 - 96 pools per mi); however, pool depths are adequate. Undercut banks are fairly common in Fedar Creek (see Table 3-58) and resident fish in small streams can readily use undercut banks for flow refuge and hiding cover in lieu of deep pools. Large organic debris is common and of sufficient size to interact with the stream channel to form habitats; however, large recruitment trees do not occur everywhere in this drainage. There are some sections of stream in the headwaters where timber has been harvested adjacent to the stream within the last 30 years (USDA Forest Service 2004 – Weidich et al.). Within the forested sections of Fedar Creek, large woody debris forms the majority of fish habitat. Streambed materials are primarily gravel with some cobbles, but fine sediment[50] limits some of the production from this stream, particularly the lowest reach near the mouth. Roads built on unstable hillslopes have deposited sediment into the stream, likely skewing the size of streambed particles to smaller sand-size particles. In addition, there have been recent landslides originating from brushed-in roads on unstable hillslopes and there are several road-stream intersections that introduce road-derived fine-sediment annually. Many of these intersections also serve as fish passage barriers.

Idaho Department of Environmental Quality lists Granite Creek as an impaired waterbody with elevated temperature as the pollutant of concern (IDEQ 2005 listing; see Hydrology Report). Based upon the hydrogeology and hydrologic assessments near the mouth of Granite Creek (USDA Forest Service 2007), there is a high degree of groundwater movement downslope into both Granite Creek and Priest Lake. Nevertheless, the temperature regime near the mouth of Granite Creek is approximately 2˚C higher than upstream reaches with peak 7-day maximum temperatures ranging from 15-18˚C each summer (Figure 3-44). While this temperature regime is within a natural range and follows a pattern[51] observed in many other systems, thermal regimes for Granite Creek also do not meet the general RMO for temperature. Water temperatures near the mouth of Fedar Creek and within the beaver meadows are high[52] and are a factor contributing to the dominance of eastern brook trout in these reaches.

[50] Percent fines < 6mm in the reach below the beaver meadow and above the meadow measured 24% and 40%, respectively.
[51] Along the stream continuum, the daily temperature flux varies most in mid-order streams, such as Lower Granite Creek. Headwater streams typically have near-full shade over the water that buffers maximum temperatures. Moving downstream, forest canopies shade the entire stream less and less and some sections become broad and shallow. This pattern tends to cause significantly higher temperatures in lower reaches of streams (4th and 5th order).
[52] The 7 day daily maximum average temperature in 2007 in the lowest reach of Fedar Creek was almost 19˚C.

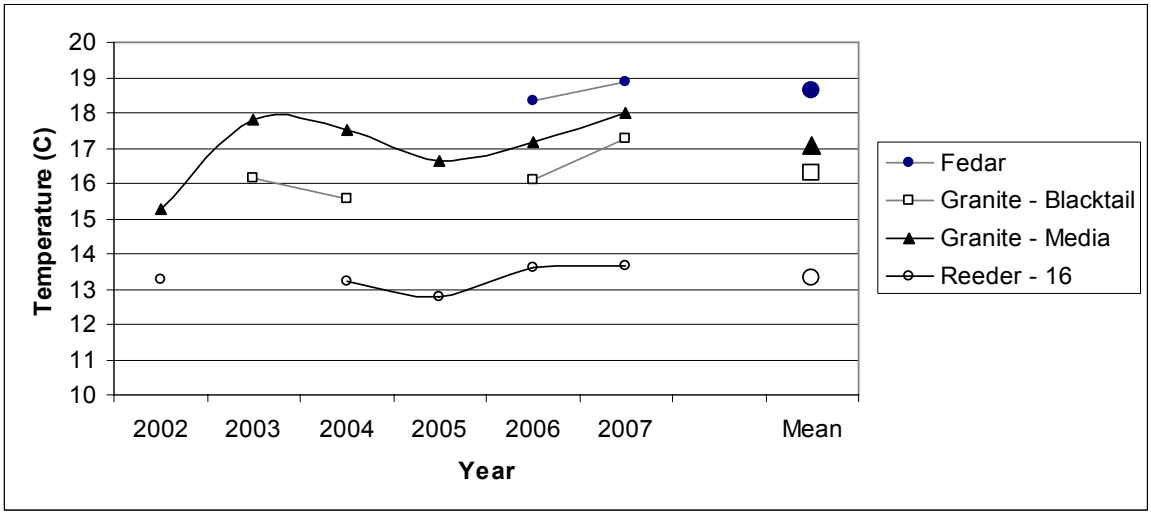


Figure 3-44. Comparison of the mean daily average temperature from July 1 to September 30 for locations in Granite and Reeder Creeks.

Key fish habitat concerns are:

- Apparent lack of adequate size of large woody debris in the mainstem of Granite Creek.
- Extensive stream lengths with little habitat complexity to provide cover from predators and resting areas for migrating fish.
- High degree of habitat fragmentation and fine sediment deposition in Fedar Creek.
- Riparian and mid-slope road failures delivering sediment into portions of Fedar Creek
- Lack of fish passage from mainstem into tributary streams, such as Fedar Cr., Packer Cr., Athol Cr., and unnamed streams.

Reeder Creek

Reeder Creek is a large second-order tributary stream to Priest Lake. Much of the drainage flows through an ancient lacustrine deposit called Bismark Meadows and drains the southern portions of Indian and Nickelplate Mountains with numerous springs and substantial amounts of groundwater flow. Within the lower sections, the stream is primarily comprised of a low slope (one percent) channel flowing through a broad floodplain and several interconnected, wet meadows. The streambed materials are primarily sand and gravel with 51 percent of materials smaller than 6 millimeters. The last half-mile of the stream is a moderately steep channel, referred to as a “B” channel, as the stream drops in elevation in its approach to Priest Lake. The upper sections of the watershed are divided into two distinct drainages: (1) Reeder Creek and (2) Indian Creek. The Reeder Lakes actually occur in different drainages[53], but will be discussed in this section.

The meadow portion of Reeder Creek is the longest section, which travels 2.5 miles across private lands, and contains the majority of fish habitat within the drainage. Reeder Creek used to be channelized across most of the private land in Bismark Meadows to render the land more useable for agriculture; however, in 2004, the USDA Natural Resource Conservation Service acquired a conservation easement over the private lands in Bismark Meadows. With the recent meadow restoration, Reeder Creek has been allowed to meander, flood, and has begun to regain the historic condition again (see Hydrology Report).

[53] Two of the Reeder Lakes drain by groundwater into Reeder Creek, whereas the remaining are interconnected by seasonal flow together, but are not connected by surface flow to Granite Creek.

Downstream of the Highway 57 crossing, on Forest Service lands (Sections 23, 24), the channel is deep and relatively narrow and small channel materials are dominant[54]. There are extensive beaver dams and ponds that volumetrically provide vast expanses of fish habitat with well-vegetated, stable banks. Throughout the beaver-influenced areas and elsewhere, numerous stable and well vegetated undercut banks also provide good habitat conditions for fish. The thermal regime of Reeder Creek is cold and fed by groundwater, with a 7-day maximum of 13°C, which is well below the 15°C maximum temperature RMO for adult fish.

Upstream of the confluence of Indian and Reeder Creeks, both streams are considered forested streams and fish habitat changes accordingly. Reach 2 of Reeder Creek runs through a confined valley[55] and habitat conditions change to more cobble substrate and even a few boulders. The upper portion of this reach splits with one arm flowing from the slope of Reeder Mountain and the other originating from a large beaver pond. The most upstream reach (No. 3) of Reeder Creek has some channel instability and is hydrologically interconnected to downstream reaches by high runoff flows during some years. Due to the lack of surface flow in this section, fish do not reside in this reach of Reeder Creek.

Indian Creek

Indian Creek is a small second-order tributary stream to Reeder Creek with alternating meandering and steep reaches. Several roads and harvested units occur in the watershed. The fish-bearing portion of this stream occurs downstream of the confluence of the two 1st-order streams (3480 ft. elevation). The lower reaches of Indian Creek flow through a relatively confined valley shape and have a moderate slope (< 5 percent), which produces a fish habitat pattern of long riffles and shorter pools and accounts somewhat for the low pool frequencies (Table 3-58) observed in this stream. The availability of different habitats is greatest in the lowest reach of Indian Creek and declines moving upstream and beyond the end of fish presence[56]. Large woody debris occurs in sufficient size and quantity to create habitat complexity and cover; however, the timber along approximately half of a mile of the stream has been completely removed and this section has no shade and no potential wood recruitment. Surprisingly, temperatures in Indian Creek are not elevated substantially by the canopy removal. Like Reeder Creek, stream temperatures in Indian Creek are regulated by groundwater flow and therefore, are very cool and stable. Fish-passage is blocked by two culverts, which likely hinders the ability of native cutthroat trout to re-colonize Indian Creek. The steep reaches of Indian Creek have limited the fish distribution to the lower portion of the watershed. Although low-gradient meadow reaches occur farther upstream in the drainage, they are not large enough to retain resident fish and lack access from downstream population sources.

Chemistry of Reeder Creek

This stream has substantial amounts of groundwater inputs and high flow connectivity to underlying aquifer. Temperature regime in Reeder Creek[57] is substantially cooler than Granite Creek and thermally functions as high quality habitat (Figure 3-44). Because the stream courses through a system of meadows, there is a significant amount of natural organic leaching into the stream, resulting in naturally high

[54] Survey data 1999; show a width to depth ratio of 4 indicative of a normal meadow stream; noted numerous pools over 1 m deep; Wolman Pebble Counts showed 80% gravels and 20% sand.
[55] Considered a Rosgen Type B3 channel with steep valley walls and a flat valley bottom
[56] The availability of different types of habitats was measured using Simpson's Diversity Index on a scale from 0 to 1. Lower Indian Creek had an index value of H'= 0.54, whereas Upper Indian Creek only had an index value of H'=0.25. This indicates that there are fewer types of habitats available and that some habitat types, like pools, are particularly under-represented.
[57] The 7-day average maximum temperature was ~ 13˚C (USFS 2004).

phosphorus and nitrogen concentrations as well as tannins. DEQ monitoring on this stream indicates some sources of anthropogenic nutrient enrichment via fecal coliform and Escherichia coli[58] bacteria.

Reeder Lakes are a unique water resource that provide excellent habitat for native amphibians; however, almost all of these lakes are hydrologically disconnected from surface water flow into Reeder Creek. Two of these lakes drain by subsurface flow into Reach 2 of Reeder Creek. The lakes are shallow and less than an acre in size. While they do not appear to contain adequate habitat space for viable fish populations, they do boast an abundance of macroinvertebrates and other aquatic vertebrates, like Columbia spotted frogs and long-toed salamander.

Figure 3-45. Reeder Lakes

Key fish habitat concerns are:

- Non-native eastern brook trout are well established in this watershed.
- Several culverts on both Reeder and Indian Creeks are barriers to fish passage.
- High supply of fine sediment from poorly maintained and unauthorized forest roads.
- Complete canopy removal along portions of Indian Creek.

[58] In 2001, IDEQ reported some natural nutrient enrichment and some anthropogenic contamination in the Priest River Subbasin Assessment and Total Maximum Daily Allocation.

Table 3-59. Key habitat conditions/factors used in the effects analysis for Reeder Creek.

Section	Substrate	Fine Sediment (<6mm)	Temperature	Habitat Quality	Large Woody Debris
Reeder (1) Sections 19, 23, 24, and Bismark blw Highway	Sand - 20% Gravel - 80 %	51%	Exceeds 21C near the mouth (Bjornn 1957); areas of warm temperatures during summer.	Primarily meadow with deep pools, stable banks, undercut banks, and beaver activity	Very little woody debris
Reeder (2) Bismark to Elev. 2840 ft	Gravel – 78% Cobble – 15% Sand - 8%	24% with evidence of fine sediment aggradations	Transitional due to beaver activity; Cooler thermal regime upstream of FS 2231	Poor pool quality; banks eroding and instability due to beaver dam failure; High sand in upper section	Heavy blow-down; Most LWD bridges channel; only small OM within channel
Reeder (3) Elev. 2840 to headwaters	Gravel – 75% Sand - 15% Cobble – 9 %	30% with evidence of fine sediment aggradations	>14C 7d maximum mean temperature across 5 years	Intermittent connection to downstream; High channel instability; high quality in patch of mature forest	LWD functioning in mature timber; Small diameter elsewhere
Reeder Lakes	Varies from silt to talus	N/A	N/A	N/A	Within range of natural variability
Lower Indian blw FS 2516	Gravel – 68% Cobble – 16% Sand/Boulder ~ 8% ea.	13%	12C mid-day in mid-July 1999; 9C tributary	Pool frequency is low (40/mi); pool depth < 0.2m; Riparian forest removed for ~ 0.4 mi	Adequate frequency; >50% pools formed by LWD
Upper Indian abv FS 2516	Gravel – 81% Sand – 16% Cobble – 3%	34%	12C mid-day in mid-July 1999.	Pool frequency is moderate (72/mi); pool depth < 0.2m; mix of steep & forested meadow	Adequate frequency; >60% pools formed by LWD

Kalispell Creek

Habitat and channel conditions in Kalispell Creek are unique to the intensely-burned vegetation and decomposed granitic geology. Major fires in 1890, 1926, and 1939 burned over 80 percent of the watershed, with relatively high burn intensity as many areas were reburned in successive fires. Past management practices, including post-war timber/salvage harvest (1940s-1950s) and related road construction, have affected the aquatic resources in this area via impacts of sedimentation and changes in vegetation patterns. Coupled with the extreme fire disturbance events that destroyed much of the soil and

native vegetation, the stream habitat reflects a system with an over-burden of fine, sandy sediment and a relatively warm thermal regime. It is within this context that the State of Idaho listed Kalispell Creek as a 303(d) listed Water Quality Limited Segment. Sediment (listed in 1994) and temperature (listed in 1998) are the primary pollutants of concern. In 2001, a restoration plan called the Total Maximum Daily Load Implementation Plan was developed for the long-term remediation of these pollutants and implementation was initiated by the State of Idaho (IDEQ 2001).

The reaches of stream that flow through the project area are relatively low-gradient and traverse relatively flat, wide floodplains with wet, sandy soils (Table 3-60). These reaches are considered gravel dominated, meandering to moderately incised streams. Thus, riparian vegetation immediately adjacent (50 to 100 feet) to the stream is dominated by wet grassy-areas and alder with only occasional encroachment by Engelmann Spruce[59]. With the exception of the old-growth patch of timber from Bath Creek upstream to Nuisance Creek, most large-mature trees do not occur within 80-100 feet of the channel. In fact there are few large trees that can or have recruited to the stream in recent decades. As a result of the proximity and ages of trees, most of the woody debris in Kalispell Creek is either burned timber from long ago or small diameter alder that decays rapidly. The general stream attributes from recent surveys show moderate pool frequency, high cumulative residual pool volumes, and adequate woody debris counts (Table 3-60Table 3-60). Pool frequency and residual depths are relatively high in some reaches of Kalispell Creek because of the number of active and inactive beaver dam complexes. However, pool quality is generally poor because of shallow depths and a lack of habitat complexity. Habitat diversity (i.e., a well-distributed assortment of fast-water and slow-water habitats) is good in the reach from Virgin to Hungry Creek. Current woody debris counts indicate the number of debris pieces fall within natural limits (120 pc per mile). However, because size (diameter and length) of debris relative to channel width is not considered "key" and the state of decay is advanced, the overall woody debris component in this section of Kalispell Creek is consider poor. Streambed conditions are dominated by sands and small gravels, even in higher gradient reaches[60]. In addition, cobble embeddedness is very high[61] so most substrate interstices are not available for macroinvertebrate production and produce poor spawning conditions for bull and cutthroat trout. These substrate and streambed conditions have been in this state for several decades[62]. Thermal habitat conditions in Kalispell Creek are most likely in the range of natural variability (Figure 3-46); however, even the coolest stream reaches of Kalispell Creek have thermal regimes that often have a "low likelihood of bull trout occurrence[63]. This thermal regime favors eastern brook trout, as it is the dominant trout species. In the steeper headwater reaches where substrate is larger and thermal regimes are cooler, native cutthroat trout occur more frequently (see fish distribution section).

[59] Most large-mature trees do not occur within 80-100 feet of the channel. Trees available to recruit into the stream younger, shorter, and smaller (avg. diam. < 14 in. DBH) than typical mature trees that provide ideal organic inputs to the stream.

[60] Substrate particles were measured using Wolman Pebble Counts during the 2002 survey. For reach 6, fines less than 6mm comprise >55% of substrate, while small gravel comprises the remainder. For reach 7, fines less than 6mm comprise >35% of substrate with the remainder being mostly gravels (53%) and a few cobbles (10%). Reach 8 above the Kalispell Creek gorge is very flat contains even more fine sediment.

[61] Data summaries from Forest Service Stream Surveys in 1992 across the mainstem of Kalispell Creek showed an average of 50% or greater cobble embeddedness.

[62] Survey notes from 1966 and 1971 within the project area recorded silts, sands, and small gravels as majority of substrate particles and surveyors noted "much of the siltation and sand deposits in the stream are a result of soil damage from the burn [1930 fires]".

[63] From a study in southern Idaho, only 40% of streams with mean daily temperatures between 10-12˚C were occupied by bull trout and no streams with mean daily temperatures above 12˚C were occupied by bull trout (Gammett 2002).

Table 3-60. Key habitat conditions/factors used in the effects analysis for Kalispell Creek.

Stream Section	Pool Freq.	Res. Pool Depth	Habitat Diversity (H')	Percent Undercut Bank ± SE	Percent Stable Banks ± SE	Width to Depth Ratio	Large Woody Debris
Kalispell (1) Mouth to RM 4.0	15	0.2	0.2	7% ± 5%	70% ± 15%	21	241 pieces; 50% of pools formed by LWD
Kalispell (2) RM 4.0 to Fox Cr.	19.5	0.3	0.19	14% ± 7%	70% ± 13%	18	347 pieces; 50% of pools formed by LWD
Kalispell (3) Fox Cr. to FS 1362	23	0.1	0.25	39% ± 15%	90% ± 9%	21	264; all pools formed by LWD
Kalispell (4) FS 1362 to Bath Cr.	23	0.3	0.26	20% ± 13%	78% ± 17%	20	128 pieces; 75% of pools formed by LWD
Kalispell (5) Bath to Virgin Cr.	22	0.2	0.11	18% ± 4%	75% ± 10%	29	205 pieces; all pools formed by LWD
Kalispell (6) Virgin Cr. to RM 12.0	121	0.4	0.79	40% ± 6%	64% ± 5%	25	241 pieces; < 50% of pools formed by LWD
Nuisance Reach 1	39	0.2	0.15	42% ± 8%	88% ± 4%	17	170 pieces; 70 % of pools formed by LWD
Lower Diamond & Potholes	35	0.15	N/A	70% ± 10%	91% ± 5%	14	368 pieces in all reaches; 80% of all pools formed by LWD

Key fish habitat concerns are:

- Over-burden of fine sediment throughout the entire watershed.

- Dominance and continued persistence of eastern brook trout in the watershed.
- Severely altered riparian vegetation and associated absence of large woody debris.
- Warm stream temperatures in the Upper and Lower Reaches of the basin.

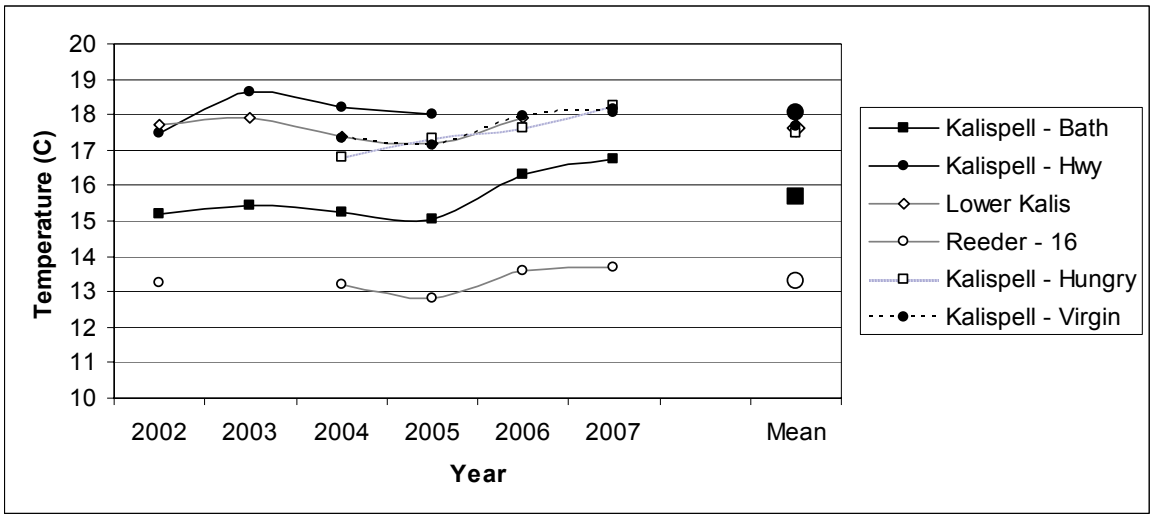


Figure 3-46. Comparison of the mean daily average temperature from July 1 to September 30 for locations in Kalispell and Reeder Creeks.

Boulder Creek

Boulder Creek is a large third-order tributary stream to Hughes Fork with alternating meandering and steep reaches. Several mid- and high-elevation roads traverse its headwater tributaries (road #'s 1341, 1015, 1014, and 401 series) and harvested units have occurred in the watershed. The fish-bearing portion of this stream occurs from its confluence with Hughes Fork to its headwater 1st-order streams, approximately 5.5-miles of fish bearing waterway. The lower reaches of Boulder Creek flow through a relatively confined valley shape and have a moderate slope (< 5 percent), before entering Hughes Fork a known bull trout occupied system. The steep reaches of Boulder Creek have limited the fish distribution to the lower portion of the watershed, although the low-gradient Boulder Creek meadows exist in the headwater region. Bull trout redd surveys have been conducted within the system by IDFG (see Fisheries Existing Condition – Bull Trout). In 2004, sampling was conducted in Boulder Creek by IDFG and the Kalispell Tribe for genetics work on bull trout, yet none were found during effort. However, a large percentage of westslope cutthroat trout were collected along with a few eastern brook trout.

Key fish habitat concerns are:

- Potential lack of large woody debris in the system providing adequate pool availability for native species;
- Dominance and continued persistence of eastern brook trout in the watershed;

Habitat Fragmentation

Fish habitat is fragmented by artificial and natural barriers throughout the Lakeview Reeder Project area as well as the greater watershed areas of Kalispell, Reeder, Granite, and Boulder Creeks. County, private, and Forest Service roads cross several of the fish-bearing streams within and immediately adjacent to the project area. While a handful of these 'road-stream' intersections are easily negotiated by individual fish desiring to move upstream or downstream within a stream to access important spawning or rearing habitat, several are not (Table 3-61). In Granite Creek, there are five culvert barriers that either block or

limit access to important habitats needed by native trout. In Indian Creek, culverts limit upstream passage to the more than half of the drainage. In Kalispell Creek, culverts do not allow fish in the mainstem to use the habitats of the Potholes or Nuisance Creek.

Table 3-61. Description of the man-made fish passage barriers in the project area.

Watershed	*Stream*	*Road*	*Severity*	*Habitat*
Granite	Fedar	1347	Complete	1.5 miles headwaters with cutthroat
Granite	Fedar	1340	Complete	0.7 mile headwaters with cutthroat
Granite	Fedar	1340A	Complete	0.5 mile headwaters with cutthroat
Granite	Packer	302	Complete	0.3 mile of refuge/rearing habitat
Granite	Zero	302	Juvenile	0.4 mile of refuge/rearing habitat
Reeder	Reeder	2231	Juvenile	0.75 mile coldwater habitat; brook trout
Reeder	Indian	2516	Juvenile	1.1 miles coldwater habitat; 100% brook trout
Kalispell	Fox/Potholes	308	Juvenile	0.7 mile meadow habitat
Kalispell	Nuisance	308	Complete	2.1 miles meadow headwater habitat
Kalispell	Diamond	657 (2X)	Complete	2.0 miles meadow and stream habitat
Hughes	Boulder	1014	Juvenile	0.3 miles of headwater habitat

Environmental Consequences

Alternative 1—No Action

Direct Effects- No Action

Under the no-action alternative (Alternative 1) of the Lakeview Reeder Project, fuels reduction treatments (harvest or burning) would not be performed, roads would not be constructed, roads would not be reconditioned, and fish-barrier culverts (e.g. roads 2231, 2516 and 308) would continue to block fish movements and migration. More intense and lasting road maintenance and reconstruction activities (culvert upgrades, repair of drainage problems, etc.) would not occur on 22 miles of roads. As a result, the short-term negative impacts related to road maintenance work, followed by the long-term benefits derived from improving the drainage and reducing overall sediment delivery potential would not occur. In addition, the fish-passage barriers at road crossings (Indian, Reeder, Fedar, and Zero Creeks) would not be eliminated and thus, fish habitat would not be reconnected. Road #308 as part of the proposed action would not be relocated away from the stream either. As a result of the encroachment, there would continue to be reduced canopy closure and increased solar radiation input, reduced LWD recruitment, and increased sediment delivery.

If high severity fire does not burn the area or only burns a very small area, fish habitat and populations are likely to remain near their existing condition. In the tributaries, incremental increases in woody debris recruitment, habitat complexity, and water temperatures are likely to occur over the next decade as insects and disease continue to kill scattered pockets of trees in RHCAs.

Roads, particularly those that encroach on streams, would continue to generate the bulk of the man-caused sedimentation of fish habitat.

Indirect Effects- No Action

With the absence of fuel treatments, the no action alternative could have other effects. No action could indirectly result in a higher risk of a stand-replacing, high-intensity wildfire across the project area because fire suppression activities could be more difficult as a result of the more extreme fire behavior

encountered in untreated areas (see Fire Regime Discussion). A high-severity fire is not certain to occur within the project area during a given timeframe; however, such an event could result in indirect "fire-related" effects to fisheries resources. It is not possible to predict when and where fires will occur. To a greater extent, we know much less about fire effects in riparian areas and forecasting with any degree of certainty the exact effects of fires in riparian areas is speculative at best (Butler 2007). Rather, we can describe, in general terms, fire risks and effects to riparian areas and fisheries resources.

In the project area, moderate to high intensity fires occurred in the not too distant past. In Granite Creek, the lowest portion of the drainage burned last in 1880, and given the broad riparian zone likely burned with mixed severity. Much of the North and South Forks of Granite Creek burned in the 1926 fire, with the South Fork and Sema Creek burning more intensely. The western side of Fedar Creek burned in 1925, but the eastern slopes of that drainage have not burned in recent history. Most of the fish habitat conditions within the riparian areas of Granite Creek have recovered and many areas may well have benefited over the decades from the post-burn effects. The legacy effects that persist today relate only to post-fire land uses of road-building and salvage logging following those fires. The majority of these effects occur within the lower reaches and tributaries of Granite Creek. Much of Kalispell Creek has burned twice or three times within the historical record (1880, 1926, and 1939). Very little riparian forest remained intact in Kalispell Creek following those events except for some patches in the middle reaches. The 1939 fire burned with such intensity that complete "recovery" may not occur for centuries to come. In addition, extensive salvage logging, felling dead trees (snagging), and planting off-site trees, has resulted in poor recovery of the vegetation and related hydrologic processes, resulting in less than desirable fish habitat conditions. The middle section of Kalispell Creek that did not burn and reburn is located near the Bath Creek tributary and interestingly is one of the few areas where remnant old growth patches provide large wood to the channel, forming desirable fish habitat. Within the Reeder Creek watershed, lower Reeder and Indian Creek were burned in 1880 and the 1926 fire. The upper portion of Reeder Creek burned in 1880, whereas the area surrounding Reeder Lakes has not burned in recent history. Although most of the riparian forest has recovered in Granite and Reeder watersheds well enough to provide functional fish habitat, the post-fire salvage logging near areas of human settlement limited the amount of large wood recruitment to the stream that would have occurred following the fire. The persisting result now is that the systems are limited by the size and quantity of large woody debris that forms and maintains fish habitat (bed stability, deep pools, etc.).

High-intensity wildfires would have potential for impacts to Fisheries Resources in severely-burned watersheds. If high severity fire does burn an extensive portion of the project area, fish kills would likely occur in the burned small tributary streams[64] where riparian vegetation patterns differ little from that of the uplands (Butler 2007). Measurable fish kills in the mainstem habitats of Granite and Kalispell Creeks would be less probable, but possible. Fish populations in small streams, can be quite vulnerable to extirpation by severe fires because they are primarily resident fish and are isolated from founding populations by barriers. Such is the case for Fedar Creek, Upper Packer Creek, Upper Zero Creek, Indian Creek, Upper Reeder Creek, Nuisance Creek, and the Potholes wetland, owing to the impassable culverts under FS roads 1342, 302, 2231, and 308. Recovery of these fish populations would depend upon surviving individuals above these culverts. A severe fire event could increase the potential for soil erosion and sediment delivery to streams (see Hydrology Section). This, in turn, could pose short-term negative effects to stream habitats and fish species currently inhabiting streams. Observational studies have detected higher water temperatures, increased nutrients in water, and shifts in aquatic insect communities (Minshall and Brock 1991) as well as a decrease in gravel size, greater embeddedness due to upslope erosion, and less large wood and habitat in burned streams (at least 40 percent burned catchment) than observed in nearby unburned streams (Minshall et al. 1997). Post-fire erosion has been linked to acute

[64] First and Second-order streams include Fedar Creek, Indian Creek, Upper Reeder Creek, and numerous unnamed streams.

punctuations of sediment, from fines to boulders, and woody debris materials (Benda et al. 2003). Further, this pattern of sediment/debris inputs following fires likely produce new habitats and the patchy distribution of habitats. These short-term post-burn habitat effects can be severe enough to cause direct mortality (Minshall and Brock 1991) and local extirpation of fish populations (Howell 2006, Rinne 1996). As a matter of scale and magnitude, it should be clarified that fire-induced or harvest-induced sediment yield is considered a fraction of the fine sediment yield from extensive forest road construction and extensive forest road networks (Rieman and Clayton 1997). The road network of the Lakeview Reeder Project Area is considered moderate[65], but contributes greater amounts of fine sediment to streams than would a fire over the decades that the roads have existed.

Over the long-term, the understood impacts of fires and severe fires on fisheries can be beneficial when a well connected, complex habitat network exists (Rieman and Clayton 1997). The same disturbance processes of mass sediment and wood delivery into streams that can cause those short-term negative impacts, in fact serve as processes for renewal of habitats and an influx of nutrients (Gresswell 1999). Others studies have recorded dramatic improvements in fish habitat quality and diversity as well as use of habitats by trout within 5 – 10 years post-fire (Burton 2005). Within and adjacent to the project area, resident westslope cutthroat trout populations in Packer, Zero, and Diamond Creeks have persisted in spite of those drainages burning in early 20th century fires.

Cumulative Effects- No Action

This section addresses how the No Action Alternative would potentially contribute cumulatively to the past, ongoing, and reasonably foreseeable activities' effects to MIS, listed fish species, and fisheries resources as defined by the National Environmental Policy Act of 1970. The cumulative effects area (CEA) for fisheries encompasses the same area (Figure 3-38) defined by the Hydrology – Environmental Effects Consequences.

A complete description of relevant past, present, and foreseeable actions related to the cumulative effects to Lakeview-Reeder on various resources is included within the EIS (Appendix B) as specified how each action affected individual resource conditions based on the issue and issue indicators developed. Also, under Hydrology (Cumulative Effects – No Action) describe Past, Present, Reasonably Foreseeable Activities and their effects.

If high severity fire <u>does not</u> burn the project area in the future or only burns a very small portion, the cumulative effect of no action would likely be a continuation of the existing conditions described previously for fisheries. If high severity fire <u>does</u> burn an extensive portion of any fish-bearing stream in the future, the existing chronic sediment inputs from the road network could overlap with the large one time pulse of sediment that follows severe fire. This overlap in disturbance regimes could exacerbate and prolong the negative effects of post-fire sedimentation for at least five years. Research indicates that the short-term pulse of sediment created by fire is clearly more favorable and tolerable for the fishery than the constant sediment inputs produced by roads (Rieman and Clayton, 1997). However, the combination of the two disturbance regimes could prolong the recovery of fish populations back to pre-fire conditions across the analysis area. Given the presence of the impassable culvert barriers in Fedar, Indian, Reeder, Nuisance, and elsewhere, any post-fire recovery of these populations would have to come from within the drainages. With this context, if an extreme fire event occurred; native trout and other fish populations would likely face a heightened risk of extirpation.

[65] Under Existing Conditions, Granite, Kalispell, Reeder, Boulder Creeks have 4.6, 2.8, and 4.3 and 3.34 road miles per square mile, respectively (Table 11 – Hydrology Section).

Alternative 2—Proposed Action

Direct and Indirect Effects

Under Alternative 2, fish habitat and populations in the project area are expected to continue on a trend similar to the existing condition. Long-term reductions in habitat quality or changes in fish population numbers are unlikely to occur as a result of Alternative 2. Any realized negative effects that occur as a result of Alternative 2 are expected to dissipate within one-year of implementation. Most effects from the vegetation treatments would be too small to be distinguishable from the existing condition due to RHCA implementation. Research studies and monitoring results conducted on the Idaho Panhandle National Forest verify that when RHCAs or buffer strips are incorporated into timber sales, sediment delivery to stream channels is not measurable or is negligible (USDA Forest Service 2000, 1999, 1998, 1997, Belt et al 1992, Reid and Hilton 1998). The replacement and/or removal of fish migration barrier culverts would reconnect fragmented fish habitat for westslope cutthroat trout populations in Fedar, Indian, Reeder, and Boulder Creeks. This positive action would make those fish populations more resilient to future disturbances, as they would be able to move into other tributaries as needed or adjacent sub-populations could recolonize an area if a catastrophic event were to occur.

Predicting the future behavior of fire in riparian areas is speculative and cannot be forecast with precision; however, it is possible that with reduced fuel loads in the surrounding uplands created by Alternative 2, future fires in the tributary streams (e.g., Fedar, Indian, Reeder Creeks) may burn with reduced severity, assuming that the fire does not occur under extreme burning conditions. Assuming equal burning conditions, future fire in fish-bearing riparian areas is more likely to burn at a reduced severity with Alternative 2 as compared to Alternative 1 (Butler 2007).

With fuel reduction activities proposed in Alternative 2, there is always some risk that the activities themselves could cause more lasting damage to the fishery than the impact of a fire (Rieman and Clayton 1997), however utilizing control measures (e.g. fire lines, water, fuel breaks, etc) when igniting will aid in preventing an ignition escape creating a wildfire. Alternative 2 contains the following elements to aid in the improvement, enhancement, maintenance, and protection of hydrologic and fisheries resources:

- Timber harvest within the RHCA would be extremely limited and maintain existing Riparian Management Objectives (RMO), and could improve stream shade on Kalispell Creek in the future;
- No landings would be constructed in INFS buffers established for stream within the project area;
- All yarding would have to comply with Region 1 soil quality standards;
- Road/stream fish barriers would be upgraded or removed through decommissioning to eliminate passage barriers and reconnect habitat for native bull trout and westslope cutthroat trout populations.
- A total of 25.5 miles of proposed road decommissioning, 17 miles road maintenance and 5 miles of reconstruction are planned implementation that will aid in reducing overall sediment yields;
- A total of 4.5 miles of new road construction would be planned and developed at State and Federal standards of construction under mandatory contract C-clauses;
- Three miles of riparian-encroaching road along the FS 308 road would be decommissioned and fish habitat along this same section would be restored with large woody debris structure for fish following the road removal.

Sedimentation

Sediment yield under Alternative 2 has several potential mechanisms that could deliver sediment into fish-bearing streams and affect fish. They include:

- Timber harvest/fuel treatment
- Road construction & reconstruction
- Burning
- Road maintenance & log hauling
- Culvert replacements
- Instream fish habitat improvements
- Road decommissioning

Hydrologic analysis used the WATSED model (Patten 1989) to predict the quantities and timing of sediment yield for the unit treatments, road construction, and prescribed burning, whereas other sources were not modeled because of the sensitivity of the WATSED program. Information provided by the hydrologic analysis was used to assess sediment production as a result of road decommissioning and culvert replacements. Model outputs as well as the anticipated changes in sediment delivery risk were used to determine how much, if any, sediment would actually reach stream channels and fish-bearing stream habitat. Predicting the effects of sedimentation on fish species and habitat have been based upon reviews of the best available science for this subject.

Timber Harvest and Fuel Treatments:

WATSED model results predict that there would be no change in sediment yield as a result of harvest treatments in the Granite Creek watershed. There are only 55 acres of timber harvest scheduled along the southern portion of FS road 302 and on a knoll near the mouth of Granite Creek. All of these harvest units are located well outside[66] of the RHCA boundaries. There is adequate buffering capacity to prevent sediment from reaching the stream and thus affecting fish or damaging fish habitat. There are approximately 2100 acres of timber harvest or fuel treatments in Reeder Creek, which includes 12 acres of Handpiling of ground fuels within the RHCA. Timber harvesting in Reeder Creek would only occur outside of designated RHCAs. Several unit boundaries are adjacent to the edges of the RHCAs for Reeder Creek, Indian Creek, and several unnamed tributaries, but the designated RHCA distance would provide sufficient filtering to eliminate sediment from reaching the streams. Handpiling within an RHCA would not disturb soils, except where piles are burned. Piles would be burned a minimum of 150 feet from perennial, non-fish bearing streams and 300 feet from perennial, fish bearing streams, unless approved by a hydrologist or fisheries biologist to minimize sediment and nutrient delivery into live water and thus effects to fish (USDA 1995). In Kalispell Creek, unit 125 occurs in the RHCA, but only to within 100 feet of the mainstem. The unit occurs on a level bench upslope from FS road 308 so the potential for sediment yield from the harvested area to move off of the site is very low (see WATSED results under Hydrology Section). The vegetated slope between the road and the unit boundary exceeds 50 feet and would be more than adequate (USDA Forest Service 1995) to filter out any sediment generated from the units. Therefore, sedimentation as a result of harvest or fuel treatment would not directly of indirectly affect fish or fish habitat. In addition, road 308 occurs adjacent to Kalispell Creek and is likely a much more significant source of fine sediment.

[66] The closest unit to live water in Granite Creek is over 500 feet from the edge of water.

Road Construction and Reconstruction:

Alternative 2 would require some road work to access fuel reduction and timber harvest treatment areas. Specifically, there would be:

- Construction of 2.5 miles of new permanent road
- Construction of 0.5 mile of new temporary[67] road;
- Reconstruction of 5 miles of existing road;

The 2.5 miles of permanent road would be constructed on the northside of Lakeview Mountain and cross two small seasonal streams (Figure 3-47). With the exception of the two stream crossings, this road does not encroach upon any other RHCA. The road would traverse ground that is classified as a sensitive landtype[68] with 0.6 miles being rated as moderate potential for sediment delivery. To minimize the risks of road failure, provide for good surface drainage into the forest floor and not the stream, and be constructed in a manner that minimizes chronic fine-sediment delivery, specific best management practices would be employed, including 15.02 – General Guidelines for the Location and Design of Roads and Trails. The construction of this road would add sediment to these tributaries above the current bedload[69]. Based upon the geology, precipitation, and road design factors, WEPP[70] results that this road would generate very little sediment over the course of 30 years (see Hydrology – WEPP model results). The first winter/spring season following construction would generate the greatest amount of sediment to the unnamed tributaries with a declining yield for up to 6 years as the road cut stabilizes and becomes revegetated (Furniss et al. 1991). These two tributaries flow into marshy areas prior to their hydrologic connection with Reeder Creek. These two streams themselves do not provide fish habitat and only contribute to the habitat quality in Reeder Creek from a flow and water temperature perspective. The hydrologic analysis predicts that very little of the sediment generated from the construction and persistence of this road would reach the mainstem of Reeder Creek because most of the road would be constructed on low-slope benches, located a minimum of 500 feet from Reeder Creek, and the marshy areas would capture and incorporate the sediment delivered into the tributaries from the two stream crossings (USDA Forest Service 2000, 1999, 1998, 1997, Belt et al 1992, Reid and Hilton 1998). Lower Reeder Creek has a sediment regime dominated by fine-sediment, and the small quantities of potential sediment that would reach Reeder Creek are not great enough to embed spawning gravels, fill-in pools, or reduce the number of existing pools important for stream fish. Additional fine sediment in this section of Reeder Creek would not change the fish composition from the current condition. Brook trout would continue to dominate this system, particularly the low-gradient sections. Native cutthroat trout present in the steep section of stream near the lake are not directly or indirectly impacted by the small amounts of sediment yield predicted due to the effectiveness of INFS buffers applied.

[67] Temporary roads will occur on the landscape for the duration of the project up to 2 years unless otherwise specified.
[68] The western stream crossing will occur over a highly sensitive landtype, whereas the eastern stream crossing will occur over a moderately sensitive landtype.
[69] A large proportion of the total 36 tons of additional sediment yield predicted by WATSED in the Reeder Creek drainage are attributable to the new road construction.
[70] Predictions based on a watershed model called WEPP. Refer to hydrology section for more information.

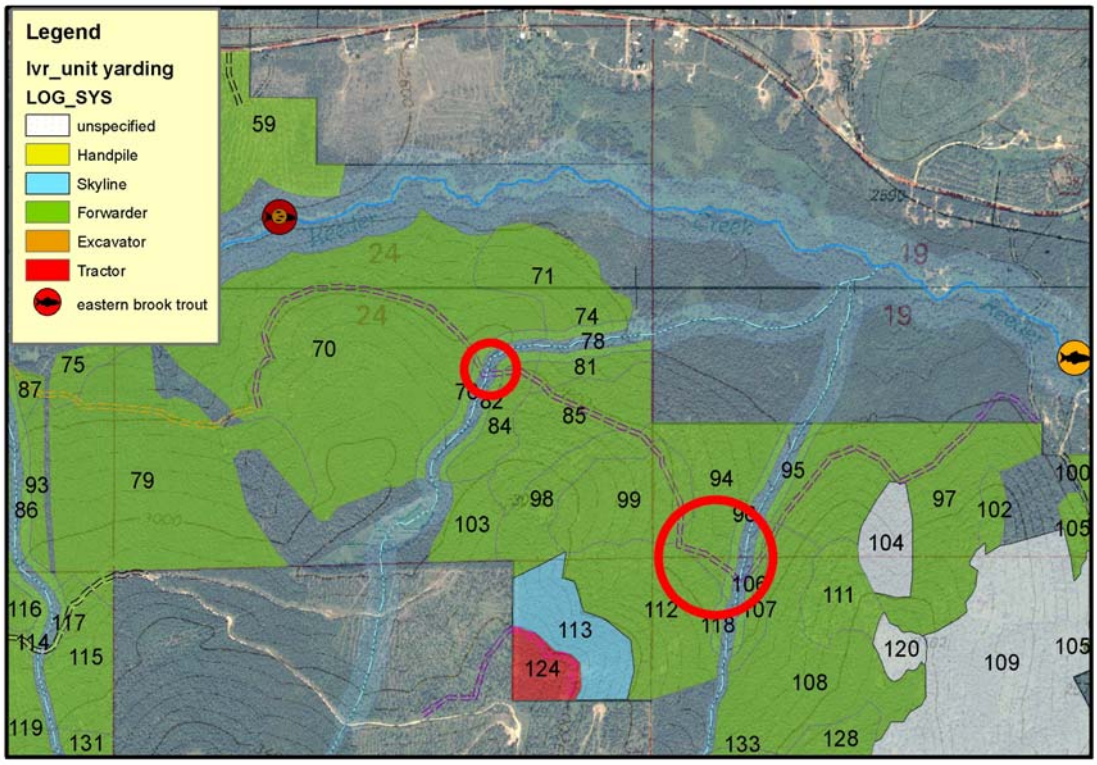


Figure 3-47. Unit map for the northside of Lakeview Mountain over an aerial photograph background. The new permanent road is shown in purple. The red circles indicate sensitive landtype areas.

The temporary roads would occur near ridge tops, outside of RHCAs, approximately 0.5 mile from a perennial waterbody, and only within the Reeder Creek watershed. Sediment generated from the construction of these roads would not reach live water (refer to Watershed sections) and therefore would not have a direct or indirect sediment-based effect on fisheries.

Roads that are overgrown or in poor condition would be reconstructed in the Reeder and Kalispell watersheds. Approximately 1.5 miles of road would be reconstructed close to the southside of Reeder Creek on the eastern side of Highway 57. This road currently exists on the landscape, crosses a small seasonal stream, and traverses roughly 700 feet of the Reeder Creek RHCA. Ground-disturbance would occur when the stream crossing is upgraded; however design features would be implemented to reduce any increased sediment yield to Reeder Creek. The new crossing that is installed along with the surface improvements would better allow for crossing functionality and improve conditions when used for commercial traffic. Other road reconstruction under Alternative 2 is related to the relocation of the FS 308 road and is discussed in the Road Relocation section.

Burning:

Under alternative 2, there would be approximately 1500 acres of prescribed burning in the project area; however, only the burning units with the potential to enter the RHCA of fish-bearing streams have been examined here, because they pose the biggest potential threat to fish and fish habitat under prescribed burn scenario should a wildfire occur. Specifically units located in Fedar, Granite, and Upper Indian Creeks; additionally the Lakeshore Riparian area and an unnamed stream within the Lakeshore Riparian Area. Although actual ignition would not occur within the RHCA, fire may be allowed to back into riparian areas. While controlling fire in the RHCAs, crews would employ minimally invasive suppression tactics (Jolly 1993), including no line digging, minimal tree cutting, pre-treating line with foam/water, etc, to avoid negative effects (e.g., fire containment lines eroding streambanks). The burning activities are

designed to be of low intensity and severity by igniting when there is adequate soil moistures, staying within the prescription window (i.e. air temperature, fuel moistures, relative humidity), and using prescribed ignition patterns; therefore burning would not consume all duff material throughout the units. Maintaining a duff layer within the RHCA would preserve the infiltration of precipitation, thus limiting the likelihood of overland flow and sediment delivery to fish habitat (USDA Forest Service 2000, 1999, 1998, 1997, Belt et al 1992, Reid and Hilton 1998). In the Granite Creek watershed burning would occur upslope from the middle reach of Fedar Creek, a stronghold for native westslope cutthroat trout, and along a riparian section of the mainstem upstream from the mouth of Fedar Creek. Habitat conditions in Fedar Creek are already limited by the amount of fine sediment; however, based upon hydrologic analyses, burning would not measurably increase sediment delivery to streams because most of the areas have low sediment delivery potential. The burning unit near the mainstem of Granite Creek is expected to have similar risks; however, the habitat conditions are not greatly limited by fine sediment in this reach of Granite Creek, thus, we do not anticipate a measurable quantity of sediment to reach either Fedar or Granite Creek. One burning unit would be located upslope from the upper reaches of the fish-bearing portion of Indian Creek. Only a small edge of this unit would be close to the edge of the RHCA. The risks to fish species and fish habitat in Priest Lake and the seasonal lakeshore tributary as a result of the Lakeview Mountain and Lake face drainage burning would be similar to those already described for streams. The direct and indirect effects of sediment yield from all activities are combined below to disclose the anticipated effects of elevated sediment on fish and fish habitat.

Road Maintenance & Log Hauling:

Under Alternative 2, approximately 17 miles of road maintenance would occur on all of the haul routes or roads being used extensively for the implementation of the project (Figure 3-48). Log hauling and associated road maintenance has the potential to add sediment into Reeder, Indian, and Kalispell Creeks. Haul routes in Granite Creek occur on paved road and thus, would not affect fish or fish habitat in lower Granite Creek. Road maintenance and use can cause sediment generation from road surface erosion that may reach live streams if the road occurs adjacent to or crosses streams. Such impacts as well as the broader-reaching aspects of impacts to aquatic biota have been well-studied and reviewed by others (Furniss et al. 1991, Gucinski 2000, Bash et al. 2001, USDA 2004). Others have further investigated how traffic levels affect sediment yield (Reid and Dunne 1984, Bilby et al. 1989), sediment yield of ditch maintenance vs. traffic (Luce et al. 2001), turbidity from traffic vs. storms (Dent et al. 2003), and how use of best-management practices (surfacing, improving road drainage, limiting use when roads are saturated) and proper design can reduce sediment yield (Burroughs and King 1989, Foltz and Truebe 1995, Sheridan et al. 2005, Cornish 2001). The overwhelming theme throughout each of these studies and reviews is that the road-stream intersections are the common thread by which sediment gets routed into live streams and are the focus of best management practices. In fact, a recent study from northwestern Montana reported strong relationship[71] between the number of stream crossings and the percentage of fine sediment in the stream (McCaffery et al. 2007).

With respect to road use on all Forest Service roads, timber hauling would occur in accordance with Forest Service Timber Sale contract provisions for environmental protections (B5.12 “Use of Roads by Purchaser”). Provisions explicitly state that the [purchaser] is authorized to use existing National Forest roads when such use would not cause damage to the roads or National Forest resources and when hauling can be done safely. For protection of soil and water quality, timber hauling on Forest Service controlled roads would be restricted when there are excessively wet weather conditions. Compliance with such restriction shall remain the responsibility of the timber sale administrator (Forest Service representative) for the life on the project. In addition, hauling would adhere to regulations within the Inland Native Fish

[71] Positive correlation ($r^2 = 0.70$, $p = 0.001$) between the percentage of fine sediment < 6.3 mm and the number of stream crossings across all watersheds examined in the South Fork Flathead River basin.

Strategy (INFS), Clean Water Act, Idaho Forest Practices Act, Bonner County Road and Bridge Department, and Idaho Department of Transportation.

In the Reeder Creek watershed, the 1356, 2231, and 2516 roads would be used and maintained during implementation of this project and may deliver sediment to Reeder Creek, Indian Creek, or unnamed tributaries. A very low density population of westslope cutthroat trout occurs in Reeder Creek and may be exposed to elevated sediment as a result of road maintenance or log hauling. FS road 1356 and spurs have four main stream crossings over unnamed tributaries (not fish-bearing) to Reeder Creek. FS road 2231 and spurs have two main stream crossings over Reeder and Indian Creeks (fish-bearing). FS road 2516 and spurs have only one stream crossing over Indian Creek (fish-bearing). Erosion would be visually monitored during log haul by aquatics staff and/or the timber sale contract administrator. If point sources of erosion occur then steps will be immediately taken to correct the situation.

In the Kalispell Creek watershed, roads 1362, 2516, and a small amount of road 308 would be used and maintained during the implementation of this project and may deliver sediment to Kalispell Creek. A population of cutthroat occurs in a patchy distribution throughout the watershed and individuals may be exposed to the short-term elevated sediment as a result of road maintenance and log hauling. Bull trout no longer occur in the watershed, a function largely related to non-native fish (see Fisheries Affected Environment), so they would not be exposed to plumes of fine sediment. There are no stream crossings on FS road 1362 that would be hauled across for this project. FS road 2516 and spurs have two crossings on small seasonal streams that are tributary to Fox Creek. FS road 308 is a primary access route into the Kalispell basin, cost-share road for the upper and middle portions, and the lower portion is administered and maintained by Bonner County. Approximately 0.75 mile of this lower portion of FS 308 is adjacent to the mainstem of Kalispell Creek (fish-bearing reach); however, there are no identifiable stream crossings under this road that flow directly into Kalispell Creek. There are drainage culverts that route ditch runoff directly into Kalispell Creek. This section of FS 308 will have BMP upgrades, including improved surface aggregate as mitigation for log hauling. In addition, sediment yield would be monitored during log haul and perceived negative effects managed adaptively based on the existing timber sale provisions mentioned previously.

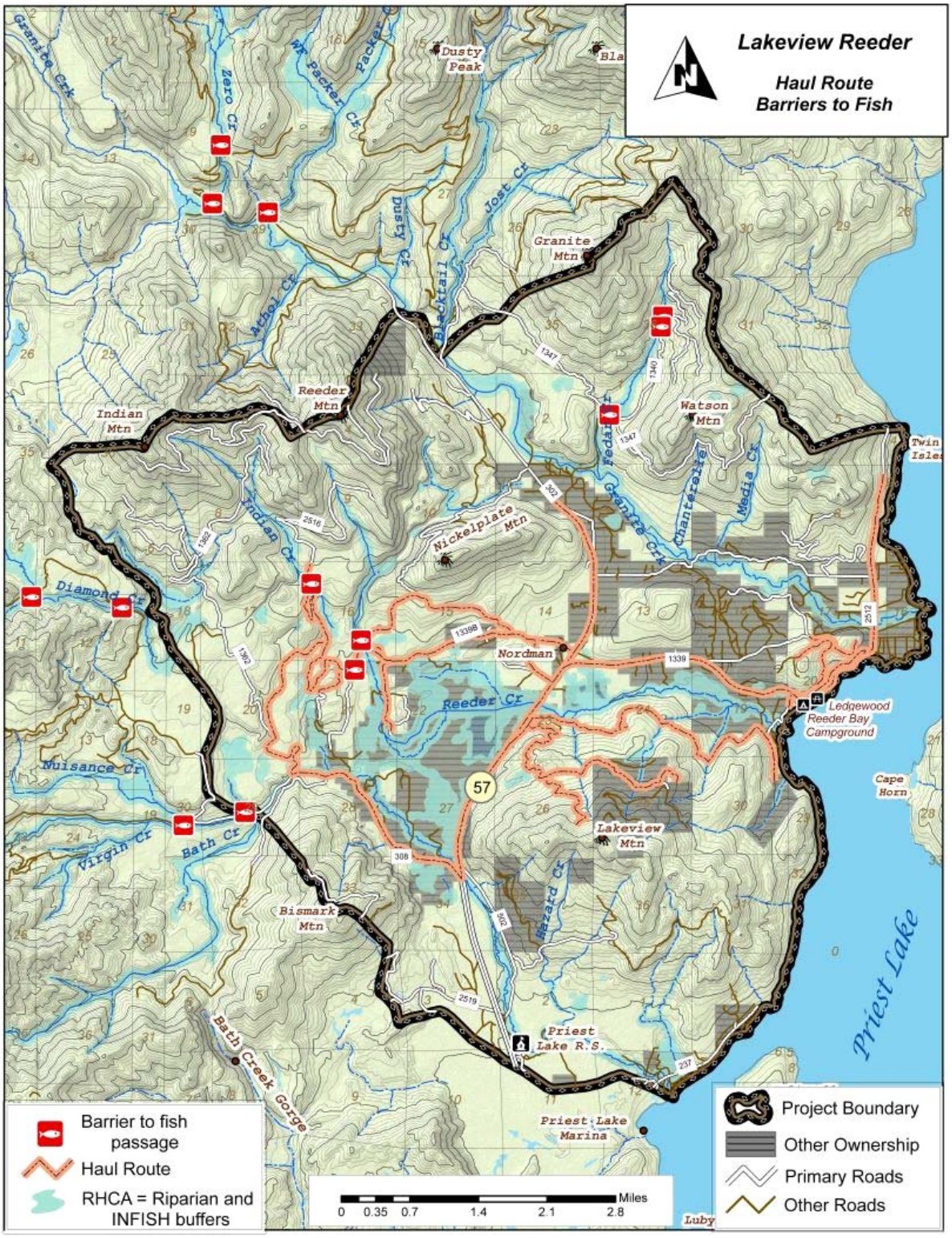


Figure 3-48. Map of haul routes where road maintenance will occur and known fish passage barrier culverts.

Although both Reeder and Kalispell Creeks have high percentages of fine-sediment in their existing condition, the anticipated quantities of short-term sediment delivered to the stream would be so small that they would be impossible to detect in the physical habitat, much less a change in the fish community (Foltz et al, 2007). In addition, road maintenance activities would create some longer-term (5-10 years) reductions in sediment yield from roads with currently poor drainage. *The effects of sediment yield from all activities are combined below to disclose the anticipated effects of elevated sediment on Management Indicator Species and fish habitat.*

Road Relocation:

Under Alternative 2, three miles of the riparian-encroaching FS road 308 would be decommissioned due to the persistent negative effects this section of road has had on water quality for decades. The road would be relocated much farther up the valley slope on a bench by reconstructing 3.6 miles of existing brushed-in road (FS road 1110), completing road maintenance on a short distance of FS road 657, and constructing 1.8 miles of new permanent road. The section of road 308 that would be decommissioned forms the streambank of some sections of Kalispell Creek and occurs as far away as 150 feet from the edge of the stream. Most of the decommissioned portion is somewhere between 40 feet and 120 feet from the edge of the stream, though some of the road segments proposed for decommissioning are within 2 feet of the stream.

The single greatest reduction in sediment is in the Kalispell Basin would be the removal of 3.0 miles of Road 308. With the removal of Road 308, approximately 200 to 400 tons of sediment (generated over a 10 year period) would not reach Kalispell Creek. Alternative 2 proposes to:

- Construct 1.8 miles of new road construction as part of the 308 reroute;
- Decommission 11.8 miles of road decommissioning;
- Provide 3.4 miles of road maintenance; and
- Reconstruct 2.6 miles of road.

At each of the 38 culvert removals, approximately 3.5 pounds (Foltz 2007) of sediment would be generated from the culvert extraction. This increase in sediment from culvert extractions would be short lived and would likely drop out after about one half mile (Foltz 2007) because of in-channel obstructions and roughness on the channel and floodplain. As modeled (see Hydrology – Table 13), when the stream begins to re-accesses its pre-road floodplain, it is not anticipated that much sediment (less than 51.8 tons) [72] would be eroded off the treated 0.5 miles of riparian road because of prescribed best management practices (see Hydrology –Table 13 for full discussion). The direct and indirect effects of sediment yield from all activities are combined below to disclose the anticipated effects of elevated sediment on fish and fish habitat. Despite the short-term negative effects, road removal, particularly removal of roads encroaching in the active riparian area, reduces chronic sediment yield (Switalski et al. 2004), facilitates recovery of riparian processes (Trombulak and Frissell 2000), and may improve fish habitats (McCaffery et al. 2007) over time. The sediment yield analyzed for from the proposed road work on the new #308 route would exist during improvement, the new 308 road route and old #308 removal, would have no direct or indirect effect on fish or fish habitat and result in a beneficial outcome.

[72] Assume 0.5 miles of riparian road, eroding 6 inches laterally and 6 inches deep for the entire distance. That would equal a volume of 2640 feet x 0.5 feet x 0.5 feet = 660 ft3 or 24 cubic yards or 2.16 tons/cubic yard. This equates to 51.8 tons, or one and three quarter dump truck loads.

Culvert replacements:

Alternative 2 proposes to provide fish passage on haul routes and other existing fish passage barrier culverts. Namely, one crossing over Reeder Creek on FS road 2231 would be retrofitted to provide year-round fish passage for all life stages of fish by installing boulder/rock weirs across the stream. Installing two rock weirs would disturb the streambed and streambanks and likely deliver sediment into the stream. The estimated quantity of sediment delivered would be small and delivery would only occur during and immediately following installation. Road #2516 crossing of Indian Creek would be completely replaced[73] with a new structure as well as one crossing on road #1376 on Zero Creek and another crossing on road #1347 on Fedar Creek. Although standard BMPs[74] would be used during each replacement, small amounts of sediment would be delivered into the stream and would affect fish. The direct and indirect effects of sediment yield from all activities are combined below to disclose the anticipated effects of elevated sediment on fish and fish habitat.

Instream Fish Habitat Structures:

To create the large woody debris habitat structures, heavy equipment would operate within the stream channel and immediately adjacent to Kalispell Creek and would directly affect fish habitat. The FS intends to use a "spider-hoe" type excavator to move and manipulate logs and rootwads. Also, excavators would be used to remove culvert crossings and road prisms that traverse Kalispell Creek. In the short-term (during and within 24 h of channel work), operating such heavy equipment in the stream and on the streambanks would undoubtedly generate and deliver sediment into these streams. The manner in which structures would be built typically require placement only; however, there are a few sites (approximately 10) where a moderate amount of bank excavation would be needed, resulting in sediment yield (see Hydrology Section) as logs are placed in the stream, bank sloughing may disturb and activate some of the fine alluvial sediments in addition to delivering some bank sediment as well.

Road Decommissioning:

Alternative 2 proposes to decommission a total of 25.4 miles of road within the Lakeview Reeder Project Area. The effects of road decommissioning on sediment yield are discussed under Road Relocation for FS road 308. The effects of decommissioning these remaining miles of roads are disclosed in the Hydrology Section (pp. 48-65). There are fourteen live stream crossings in Upper Boulder Creek along FS 1014, only three of which are potentially fish-bearing. There are only two known live stream crossings in Fedar Creek on the 1340 and 1340A roads that would be addressed under Alternative 2. The direct and indirect effects of sediment yield from all activities are combined below to disclose the anticipated effects of elevated sediment on fish and fish habitat.

Sediment Effects to Fish

Several activities under Alternative 2 would deliver sediment to fish-bearing streams. There are two types of sediment that would directly and/or indirectly affect individual fish and would potentially affect fish habitat: (1) sediment in the water column (turbidity, suspended sediment) and (2) depositional sediment. How these types of sediment affect fish are discussed and summarized below and based on Cobb (2008).

Short-term impacts of sediment delivery on habitat would include short-term turbidity plumes when working in the stream, during some project related activities (see Hydrology Section). Deposition of fine sediments on the streambed downstream of disturbed areas would occur as a result of some project activities. Deposition of related fine sediments can adversely affect reproductive success of salmonids as

[73] Road fill would be excavated to where the old culvert could be removed, a new fish-friendly crossing would be installed, and road fill would be placed back over the crossing.

[74] Erosion control features at these sites includes dewatering the construction zone, performing work during the instream timing window, using sediment catchment devices, and controlling surface erosion with vegetation following construction (see USDA 1988 [Soil & Water Conservation Handbook]).

a result of reduced embryo survival when fines < 8 mm exceed 20 percent of the streambed (Bjornn and Reiser 1991, Waters 1995). More specifically, bull trout embryo survival was lowest (5 percent) at sites with 45 percent or more of fines < 6.3 mm. Large quantities of deposited sediment can reduce the amount of available habitat as pools are filled in with sediment (Bjornn et al. 1977) and reduce the availability of spawning habitat due to substrate embedding (Waters 1995). Deposited sediment (i.e., bedload) can detrimentally affect aquatic macroinvertebrates; however, Waters (1995) states, "Construction activities that last only for short times "e.g., road construction, bridges, and pipeline crossings) usually produce transitory effects on invertebrate populations" which recover rapidly because of various life history strategies and environmental factors. The quantities of sediment predicted to be deposited in fish-bearing streams are very low (< 5 kg per stream crossing) and nowhere near the levels that cause habitat loss, degradation of spawning habitat, and reduced reproductive success. In fact, the predicted levels of sediment yield that would actually be deposited in the stream would not likely be detectable for all activities, except for the FS 308 road decommissioning (see Hydrology section).

Sediment catching devices would be placed downstream of each disturbed area to capture most of the 'potential' sediment being transported downstream. Timing of this work would be accomplished in the drier months of the summer (July 15 – September 1), hence any deposition of fines into potential spawning areas should not cause any fish mortality because spawning activity and fry emergence would not be occurring during that time. In addition, if fines are deposited, they are expected to flush from trout spawning areas/systems prior to the spawning season. Such effects would be short-lived and sedimentation impacts should be negligible in comparison to the current composition of fine sediment within the background bedload.

Temperature

Alternative 2 would maintain current temperature regimes in each of the watersheds by maintaining shade in RHCAs. As stated previously the allowable activities in the RHCAs of the project watersheds would include manually thin from below and thin-burn small-diameter understory trees, hand-slashing, near road excavator piling, and burning fuels along portions of the lakeface RHCA[75]; and road decommissioning and other road related work[76].

The improvements in riparian stand structure and condition treatment units are proposed within RHCAs, but not within a distance near stream channels where stream shading along these sections would not change. In addition, one section of Kalispell Creek is the coolest of all reaches/sites in the entire basin[77], thus, temperatures in this section either aren't severely limited by stream shade or groundwater inputs are a large factor in regulating temperature (hyporheic zone).

There would only be 4 road/stream crossings under Alternative 2 proposed, where the road construction across these RHCAs would create very little linear riparian loss. This loss should not raise stream temperatures since these streams are intermittent in form and would be dry most of the year and during construction periods. In addition, Reeder Creek has a very cold thermal regime (regulated by groundwater inputs) compared to nearby streams (see Figure 3-44 and Figure 3-46) and would be unaffected by minor fuels reduction efforts in watershed.

Over the long-term, recovery of riparian vegetation is expected following removal of FS road 308. Through the course of one or more decades, streamside vegetation is expected to return and improve

[75] Ground-based equipment and pile burning will not occur within 50 feet from the lake.
[76] Road work includes all road construction, reconstruction, and maintenance for Alternative 2 and would only occur in the RHCA at 12 stream crossings, 3 of which are fish-bearing.
[77] Reach 3 of Kalispell Creek as identified in the Affected Environment Section and the thermograph site named Kalispell at Bath Creek (Figure 4).

stream shading, which would help to moderate and perhaps even cool stream temperatures, thereby expanding to cool water zone downstream near Bath Creek.

Overall, the direct and indirect effects of Alternative 2 would maintain the existing temperature regimes in Granite and Reeder and aid in improving shading to Kalispell Creeks, not directly or indirectly affecting individual fish, fish populations, or thermal habitat quality.

Fish Habitat Quality

Stream channel equilibrium (stability) is the balance between sediment yield, water yield, and channel morphology, which exists within a stream system. Studies indicate that shifts away from channel equilibrium can result in negative changes in the structure and function of stream ecosystems (Bilby and Likens 1980, Schlosser 1982) and their dependent fish populations. Bisson and Sedell (1982) report that where stream channels have become destabilized, riffles elongate and in many cases extend through former pool locations resulting in loss of pool volume. They suggest that declines in older fish might be the result of their dependency upon deeper water habitats. The persistence of bull trout over time can best be provided by maintaining lateral and in stream habitat complexity in association with channel stability (Gorman and Karr 1978, Karr and Dudley 1981, Karr and Freemark 1983). Some activities of Alternative 2 would affect the stability and complexity of fish habitat in portions of the project area.

Although some activities (road work) would deliver sediment into-fish bearing waters, the predicted quantities of sediment are not great enough to change geomorphology and subsequent habitat patterns of pool – riffle – run (see Sediment discussion). Pool frequencies and pool depths would not be reduced as a result of the small quantities of sediment anticipated to reach fish-bearing waters. Therefore, fish populations would not experience reductions in the availability of pool habitats.

The WATSED analysis (see Hydrology-Figure 3-39) modeled water yield to increase by approximately 6 percent within Reeder Creek. There is very little (< 1 %) to <u>no</u> increase in Kalispell and Granite Creeks and direct and indirect effects to fish and fish habitat will not be considered any further, respectively. The increase in water yield would not directly or indirectly affect the physical structure or quality (i.e. bank stability) of fish habitat in Reeder Creek because the meadow-type streams are capable of handling increase (i.e. floods) without damage. Consequently, the increase in water yield in Reeder Creek is not expected to change fish population levels within the Reeder Creek watershed.

Instream Fish Habitat Improvements:

In the mainstem of Kalispell Creek, Alternative 2 would ultimately create more complex habitat, improve the quality (tree species with slower decay rates) of large woody debris, and provide deeper, more persistent pools than are currently present. The current type of woody debris in the stream is either old, fire-burned logs or small diameter alder, which decays rapidly. Creating habitat structures with complex structure would increase the quality of summer rearing and overwintering habitats available to all trout species. These effects would help to meet the pool frequency RMO and thus, would be beneficial to fish (salmonid) habitat and listed fish species as the additional channel complexity would improve the diversity of habitats available. Large woody debris structures placed in sections of Kalispell Creek with little habitat diversity (Reach 5) would substantially increase the availability of several different slow-water and fast-water types of habitat. In addition, pool depths would be increased, providing more habitat space and refuge from warm water temperatures.

Large Woody Debris

Current levels of large woody debris (LWD) would be maintained by Alternative 2 in the Granite Creek and Reeder Creek watersheds and improved in the Kalispell watershed. Under Alternative 2, in-channel structures would be placed into Kalispell Creek to improve fish habitat. Two types of woody debris

structures would be used in various locations throughout the fish bearing portions of the stream network, depending upon the specific site requirements.

- Engineered Woody Debris Complexes: In those locations where the stream lacks stable wood complexes, approximately fifteen engineered stable, in-channel woody debris complexes would be created.
- Large Wood Replenishment: In locations where the stream lacks wood and there is very limited recruitment potential, wood would be reintroduced into the stream in discrete groupings and left for the stream to incorporate into existing or future habitat features. These structures would not be secured and would be allowed to move within the larger stream system.

Future LWD recruitment would be maintained by Alternative 2; however, there are two activities that would have minor effects to future LWD recruitment. Unit (125 in the Kalispell Creek RHCA would remove trees; however, the unit is barely within the tree recruitment zone of 150 feet[78] and FS road 308 is located between the unit and stream. The presence of the road effectively eliminates LWD recruitment because trees that fall across the road would be removed for safe travel. Canopy trees would be removed from the RHCA where the new permanent road crosses the seasonal tributaries to Reeder Creek. Treatment units in Reeder Creek are proposed to remove and reduce fuels as part of Alternative 2 (units 4, 44, 49, and 72). These streams do not provide fish habitat; however, organic debris jams in headwater streams provide food sources to downstream supported fisheries (Bilby and Likens 1980, Schlosser 1982). Debris jams retain nutrients vital to fisheries productivity; and moderate sediment pulses, so they do not exceed channel capacities downstream (Meehan 1991). The road would cross less than 1/10th of an acre of RHCA and result in the removal of approximately 70 trees at each crossing. These high-density stands of 80 foot tall trees currently provide sufficient quantities of small diameter LWD to these streams. The removal of these trees from stands with over 900 trees per acre would not affect current levels of LWD or future LWD quantities and recruitment into the seasonal streams and thus would not have an effect on downstream fisheries.

Habitat Fragmentation

Under Alternative 2, fish passage would be restored to all of the identified fish passage barrier road crossings and other barriers on roads decommissioned for grizzly bear security. A total of 15 miles of headwater, fish-bearing habitat would be reconnected to downstream sources. Reconnected habitat would allow native fish to more easily recolonize areas where they are now absent and would improve the viability of native fish populations by allowing fish to freely move in and out of headwater habitats year-round as needed. Further, the improved habitat connectivity would make fish populations more resilient to both natural and anthropogenic disturbances.

Cumulative Effects

This section addresses how the Action Alternative would potentially contribute cumulatively to the past, ongoing, and reasonably foreseeable activities' effects to MIS, listed fish species, and fisheries resources as defined by the National Environmental Policy Act of 1970. The cumulative effects area (CEA) for fisheries encompasses the same area (Figure 3-38) defined by the Hydrology – Environmental Effects Consequences. The Lakeview Reeder Fuels Project occurs within several larger watersheds and some of there subwatersheds, to re-iterate these include: Granite, Reeder, Fedar, Boulder and Kalispell Creeks.

A complete description of relevant past, present, and foreseeable actions related to the cumulative effects to fisheries resources can be found in Appendix B - Cumulative Effects and the hydrology report. The

[78] The 150 foot distance is based upon the site potential tree height for the Kalispell watershed, in accordance with Forest Plan direction (USDA Forest Service 1995).

following activities have significantly affected either or both bull trout and westslope cutthroat trout populations within the cumulative effects area.

- Fire suppression beginning after 1910 has altered one of the primary renewal processes for productive fish habitat, particularly where man-made disturbances, like road building and home development, have also occurred. Although we cannot quantify the loss of productivity, it is a persistent pressure that affects the quality of fish habitat.
- Snagging operations and post 1926 fire salvage logging removed a significant quantity of potential LWD recruitment that would have fallen into streams, (particularly Kalispell Creek), and provided high quality habitat that would have aided in a more rapid recovery of fish populations following the large wildfires. Wide scale salvage logging is not planned for the near future on federal or private lands.
- Most timber harvests prior to 1970, whether on private or National Forest lands, affected fish habitat by different means. Logging systems, road construction, and inadequate riparian buffers contributed significant quantities of sediment to streams to the point that some streams in the project area still suffer from altered composition and higher than natural levels of bedload, which in turn reduced the quantity and quality of habitat available for fish. Along the larger streams, like lower Granite, streamside shading and thus stream temperatures are still recovering from the loss of large, full crown trees that used to line the riparian areas. These large trees also provided sources of large woody debris that provide and maintain high-quality fish habitat. Those trees were well over 200 years old and only time will provide for recovery of that component. Riparian areas are now protected from such disturbances on federal land and management is expected to continue on that theme.
- Road construction and presence of forest road networks are some of the primary watershed level impacts with a negative relationship to the occurrence of bull trout in a particular watershed. Roads have also negatively affected native cutthroat trout. The effects of roads, as well as their use and maintenance, to fish habitat is primarily related to the higher levels of fine sediment found nearby that degrades spawning and rearing habitat; and loss of access to habitats where road-crossings block fish passage. Both of these problems persist within the cumulative effects area. Current road construction is limited and incorporates design considerations that minimize riparian impacts, including the number of stream crossings.
- Several activities throughout the past century have removed woody debris from streams and include: narrow gauge railroad (Kalispell Cr), log flumes, stream transport of logs, salvage logging, and stream cleaning with intent to improve fish passage where debris jams occurred. The present state of fish habitat in Granite, Reeder, and Kalispell watersheds is below the desired level of large woody debris largely as a result of those past actions.
- As previously described, non-native fish introductions and continued presence within Priest Lake and the three potentially affected watersheds (Granite, Reeder, and Kalispell Creeks) is perhaps the single most limiting factor hindering the recovery of bull trout and westslope cutthroat trout. Future introductions of non-native fish may occur, but are certainly not planned. At this time, unknown negative interactions with other non-native fish species (e.g., smallmouth bass *Micropterus dolemieu*) may be discovered that also hinder the recovery of native fish. Non-native fish issues are primarily managed by the State Fish & Game Departments of Idaho and Washington and occur on both public and private lands.

The fisheries resource is particularly vulnerable to repeated or concurrent actions that add anthropogenic sediment to streams or remove large trees capable of shading streams or adding woody debris to streams. Sediment is a natural element of all streams. When a stream is in equilibrium, sediment inputs equal sediment outputs, and the stream is able to transport the sediment it receives from its watershed without

causing negative changes to its fish habitat. When sediment inputs chronically exceed sediment outputs for prolonged durations, however, negative changes to fish habitat occur that reduce reproductive output and the carrying capacity of the stream. The same scenario applies to shade and woody debris recruitment. Incremental reductions in both features result in warmer water (native bull and cutthroat trout need cold water), fewer and shallower pools, and simplified habitat (native fish need frequent, high quality pools and complex habitat).

In summary, the combined effects of all past, present, and future actions together with the effects of Alternative 2, would not have a significant effect on the fisheries resources, fish habitats, or native fish populations. Although some short-term impacts to fish may occur as a result of culvert installation on new roads, watershed improvements to road networks, upgrading culverts, and decommissioning roads, the long-term benefits to fish habitat as a result of implementing Alternative 2 would exceed the negative effects.

Determination of Effect for Sensitive Species

The westslope cutthroat trout is designated as a Sensitive Species by the Regional Forester, and is the management indicator species for fisheries changes in the Idaho Panhandle Forest Plan (USDA Forest Service 1987). Bull Trout is listed as Threatened under the ESA and is listed as a management indicator species under the IPNF Forest Plan (USDA Forest Service 1987). A biological assessment and evaluation has been incorporated into this project where effects to each fish and their habitat have been summarized. The following paragraphs summarize the determination of effects for each alternative for westslope cutthroat and bull trout.

Alternative 1

Existing roads would receive maintenance based on monies and on a rotational basis. No road reconstruction or fish barrier upgrades/replacement work would occur, unless accomplished under separate NEPA analysis, provided funding would even become available. Riparian roads planned for decommissioning would persist, which would result in continued effects from lack of canopy development, large woody debris recruitment, sediment delivery, and solar radiation input. Also, in the watersheds analyzed, incremental increases in woody debris recruitment, habitat complexity, and water temperatures are likely to occur over the next decade as insects and disease continue to kill scattered pockets of trees in RHCAs.

If high severity fire does not burn the area or only burns a very small area, fish habitat and populations are likely to remain near their existing condition. Reciprocally if a severe and intense fire burned in the watersheds analyzed, mass wasting potential and consequent sediment delivery could impact fish and fish habitat. Depending on the occurrence and extent of high severity fire in the project area in the future, no action could result in determination calls that cover the entire spectrum. One cannot predict the future fire behavior in the watersheds analyzed, but this alternative does nothing to change the fire condition (Level 3) that currently exists and the attributes that comprise its determination. The No Action Alternative has a maintained affect on fish and fish habitat, no effect on westslope cutthroat and bull trout.

Alternative 2

Under Alternative 2, the direct and indirect effects of increased sediment yield, peak flows, and water yield combined with the effects from past, present and reasonably foreseeable activities would not result in cumulative effects that would change the existing condition for fish and fish habitat in Granite, Reeder, Kalispell, and Boulder Creeks. The modeled increases of these are within the historic range of variability for magnitude, intensity and duration when compared with estimates for past natural events. The effects of Alternative 2 would be consistent with what likely occurred within the natural variability of such

events for sediment yield, peak flow, and water yield increases (see Hydrology – Alternative 2 Cumulative Effects).

In general, there would be long-term (4-8 years) benefits to fisheries with the implementation of road decommissioning, pipe removals, upgrades, road reconstruction, instream fish habitat improvements, and fuel reduction. Based on the direct and indirect effects discussed, the risk of any sediment delivery actually reaching a live channel is relatively low, however is existent. Consequently if Alternative 2 is selected, the potential short-term increase in sediment, peak flow, and water yield, **may affect individual westslope cutthroat trout, but would not lead toward a trend in federal listing** and for bull trout **may affect, but is not likely adversely affect threatened bull trout or designated critical habitat (NLAA)**. Any increases in water yield or peak flow changes would be localized and would not be measurable in fish-bearing channels.

Monitoring

Standard implementation and BMP monitoring would be performed by fisheries staff for those actions with the greatest potential to damage habitat (road work at stream crossings). In addition, monitoring would be performed where RHCA buffers are treated to track the measured changes in canopy closure, streamside shade, and stream temperatures middle reaches of Kalispell Creek, Indian Creek and tributaries to Reeder Creek, where limited timber treatments are planned within the Riparian Habitat Conservation Area.

Compliance with the Forest Plan and Other Regulatory Direction

Consistency with the Idaho Panhandle National Forests Forest Plan

The proposed action meets the requirements of the IPNF Forest Plan for fisheries resources, as amended by the Inland Native Fish Strategy. Specific requirements and how this project meets them are listed below.

Fish Standard 1:

Activities on National Forest lands will be planned and executed to maintain existing water uses. Maintain is defined as “limiting effects from National Forest activities to maintain at least 80 percent of fry emergence success in identified fishery streams.” The percent is measured from pristine conditions. Current methodology will not detect an impact of less than 20 percent. During the life of the plan, new technologies may permit more precise assessments; however, the goal of this standard will remain as “to maintain 80 percent of fry emergence success.

Fish Standard 2:

Streams providing spawning and rearing habitat, which are considered critical to the maintenance of river and resident populations of special concern “high value streams”, will be managed at a standard higher than the 80 percent standard. Monitoring will be needed to detect this higher standard.

The IPNF Forest Plan contains standards for fry emergence that are no longer valid since the Inland Native Fish Strategy (USDA Forest Service 1995) was developed. On June 2, 2005, the Forest Supervisor for the Idaho Panhandle National Forests signed a Decision Notice and Finding of No Significant Impact that amended the Forest Plan to modify or remove objectives, standards and monitoring requirements pertaining to fry emergence success (IPNF 2005). The amendment was implemented because the fry emergence objectives, standards and monitoring requirements in the IPNF Forest Plan were inferior to the INFS objectives, standards, guidelines and monitoring direction for meeting the goals of providing sufficient habitat in support of maintaining diverse and viable populations of fish species across the forest. In addition, because of the limited application of the fry emergence models and their unreliability, and the

inability to determine fry emergence success in the field due to high variability affected by multiple natural and human-caused factors, the Forest Service was not able to state with any degree of certainty whether measures for fry emergence success were accurate or precise.

Fish Standard 3:

The stream and river segments (if listed) will be managed as low access fishing opportunities to maintain a diversity of fishing experiences for the public and to protect sensitive fish populations. Special road management provisions will be used to accomplish this objective.

Blacktail Creek is the only stream listed for low access within the Lakeview Reeder area. This project would have no effect on this stream or access to the fishable portions of the stream. For all other areas, Forest Plan standard 3 is not applicable to this analysis because no other streams in the Lakeview Reeder Project Area are listed as "low access fishing streams."

Fish Standard 4:

Provide fish passage to suitable habitat areas, by designing road crossings of streams to allow fish passage or removing in-stream migration barriers.

Within the Lakeview Reeder Project Area, known fish barriers were identified through surveys, and planned activities include the removal or replacement of known barriers with culverts that do not intrude fish passage (See Habitat Fragmentation Section). This objective does apply to the Lakeview Reeder Project Area.

Fish Standard 5:

Utilize data from stream, river, and lake inventories to prepare fishery prescriptions that coordinate fishery resource needs with other resource activities. Pursue fish habitat improvement projects to improve habitat carrying capacities on selected streams.

Information was utilized from stream inventories, field reviews, historical records, aerial photographs, analysis of watershed conditions, published scientific literature, discussions with Fisheries Biologists and electrofishing/stocking data from the Idaho Department of Fish and Game, and the U.S. Fish and Wildlife Service.

INFS Amendment Standards and Guides:

TM – 1 Prohibit timber harvest… in Riparian Habitat Conservation Areas.

All harvest units and harvest activities, including yarding and yarding corridors, will occur outside of RHCAs for fish-bearing, perennial non-fish bearing, and intermittent/seasonal streams as well as small wetlands. Units 125, 44 72 and 4 occur within the RHCAs, but have been designed so as not to prevent attainment of RMOs. RHCA boundaries will be verified by a biologist and/or hydrologist with the cooperation of timber crews during unit layout.

RF – 2 For each existing or planned road, meet the Riparian Management Objectives and avoid adverse effects to inland native fish by:

b. minimizing road and landing locations in RHCAs

Access to units minimizes new road construction and utilizes existing road prisms on the landscape. The new permanent road that would cross RHCAs are designed for seasonal use, following sections of streams far up the hillside, so as to minimize surface erosion and landslide risks.

c. initiating development and implementation of a Road Management Plan or a Transportation Management Plan. At a minimum, address the following items.

2. Road management objectives for each road.

A Road Analysis Procedure (RAP) was performed for those roads being used within the project area to determine if they are still needed or could possibly be decommissioned (Project File – RAP Spreadsheet). For those existing roads which would be used for the project, engineers would determine specific required maintenance needs at the time of the sale package preparation, including those design features included in both the Fisheries and Hydrology reports. Roads unneeded for short-term access following the project, over which the FS has sole control have been identified and would be rendered hydrologically inert (road storage) after the project. Many of these road closures would also help to meet grizzly bear standards.

5. Regulation of traffic during wet periods to minimize erosion and sediment delivery and accomplish other objectives.

Operational controls have been established and will be accounted for in the Timber Sale Contract to meet this standard.

d. avoiding sediment delivery to streams from the road surface.

Operational controls, special management of riparian zones, road drainage improvements, and road surface treatments have been incorporated into this project to meet this standard.

RF – 3 Determine the influence of each road on the Riparian Management Objectives. Meet Riparian Management Objectives and avoid adverse effects on inland native fish by:

a. reconstructing road and drainage features that …do not retard attainment of Riparian Management Objectives.

Road reconditioning and drainage improvements would be made to the 2231, 1356, and 308 road systems, particularly where roads cross stream courses to reduce inputs of road-derived sediments into streams and reduce negative impacts to fish.

c. closing and obliterating roads not needed in the future based on the ecological value of the riparian resources.

Approximately 25.5 miles of road in the immediate vicinity of the Lakeview Reeder Project Area, regardless of use, would be rendered hydrologically by the end of this project.

FM – 1 Design fuel treatment…actions so as not to prevent attainment of Riparian Management Objectives, and to minimize disturbance of riparian ground cover and vegetation.

Most fuels treatment units for this project do not treat RHCAs and should not indirectly affect the capacity of RMO attainment within the RHCAs. Units 125 and 126 are designed, based on the management direction of INFS, to not prevent the attainment of RMOs for Kalispell Creek.

National Forest Management Act (NFMA)

Fish species that may be affected by the project (bull trout, westslope cutthroat trout, and rainbow trout) are also distributed across the Forest. For example, bull trout and rainbow trout are found in 8 of 13 (61 percent) 4th code HUC watersheds (i.e. large watersheds, such as Priest River Basin) on the IPNF. Cutthroat trout currently occur in 100 percent of 4th code HUC watersheds on the Forest. There is

seasonal connectivity between the Priest River watershed upstream of Outlet Dam, which includes Granite Creek and Kalispell creek, and the Lower Priest River, Pend Oreille River, and Lake Pend Oreille.

At the smaller watershed scale (e.g. Granite and Kalispell Creeks, 6th code HUC watersheds), bull trout are known to inhabit approximately 80 percent of the watersheds in the Kootenai River drainage, while westslope cutthroat trout and rainbow trout occur in approximately 100 percent .

Based on the distribution of species across the Forest, the lack of connectivity between large watersheds, the limited cumulative effects area (i.e., majority of effects are limited to the lower portions of Kalispell and Reeder Creeks watersheds), and the negligible short-term effects and potential beneficial long-term effects on these species and their habitat, the Lakeview Reeder project would not affect the viability of any threatened, endangered, sensitive or MIS fish species on the IPNF.

Endangered Species Act

The proposed action meets the requirements of the Endangered Species Act. The project may affect, but is not likely to adversely affect threatened bull trout, and would not jeopardize their continued existence. There is no designated critical habitat for bull trout within the cumulative effects area.

Rules Pertaining to the Idaho Forest Practices Act (Title 38, Chapter 13, Idaho Code, 2000)

Alternative 2 would meet all of the relevant provisions of IFPA.

Executive Order 12962 (Recreational Fishing)

The proposed action is consistent with this executive order regarding aquatic systems and recreational fisheries. Short-term effects may affect westslope cutthroat trout individuals, but would not lead toward a trend in federal listing. Long-term effects (i.e., net reduction in sediment) are expected to benefit bull trout and westslope cutthroat trout survival and habitat.

State of Idaho Governor's Bull Trout Plan

The proposed action is consistent with the direction in the Governor's Bull Trout Plan. Long-term effects from the decommissioning of roads with known sediment sources are expected to benefit bull trout and their habitat.

3.7 Botany

Threatened, Endangered and Sensitive Plants and Forest Species of Concern (Rare Plants) – Affected Environment

Regulatory Framework

Federal legislation, regulations, policy, and direction require protection of species and population viability, evaluation and planning-process consideration of threatened, endangered, and other rare plant species. The regulatory framework for these plants includes the Endangered Species Act (1973) as amended; the National Forest Management Act (NFMA) (1976); the National Environmental Policy Act (1969); Forest Service Manual (2672.1-2672.43); Idaho Panhandle National Forests (IPNF) Forest Plan (1987); and direction from the Regional Watershed, Wildlife, Fisheries and Rare Plants (WWFRP) program and Washington Office.

Introduction

There are no federally listed endangered plant species suspected to occur in the Idaho Panhandle National Forests (USDI 2007). The US Fish and Wildlife Service (USDI 2007) currently lists no Threatened plant species as suspected to occur in Bonner County, Idaho, in which the Lakeview Reeder project area occurs.

Sensitive species are determined by the Regional Forester as those species for which population viability is a concern, as indicated by a current or predicted downward trend in population numbers or habitat capability that would reduce the species' existing distribution. Several Forest species of concern are also considered; while they are generally not at risk on a rangewide, regionwide or state level, they may be imperiled at the National Forest level. Seventy-seven sensitive plant species and Forest species of concern are known or suspected to occur in the Kaniksu portion of the IPNF, which encompasses the Lakeview Reeder project area.

Rare plants may be assigned to one or more habitat guilds. These guilds are artificial assemblages based on similar habitat requirements and are used to streamline analysis. A list of rare plant species by habitat guild and descriptions of the guilds are included with the rare plants report in the project file.

Pre-field Review and Field Survey Results

Assessment of rare plants and suitable habitat occurrence was accomplished through review of Idaho Department of Fish and Game Conservation Data Center element occurrence records (ICDC 2005), National Wetlands Inventory maps, queries of the timber stand data base (TSMRS), aerial photographs and topographical maps, rare plant surveys completed in 2007, personal knowledge and professional judgment of the North Zone Botanist.

Many previously documented rare plant occurrences are known within the project area. Rare plant surveys were conducted for this project in 2007. Intensive surveys targeted highly suitable habitat within or adjacent to proposed harvest units. Cursory surveys were conducted in other proposed units to assess the potential for sensitive plant occurrence and to identify small microsites that could support sensitive plant species. The following new rare plant occurrences were identified during the field surveys:

Botrychium minganense, B. montanum, B. lanceolatum ssp. lanceolatum, Trientalis europaea ssp. arctica, Petasites sagittatus, Lycopodium dendroideum, Rubus spectabilis, Hypericum majus, Carex flava, and *Symphytotrichum boreale*

Complete results of the field surveys are included in the project file.

Species Screen

The Council on Environmental Quality (40 CFR 1502.2) directs that impacts be discussed in proportion to their significance. Table 3-62 below displays the level of analysis for rare plants.

No endangered plant species are suspected to occur in the IPNF, and no threatened plant species are suspected to occur in Bonner County (USDI 2007). Federally listed plant species will not be discussed further. Other rare plant species and habitats not found in the project area will not be discussed in this EIS. These include the deciduous riparian, subalpine, cold forest and dry forest habitat guilds.

Other habitats and/or species in the project area would not be impacted by the proposed activities either because the activities would not occur in or near the species' habitat or through project design. These include the aquatic and peatland guilds. No activities would occur near aquatic habitats. No activities would occur within the site boundaries of Hager Lake fen, Potholes RNA or Packer Meadows, and only three acres of hand piling would occur within the site boundaries of Bismark Meadows (Lichthardt 2004). Other, smaller peatlands would be protected according to guidelines in the Conservation Strategy for Idaho Panhandle Peatlands (Lichthardt 2004). For these reasons, the aquatic and peatland guilds will not be discussed further. See the rare plants report in the project file for a detailed discussion of peatland habitats in the project area.

Table 3-62. Rare plant species and habitats analyzed

	No detailed discussion and analysis is necessary for species or habitat not present within the affected area. Rationale for no further analysis for these species is in the project file.	***Supporting rationale is presented in this section for those species and/or habitat present but not affected by the proposed activities or no action. No detailed discussion and analysis is necessary.***	***Species and/or habitat considered present and potentially affected by the proposed activities or no action are carried forward into a detailed discussion and analysis.***
Federally Listed Species			
Howellia aquatilis	X		
Silene spaldingii	X		
Region 1 Sensitive Species/Forest Species of Concern			
Deciduous riparian guild species	X		
Cold forest guild species	X		
Subalpine guild species	X		
Dry forest guild species	X		
Aquatic guild species		X	
Peatland guild species		X	
Wet forest guild habitat			X
Moist forest guild habitat			X
Lycopodium dendroideum			X
Botrychium species			X
Cypripedium fasciculatum			X
Orobanche pinorum			X

Species or habitat considered present and potentially affected by the proposed activities are carried forward into a detailed discussion and analysis in the Environmental Consequences Section.

Species and Habitats that May be Affected by Project Activities

Moist Forest Guild Habitat: Although all previously documented occurrences of rare moist forest guild species and new occurrences identified during field surveys for this project would be excluded from project activities, microsites of suitable habitat that could support these species were confirmed in some proposed treatment units. All documented occurrences of **rare moonworts (*Botrychium* species)** would be excluded from project activities. However, some rare moonworts may not have been detected during the surveys, as they do not always appear aboveground every year. In addition, microsites of suitable habitat for rare moonworts occur in some proposed treatment units. Approximately 637 acres of marginally to moderately suitable moist forest habitat for moonworts occur in proposed treatment areas. Therefore, this analysis will consider the potential effects of the proposed treatments on moonworts and on habitat for other moist forest guild species.

Wet Forest Guild Habitat: Highly suitable wet forest habitat identified during the field surveys in proposed vegetation treatment areas has either been dropped from proposed treatment or would be protected by site-specific buffers established by a qualified botanist during project layout (see Chapter II). However, improvements to fish passage on Fedar Creek, Packer Creek and Zero Creek may impact a small amount of suitable wet forest habitat. Therefore, this analysis will consider the effects of the action alternative to this habitat.

Groundpine (*Lycopodium dendroideum Michaux*): Occurrences of groundpine were previously documented in the project area, and additional occurrences were identified during field surveys for this project. Groundpine spreads both by rhizomes and by spores. In the IPNF, this rare clubmoss occurs most frequently in mid-seral, moist, wet or cold forest stands and in the forested edges of wetland habitats. The species is circumboreal and occurs across Canada, southern Alaska and the northern contiguous United States, as well as in Asia.

Williams (1990) describes groundpine as a mid-seral species that declines in very old stands; several groundpine populations are documented in second growth or partially logged forests (Penny 1996). Previous monitoring (Penny 1996) and anecdotal observations indicate that groundpine is susceptible to heavy ground disturbance and increased insolation resulting from canopy removal. Fire generally kills the above ground portions as well as rhizomes in the litter layer, but if underground rhizomes survive, the plant may recover after a burn (Chapman and Crowe 1981). All documented occurrences of groundpine would be protected from project activities. However, there is the potential for No Action to affect this species; therefore, groundpine will be discussed in detail.

Clustered lady's slipper (*Cypripedium fasciculatum* Kell.): This rare orchid occurs in two disparate habitats – moist cedar/hemlock forest and dry Douglas-fir/grand fir forest. In the Lakeview Reeder project area, the highest potential habitat for the species is in Douglas-fir/grand fir forest. Although no occurrences are documented in the project area, suitable habitat for this species occurs in proposed treatment units. Approximately 184 acres of suitable habitat for clustered lady's slipper occur in proposed treatment units. Therefore, this analysis will consider the effects of the proposed treatments to suitable habitat for this species.

Pine broomrape (*Orobanche pinorum* Geyer): Pine broomrape is a non-chlorophyllous member of the family Orobanchaceae. While once believed to be parasitic on the roots of various conifers (Hitchcock et al. 1959), recent research (Ellis et al. 1999) and anecdotal field observations suggest instead that the exclusive host plant is oceanspray (*Holodiscus* spp., in particular *Holodiscus discolor* [Pursh] Maxim.). Pine broomrape is endemic to western North America, where it occurs in scattered locations from

northern California through Oregon, and in central and northeastern Washington and extreme north Idaho. It is found in mesic to dry grand fir and Douglas-fir habitats. Little is known about the species' ecology or the mechanism of parasitism between it and its host. Although no occurrences are documented in proposed treatment units, suitable habitat does occur. Approximately 184 acres of suitable habitat for pine broomrape occur in proposed treatment units. Therefore, this analysis will consider the effects of the proposed treatments to suitable habitat for this species.

Threatened, Endangered and Sensitive Plants and Forest Species of Concern (Rare Plants) –Environmental Consequences

Methodology

Analysis was conducted based on the results of rare plant surveys, current population distribution of rare plant species in the project area, the most current scientific literature, and professional judgment of the project botanist. Methodology for cumulative effects analysis is discussed below in the Cumulative Effects section.

The issue indicator for analysis of effects to sensitive and rare plants is the relative amount of canopy opening and/or ground disturbance in and adjacent to documented rare plant occurrences and/or suitable rare plant habitat. The issue indicator was determined based in part on the affinity of moist forest guild rare moonworts for relatively closed-canopy conditions (ICDC 2007) and their dependence on soil mycorrhizae, which may be destroyed during ground-disturbing activities. Effects of proposed treatments on soil mycorrhizae are also considered in the effects analysis for clustered lady's slipper.

Direct and Indirect Effects

Direct and Indirect Effects of Alternative 1 – No Action

This section describes predicted direct and indirect effects to rare plants from Alternative 1 that differ from effects expected under Alternative 2.

Management activities would not change from current levels, and current trends, including increased fuel loading and cycles of tree mortality from root disease and insects would be expected to continue. No direct impacts to any rare plants would occur from implementation of this alternative.

Indirectly, the continued increase in fuel loading could pose a threat to suitable rare plant habitat in the context of a higher risk of stand replacing fires. Such fires could extirpate the documented occurrences of groundpine, documented and/or undetected rare moonworts, arrowleaf coltsfoot and other rare plants in the project area. Habitat suitability for rare moonworts and clustered lady's slipper may be reduced if fire intensity is sufficient to destroy soil mycorrhizae on which these species depend (Allen 1991). In addition, oceanspray, the preferred host plant for pine broomrape, could be at least temporarily reduced in cover by a high-intensity fire (Crane and Fischer 1986).

Direct and Indirect Effects of Alternative 2 – Action Alternative

Under Alternative 2, stands with **wet forest** habitats that support boreal aster, lance-leaved moonwort, salmonberry and groundpine were dropped from proposed treatment. The occurrences of Mingan moonwort and western goblin in proposed treatment areas would be buffered from all project activities. The buffers would be site-specific and would be established by a qualified botanist. No direct or indirect impacts to these occurrences or their habitats would occur. In addition, unoccupied microsites of highly suitable wet forest habitat would be buffered from all project activities (see Design Features above). No direct or indirect impacts to such microsites would occur.

Improvements to fish passage on Fedar Creek, Packer Creek and Zero Creek may impact a small amount of suitable wet forest habitat where ground disturbance would occur. Any impacts would be localized and would be temporary in nature.

Although the known rare **moonwort** occurrences would be protected, undetected individuals may be directly impacted by project activities. Ground-based harvest could disrupt soil mycorrhizae in suitable habitat for rare moonworts. Because potential for occurrence of rare moonworts in most proposed treatment areas is marginal at best, and because highly suitable wet microsites within proposed treatment areas would be protected by project design (see Design Features in Chapter II), loss of undetected individuals is unlikely and would be considered incidental.

Indirectly, there could be a risk of prescribed fire impacting marginally suitable habitat for rare moonworts. The extent of risk would depend on many factors, including timing of the burn, phenology of the plant species involved and occurrence of abnormally wet or droughty conditions at the time of the burn.

There have been a few studies of fire disturbance in *Botrychium* populations. Johnson-Groh and Farrar (1993) found that fire affects the aboveground fronds of *B. simplex*, but the population being studied appeared to be resilient even with particularly hot fires that desiccated the soil. The loss of photosynthetic capacity the year of the fire was considered equivalent to non-emergence for a year, and the fire might be considered a minor disturbance. However, as a secondary effect with other stress disturbances, loss of population vigor or population decline may result (Johnson-Groh and Farrar 2003, Johnson-Groh and Farrar 1996). While many documented Botrychium occurrences show evidence of previous fire, a study of historical documentation of the type and periodicity of such fires has not been undertaken.

Prescribed fires have the potential to emulate wildfire effects but with the advantage of management considerations of scale, timing and intensity. Timing of prescribed fire is essential, with burning recommended either prior to plant emergence or after spore maturity (Weldon et al. 2001, Johnson-Groh and Farrar 1989). In the Kaniksu portion of the IPNF, rare moonworts have been found to emerge aboveground in early to mid-June at the earliest (Hammet personal observations 1991-2007). This is well after the period in which prescribed spring burning would occur (Lux personal communication 2006). Conversely, fall burning typically occurs well past spore maturity for most rare moonworts (Hammet personal observations 1991-2007).

Based on the best available knowledge, the risk of indirect impacts to undetected rare moonwort individuals from prescribed fire under the proposed action would be very low.

No occurrences of **clustered lady's slipper** were found in any proposed activity areas. No direct, indirect or cumulative impacts to this species would occur. Only a small amount of suitable habitat for this species occurs in proposed harvest units. Most suitable habitat for this species occurs in proposed ecosystem or wildlife burn units.

The proposed treatments are consistent with natural disturbance regimes in the Douglas-fir/ninebark habitats that support clustered lady's slipper in northern Idaho. Stand structure and landscape pattern in regions where the species occurs in Idaho and Montana have historically been determined by fire. In Montana, clustered lady's slipper occurs primarily in Douglas-fir/ninebark and grand fir/ninebark habitat types that historically experienced low- to moderate-intensity surface fires on an interval of ten to thirty years (Lichthardt 2003). Following fifty or more years of fire suppression, stands in these habitat types are now more densely stocked and have greater canopy closure, increasing the probability of severe, stand-replacing fires that could reduce the availability of suitable habitat, both in terms of canopy removal and adverse soil and ground-layer effects (Lichthardt 2003). The proposed action would, to some degree, trend the treated areas toward historical conditions would reduce the risk of large, stand-replacing fires.

No occurrences of *pine broomrape* were discovered during the surveys. The amount of suitable habitat for this species is essentially the same as for clustered lady's slipper. The impacts of the proposed treatments to suitable habitat for this species cannot be predicted with certainty because the species' ecology is poorly understood. However, the proposed treatments would likely enhance oceanspray, which is the preferred host species. Oceanspray is considered to be well adapted to disturbance by fire, usually responding to a low-intensity burn by root crown and rhizome sprouting (Young 1983). The proposed action would, to some degree, trend the treated areas toward historical conditions would reduce the risk of large, stand-replacing fires.

Approximately 24 miles of existing road would be decommissioned, five miles of existing road would be reconstructed, four miles of new permanent road and 0.4 mile of new temporary road would be constructed. No rare plants were found on any of the roads to be decommissioned or in the proposed routes for new temporary or permanent construction.

Cumulative Effects

For analysis of proposed vegetation treatments and associated road work, the cumulative effects area for rare plants is the project area. This area represents the likely limit of effects to rare plant populations from implementation of the action alternative. Those limits are largely based on the expected distance of spore or seed dispersal and potential for colonization of rare plant populations in areas of suitable habitat. While patterns of dispersal are not known with certainty for many plant species, in studies of Botrychium virginianum most spores fell within three meters of the source plant (Peck et al. 1990). Other sensitive species' seeds that are heavier than Botrychium spores might be assumed to have similar if not more restricted dispersal patterns.

For the same reasons, analysis of proposed road decommissioning, reconstruction and new construction and improvements to fish passages outside the project area for vegetation treatments includes the areas proposed for ground disturbance as part of those activities.

Cumulative effects to rare plant species and suitable habitat from proposed activities are generally described as very low, low, moderate or high, with the following definitions:

- very low = no measurable effect on individuals, populations or habitat
- low = individuals, populations and/or habitat not likely affected
- moderate = individuals and/or habitat may be affected, but populations would not be affected, and habitat capability would not over the long term be reduced below a level which could support sensitive plant species
- high = populations would likely be affected and/or habitat capability may over the long term be reduced below a level which could support sensitive plant species

The following past, current, ongoing and reasonably foreseeable events apply to the cumulative effects analysis for rare plants:

Past Activities and Events

- Wildfires (1890-1968)
- Mining (1890-early 1900s)
- Timber harvest on NFS lands before 1990(9,920 acres)
- Timber harvest on NFS lands after 1990 (2,149 acres)
- Timber harvest on private lands (4,397acres)

- Road construction
- Wildfire suppression
- Residential development on private lands

Current and Ongoing Activities

- Road and trail maintenance
- Helispot maintenance
- Timber harvest on private lands
- Defensible space mitigation on private lands
- Wildfire suppression
- Residential development on private lands

Reasonably Foreseeable Actions

- Noxious weeds monitoring and treatment

The period for measuring short-term cumulative effects to rare plants and suitable rare plant habitat is ten years following completion of harvest and other restoration projects, or, in the event of selection of the No Action alternative, ten years after the date of the signing of the Record of Decision. Beyond ten years, the likelihood of events or activities affecting rare plants and suitable habitat would be difficult to predict.

Cumulative Effects Common to Alternatives 1 and 2

The following activities, when combined with either the No Action or the Action Alternative, would result in the same cumulative effects to rare plants.

Past Activities and Events

Past wildfires, mining, timber harvest on NFS lands and road construction may have affected documented occurrences of rare plants and/or rare plant habitat through ground and vegetation disturbance and canopy removal. Few floristic surveys were conducted on National Forest lands before 1990, so the extent of and effect on rare plant populations of older projects is unknown. Timber harvest on National Forest lands after 1990 occurred with protections for documented occurrences of rare plants.

Timber harvest and residential development on private lands likely affected rare plants and suitable rare plants habitat, although the extent of such effects is unknown.

Current and Ongoing Activities

Road, trail and helispot maintenance activities would occur in areas with low suitability as rare plant habitat. Therefore, no effects to rare plants or suitable habitat are expected to occur.

Timber harvest, residential development and defensible space mitigation on private lands may continue to impact rare plants and suitable rare plant habitat, but the effects of such activities are unknown.

Reasonably Foreseeable Actions

Weed treatment and monitoring would follow guidelines established in the Priest Lake Noxious Weeds Control Project EIS (USDA 1997). Effects to rare plant species were analyzed in that document. No effects to rare plants beyond those described in that EIS are expected to occur.

Determination of Cumulative Effects

When combined with the above activities and events, neither alternative would be expected to contribute cumulative effects to rare plants – under No Action, there would be no change in current management practices, and under the Action alternative, protection measures described in Chapter II would preclude effects to documented rare plant occurrences.

Cumulative Effects of Alternative 1 - No Action

When combined with the following past, current and ongoing activities and events, Alternative 1 has potential cumulative effects to rare plants that differ from those of Alternative 3. All other cumulative effects of this alternative are described above under Cumulative Effects Common to Alternatives 1 and 3.

Past Activities and Events

Past wildfire suppression in the project area has increased the risk of severe stand-replacing fires (see Fire/Fuels analysis). Implementation of no action would not address these accumulated fuels in the project area.

Current and Ongoing Activities

Ongoing wildfire suppression in the project area would increase the risk of severe stand-replacing fires (see Fire/Fuels analysis). Alternative 1 would contribute to the continued accumulation of fuels in the project area.

Determination of Cumulative Effects

When combined with the effects of past and ongoing fire suppression, implementation of no action would further increase the risk of severe stand replacing fires. Should such a fire occur, it may impact populations and/or reduce habitat suitability for groundpine, rare moonworts, clustered lady's slipper and pine broomrape, at least temporarily. The habitats that support arrowleaf coltsfoot and salmonberry may also be impacted by severe wildfire, particularly if such a fire were to occur after several years of drought sufficient to dry out these habitats. No action could have low, moderate, or high cumulative effects to these species and/or habitats, depending on where a fire occurs and how severe it is. However, the occurrence and intensity of a future wildfire in suitable habitat for these species would be difficult to predict.

Cumulative Effects of Alternative 2

When combined with the following past, current and ongoing activities and events, Alternative 2 has potential cumulative effects to rare plants that differ from those of the No Action alternative. All other cumulative effects of this alternative are discussed above under Effects Common to Alternatives 1 and 2.

Past Activities and Events

Past wildfire suppression in the project area may have increased the risk of severe stand-replacing fires. Alternative 2 would reduce accumulated fuels from decades of wildfire suppression.

Current and Ongoing Activities

While wildfire suppression would continue in order to protect adjacent private property values, water quality and other resource values, the proposed treatments would increase the ability to safely use prescribed fire, periodically reducing fuel loads, and to suppress unwanted wildfires. When combined with the proposed action, ongoing wildfire suppression would decrease the probability of severe stand-replacing fires. There would therefore be a lower risk of severe fire effects to occurrences of and/or suitable habitat for sensitive moonworts, groundpine, pine broomrape and clustered lady's slipper than under no action.

Determination of Cumulative Effects

Based on the above considerations, and with the design features described above, no cumulative impacts to any documented **wet forest** rare plant occurrences or their habitats would be expected to occur with implementation of Alternative 2. Reducing the risk of stand-replacing fires and improving the ability to control unwanted fires could have long-term benefits for these habitats and the rare plants that they support. Because a small amount of unoccupied suitable wet forest guild habitat may be impacted during improvement of fish passage on Fedar, Packer and Zero Creeks, cumulative impacts to wet forest guild habitat would be expected to be low to moderate.

Cumulative impacts to **clustered lady's slipper** and **pine broomrape** would be very low to low since these species were not found in the project area. The proposed treatments are compatible with natural disturbance regimes in these species' habitat (see above). Reducing the risk of stand-replacing wildfires and improving the ability to control unwanted fires may have long term benefits to habitat for these species.

Based on the above analysis and given the design features described above, cumulative impacts to rare **moist forest moonworts** under this alternative would be low (individuals, populations and/or habitat not likely affected) to moderate (individuals and/or habitat may be affected, but populations would not be affected, and habitat capability would not be reduced over the long term below a level that could support the species). Reducing the risk of stand-replacing wildfires and improving the ability to control unwanted fires may have long term benefits to habitat for these species.

Because all documented occurrences of and highly suitable habitat for **groundpine** would be protected by project design (see Design Features above), no cumulative impacts to this species would be expected to occur. The proposed treatments could provide long-term benefits to this species by reducing the risk of widespread stand-replacing fire and improving the ability to control unwanted fires.

Consistency with the Forest Plan and Other Regulations

A Forest Plan management goal is to "manage habitat to maintain populations of identified sensitive species of animals and plants" (Forest Plan, II-1). A Forest Plan standard for sensitive species is to "manage the habitat of species listed in the Regional Sensitive Species List to prevent further declines in populations which could lead to federal listing under the Endangered Species Act" (Forest Plan, II-28). This standard meets the requirements of the National Forest Management Act (NFMA) of 1976, Section 6(g)(3)(B), by providing for diversity of plant communities based on the suitability and capability of the specific land area.

The Forest Plan also identifies the need to "determine the status and distribution of threatened, endangered and rare (sensitive) plants on the IPNF" (Forest Plan, II-18). Floristic surveys conducted since 1989 have provided a substantial database of rare plant occurrence on the Forest.

Across the Forest, suitable habitat for sensitive plant species appears to be well distributed. Approximately 705,000 acres have been identified as having the potential to support sensitive plant species in a wide array of plant communities. To date approximately 122,003 acres (about 17 percent) of suitable habitat have been surveyed for sensitive plants.

In 1998, sensitive species trends across the Forest were qualitatively assessed (USDA 1998b, pp. 112-116). Of the sensitive plant species assessed, 11 species were considered to have fairly secure populations with stable trends and few observed threats; 28 species had mostly stable populations with some concerns and threats; and for 16 species there was a serious concern. Estimates for this assessment were based on the best information available, including known population size, distribution and threats.

The trends for sensitive moonworts ranged from stable (Botrychium lanceolatum ssp. lanceolatum [S.G. Gmelin] Angstrom) to serious concerns for population and habitat decline over time (B. montanum W.H. Wagner). The trend for clustered lady's slipper (Cypripedium fasciculatum Kell.) was characterized as being a serious concern for population and habitat decline over time. The trend for groundpine (Lycopodium dendroideum Michaux) was also identified as being of some concern.

Since implementation of the Forest Plan in 1987, impacts to highly suitable habitat for many sensitive plant species have diminished with the implementation of laws and policies protecting riparian areas, wetland and peatland habitats and policies designed to maintain old growth forests.

A conservation assessment for sensitive moonworts in the IPNF has been prepared (Evans and Associates 2005). A conservation strategy for sensitive moonworts in the IPNF is being prepared. For clustered lady's slipper, where proposed activities in the IPNF may impact the species, formal monitoring plots have been established (USDA Forest Service 2003). A conservation strategy for the species in the Northern Region has been prepared (Lichthardt 2003). A conservation strategy for peatlands in the Idaho Panhandle National Forests has been prepared (Lichthardt 2004).

At the project level, and in accordance with Forest Service Manual (FSM) 2672.1-2672.43 and NFMA Section 6(g)(3)(E)(ii), suitable habitat has been identified and surveyed and the appropriate level of analysis conducted. All documented rare plant occurrences and their contiguous habitat would be buffered from all project activities under the action alternative. Proposed activities under the action alternative are consistent with management recommendations in the conservation strategy for clustered lady's slipper (Lichthardt 2003) and the conservation strategy for peatlands (Lichthardt 2004). Protection measures for the documented moonwort occurrences are consistent with the most current scientific literature (Lichthardt 1995, Vanderhorst 1997, Johnson-Groh and Farrar 2003).

There are no federally listed threatened or endangered species suspected to occur in Bonner County, Idaho (USDI 2007). Therefore, the project is consistent with the Endangered Species Act (1973) as amended.

3.8 Noxious Weeds

Regulatory Framework

Federal legislation, regulations, policy, and direction that require development and coordination of programs for the control of noxious weeds and evaluation of noxious weeds in the planning process include the following:

- National Forest Management Act (NFMA) (1976)
- National Environmental Policy Act (NEPA) (1969)
- Forest Service Manual (Chapter 2080, as amended) (2001)
- Executive Order #13112 (1999)
- IPNF Forest Plan (1987)
- IPNF Weed Pest Management EIS (1989)
- Priest Lake Ranger District Noxious Weed Control Project EIS (1997)

The Forest Service Handbook (FSH 3409) defines a strategy for managing pests, including noxious weeds, as "a decision-making and action process incorporating biological, economic and environmental evaluation of pest-host systems to manage pest populations" (FSH 3409.11, 6/86). This strategy is termed Integrated Pest Management (IPM).

The overall IPNF strategy is to contain weeds in currently infested areas and to prevent the spread of weeds to susceptible but generally uninfested areas. The 1989 IPNF Weed Pest Management EIS describes the strategy.

Weed management activities in the district are guided by the Priest Lake Noxious Weed Control Project EIS (USDA Forest Service 1997).

Noxious weeds are those plant species that have been officially designated as such by federal, State or county officials. In Weeds of the West by Whitson et al. (1991), a weed is defined as "a plant that interferes with management objectives for a given area of land at a given point in time." The federal Noxious Weed Act of 1974 defines a noxious weed as "a plant which is of foreign origin, is new to, or is not widely prevalent in the United States, and can directly or indirectly injure crops or other useful plants, livestock or the fish and wildlife resources of the United States or the public health" (P.L. 93-629).

The Idaho Noxious Weed Law defines a "noxious weed" as any exotic plant species established or that may be introduced in the State which may render land unsuitable for agriculture, forestry, livestock, wildlife or other beneficial uses and is further designated as either a statewide or countywide noxious weed (Idaho Code 24 Chapter 22).

Both federal and state laws define weeds primarily in terms of interference with commodity uses of the land. However, the impacts of noxious weeds on non-commodity resources such as water quality, wildlife, and natural diversity are of increasing concern.

Existing Conditions

Methodology

Information on current weed infestations and results of weed management in the project area is derived from observations during field surveys for rare plants and from weed treatment records provided by the district weed technician (see project file). Information on weed species ecology is derived from the Fire Effects Information System (2007) and the most current peer-reviewed literature.

Documented Noxious Weed Infestations

Weed species that are documented in the project area include the following:

Spotted knapweed (*Centaurea maculosa*)
Orange hawkweed (*Hieraceum aurantiacum*)
Goatweed (*Hypericum perforatum*)
Canada thistle (*Cirsium arvense*)
Dalmatian toadflax (*Linaria genistifolia* ssp. *dalmatica*)
Common tansy (*Tanacetum vulgare*)
Meadow hawkweed (*Hieraceum pratense*)
Oxeye daisy (*Leucanthemum vulgare*)
Bull thistle (*Cirsium vulgare*)
Rush skeletonweed (*Chondrilla juncea*)

Most of these species were found in low to moderate densities along open roads in the project area. Rush skeletonweed and Dalmatian toadflax are present at low levels and are targeted for eradication (see Current Weed Management Activities below). Canada thistle, bull thistle, common tansy and oxeye daisy occur at low to moderate levels, mostly along road prisms.

Spotted knapweed and goatweed occur both on and off road prisms. These two species are found in drier habitats in the project area. Heavy infestations of orange and meadow hawkweed in particular occur along closed roads in the project area, and in some of these areas the weeds have spread from the road prism into the surrounding forest. Off-road hawkweed infestations are heaviest in previously harvested areas that did not have adequate weed prevention or treatment regimes during and after the harvest activities.

Noxious Weed Species of Concern in the Project Area

Spotted Knapweed (*Centaurea maculosa* Lam.) - Spotted knapweed is native to Eastern Europe. It was introduced to North America, probably as a contaminant in alfalfa seed and/or ships' ballast, in the late 1800s (Maddox 1979, Ochsmann 2001, Roche et al. 1986). In 1920, its distribution was limited to the San Juan Islands in Washington. By 1980, it had spread to 48 counties in the Pacific Northwest, and by 1998, its known range included every county in Washington, Idaho, Montana and Wyoming (Sheley et al. 1998).

Spotted knapweed is a perennial species that reproduces almost entirely from seed, although some plants extend lateral shoots below the soil surface that form new rosettes. It establishes and dominates on dry, disturbed sites, especially along roads (Roche et al. 1986). It also invades relatively undisturbed perennial native plant communities in the northern intermountain region (DiTomaso 2000).

Most studies of spotted knapweed to date have focused on its dominance of native grasslands and/or prairies (Tyser and Key 1988, LeJeune and Seastedt 2001, Ridenour and Callaway 2001). Much of spotted knapweed's dominance over native species in those habitats may be attributed in part to root allelopathy (Ridenour and Callaway 2001). Increased availability of nitrogen in what were historically nitrogen-limited habitats that favored native grass species, and the resulting creation of phosphorus and other resource limitations in grassland soils, may also be a factor in spotted knapweed's success in grassland habitats (LeJeune and Seastedt 2001). LeJeune and Seastedt (2001) hypothesize that

manipulation of soil resource availability with traditional techniques such as fire can affect the dominance of invasive species such as Centaurea in grassland habitats.

In contrast, the Lakeview Reeder project area is largely dominated by mesic to dry forested habitats with a high shrub component. Non-forested habitats comprise a small portion of the project area (see Vegetation section). While the behavior of spotted knapweed in open grassland habitats may be mostly influenced by the above biotic factors, in forested habitats tree and shrub layer canopy cover is likely a major limiting factor.

Knapweed seeds are able to germinate under full canopy, but mature plants are uncommon in shaded areas (Watson and Renney 1974); it is typically found in open canopies, sometimes up to 20 percent but most often under canopy cover of five percent or less (Allen and Hansen 1999). Both tree and shrub canopy cover have been observed to affect the abundance of spotted knapweed in forested habitats (Hammet personal observations 1999-2005).

One study considered the effects of spotted and diffuse knapweed on the growth of confer seedlings in a montane forest in southern interior British Columbia (Powell et al. 1997). The results of the study were that abundant knapweed growth did not negatively impact conifer growth and survival during the three-year study period. While Powell et al. (1997) concluded that the lack of effects to conifer seedling growth was likely due to abundant moisture levels during the study period, only the interaction between conifer seedlings and knapweed was measured - all other vegetation had been removed from the site and was cleared every season (Powell et al. 1997). Other site variables such as availability of light were therefore not considered.

The habitats in which spotted knapweed now occurs had historical fire regimes of relatively frequent, low-severity surface fires to mixed-severity fires. Spotted knapweed established in most of these habitats after fire exclusion began, so it is unclear how historical fire regimes might affect spotted knapweed or how spotted knapweed may affect these fire regimes (Fire Effects Information System 2007).

Low-severity fire typically does not kill spotted knapweed plants or seeds (Sheley and Roche 1982). According to LeJeune and Seastedt (2001), low-severity fires in grasslands may increase the availability of nutrients that would allow native species to successfully compete with spotted knapweed. Although severe burns may reduce germination of spotted knapweed seeds (Abella and MacDonald 2000), severe wildfire would probably favor expansion of knapweed by creating widespread areas of bare soil and increasing the amount of sunlight that reaches the ground surface (Arno 1999, Sheley et al. 1999).

Spotted knapweed infestations have been associated with reductions in forage production (Harris and Cranston 1979), plant species richness and diversity (Tyser 1990), soil fertility (Harvey and Nowierski 1989, Olson 1999) and wildlife habitat (Bedunah and Carpenter 1989), as well as increases in surface water runoff and stream sedimentation (Lacey et al. 1989).

Goatweed (*Hypericum perforatum* L.) - Goatweed (also known as St. Johnswort) is native to Europe, western Asia and North Africa. It was likely introduced to North America multiple times (Maron et al. 2004). The first recorded occurrence of the species in North America was from Pennsylvania in 1793; by the early 1900s it was established in many western states (Sampson and Parker 1930). Goatweed population levels were dramatically reduced following a successful biological control program begun in the 1940s in heavily infested regions of the western United States (Tisdale 1976).

Goatweed is a perennial species that reproduces both by seed and by often extensive lateral root growth that produces additional aerial crowns. In forested areas, it is commonly associated with disturbances such as roads, logging, grazing and fire. Where it occurs in forest zones in Idaho, it is abundant only in small, localized areas in naturally open ponderosa pine stands or where tree cover has been greatly

reduced by logging, fire or other disturbance (Tisdale et al. 1959). Several studies suggest that goatweed requires abundant light for best development. In one study, plants subjected to 50 percent of full daylight almost all died after 15 days (Sampson and Parker 1930). More recent studies corroborate those findings (Parendes and Jones 2000). Both tree and shrub canopy cover have been observed to affect the abundance of goatweed in forested habitats (Hammet personal observations 1999-2005).

The historic fire regimes of habitats in which goatweed occurs range from relatively infrequent, high-severity fires in wet forest types to high-frequency, low-severity fires in ponderosa pine forests. The species established in most of these habitats after fire exclusion began, so it is unclear how historical fire regimes might affect goatweed or how goatweed may affect these fire regimes (Fire Effects Information System 2007).

While it is generally purported that fire encourages establishment, vegetative spread and increased density of goatweed patches (Campbell and Delfosse 1984), the variation in the species' response to fire from study to study may reflect differences in plant community type, fire size and severity and/or season of burning. One 1975 study in north Idaho did not show any obvious changes in goatweed infestations following spring burning of brush-covered slopes and seeding with non-native herbaceous species. Goatweed seedlings are susceptible to competition from other species; multiple stresses such as defoliation by biological control agents and fire may also cause reductions in crown density of mature plants (Briese 1997).

Goatweed is well known for its medicinal and other commodity uses. However, hypericin, a chemical constituent of goatweed, causes photosensitization in animals that consume it; the effects of poisoning can lead indirectly to death. Its impact on native plant communities may not be as great as earlier literature seems to indicate, perhaps due to the moderate success of biological control efforts over the last 60 years (Fire Effects Information System 2007). The most commonly described impacts are loss of forage production and carrying capacity on rangelands and losses from livestock poisoning (Ruggiero et al. 1991).

Orange and Meadow Hawkweed (*Hieraceum aurantiacum* L. and *H. pratense* Tausch.) - are two of the eleven species of problem hawkweeds that have been introduced to the United States from Europe (Rinella and Sheley 2002). Orange hawkweed is native to restricted areas in northern and central Europe and was first introduce to the U.S. in 1875; meadow hawkweed is indigenous to northern, central and eastern Europe and is believed to have been introduced into the U.S. in 1828 (Rinella and Sheley 2002). Both species readily resprout from below ground rhizomes and stolons as well as by wind blown seed. Mechanical disturbance of the flowering stem generally increases vegetative reproduction (Rinella and Sheley 2002). Once introduced into an area, both species can quickly form dense patches, which if not controlled usually expand into large areas and displace desired native species. Herbicides remain the most effective method for treating hawkweeds, since mechanical treatments such as hand pulling tend to spread infestations by depositing rhizomes in new areas (Rinella and Sheley 2002). There are currently no biological control agents available for hawkweeds. Should biocontrol agents become available in the future, their use would be evaluated for application in off-road infestations.

According to Bushey (1995), orange and meadow hawkweed have a generally "neutral" response to fire. Other than seed on soil within burned areas being sterilized or consumed by high heat, fire has little impact on these species when they already occupy a site (Bushey 1995).

Current Weed Management Efforts

Weed treatment in the Priest Lake Ranger District occurs under guidelines and priorities established in the Priest Lake Noxious Weed Control Project FEIS (USDA 1997). Many treatment sites in the selected alternative for that EIS occur in the project area. They include sites #16, 21, 26, 27, 35, 40, 53-57, 59 and

61. Most of these sites are open roads. Weed treatments in the project area are conducted with an emphasis on control of Dalmatian toadflax and rush skeletonweed. See the project file for treatment records on these sites from 2005-2007.

Noxious Weeds – Environmental Consequences

Methodology

Analysis was conducted based on current distribution of weed species in habitats similar to those found in the proposed treatment areas and on the types of proposed project activities. The estimation of risk of weed spread and introduction of new weed invaders from the proposed activity is based on peer-reviewed literature, experience in the project area and on similar sites in the IPNF, and professional judgment.

Effects of proposed activities on noxious weed spread are based on the amount of canopy removal and on predicted amount of soil and/or understory vegetation disturbance. There would be less ground disturbance with skyline and forwarder logging than with tractor logging. Therefore, the risk of weed spread would be lower with these logging systems than where tractor logging would occur. In addition, regeneration harvests increase the risk of weed spread through significant canopy reduction, while other harvest types typically remove less canopy, with a lower risk of weed spread.

Direct and Indirect Effects

Direct and Indirect Effects Common to Alternatives 1 and 2

New Weed Invaders

Under either alternative, no new weed invaders are expected to become established in the project area. Under Alternative 1 (No Action), no new canopy or ground disturbance would be expected to occur, at least in the short term. Under the Action alternative, design features detailed in Chapter 2 would ensure that any new invaders would be detected and eradicated before they could become established.

Existing Weed Infestations

With implementation of either alternative, seeds from any weeds on private, county and Forest roads in the project area may still be transported within and out of the area by vehicles, people, birds, and wildlife. In addition, untreated weed infestations on other ownership lands in the project area would be a continued seed source for weed spread within the project area.

Direct and Indirect Effects of Alternative 1 - No Action

Under Alternative 1, there would be no change in the short-term risk or rate of weed spread, since management practices would not change from current conditions. Treatment of existing weed infestations and monitoring for new invaders would be dependent on District priorities and the availability of appropriated funding. It is likely that District would continue to monitor and treat weeds in the project area to protect previous investments.

Weeds on closed road systems would likely remain untreated and would continue to be a seed source for new infestation and/or reinfestation of previously treated areas. Expansion of weeds off the road prisms in these areas would likely continue.

Indirectly, the continued increase in fuel loading could increase the risk of weed spread in the context of a higher risk of severe, stand-replacing fires (see the Fire/Fuels analysis).

Direct and Indirect Effects of Alternative 2

This section describes the direct and indirect effects that are expected with implementation of Alternative 2. All other direct and indirect effects of this alternative are described above under Direct and Indirect Effects Common to Alternatives 1 and 2.

Existing Weed Infestations Confined to Roads in the Project Area

Existing weed infestations that are confined to road prisms would likely continue to be treated based on District priorities and available funding (USDA 1997). Contract clauses requiring treatment of haul routes in the project area would greatly reduce the available seed source of most weed species and would reduce the risk that these species would be transported out of the project area.

Existing Weed Infestations Occurring Off-Road in the Project Area

Where noxious hawkweeds have expanded off the road prisms into adjacent forests, these infestations would likely continue to expand. Areas of new disturbance adjacent to these off-road infestations would be vulnerable to infestation – in fact, there is likely already a seed bank in the soil in at least some proposed treatment areas.

There is a risk of hawkweeds being transported by off-road equipment from infested stands to relatively uninfested portions of the project area. Timing of harvest activities so that off-road equipment moves from uninfested to infested stands in the project area, winter logging on snow in stands with active hawkweed infestations, and/or requiring off-road equipment to be washed before moving from infested to uninfested stands would reduce or eliminate the risk of hawkweeds being transported within the project area (see Chapter 2 – Features Designed to Reduce the Spread of Noxious Weeds).

Summary of Expected Direct and Indirect Effects

Implementation of this alternative would increase the risk of weed spread to varying degrees.

There would be a risk of weed spread associated with treatment on 3,865 acres. Approximately 46 acres would be excavator logged, 2,014 acres would be forwarder logged, 14 acres would be hand piled, 20 acres would be skyline logged and 102 acres would be tractor logged. There would be 266 acres of underburning. As noted above, tractor logging carries the highest risk of weed spread because it causes the most amount of ground and vegetation disturbance. There would be less ground disturbance with forwarder logging, in which the forwarder travels on a slash mat. Skyline logging and hand piling would cause the least amount of ground disturbance.

Significant canopy removal also increases the risk of weed spread. Irregular shelterwood harvest is proposed on 1,119 acres, and seed tree harvest is proposed on 55 acres; these regeneration units would be vulnerable to weed invasion from untreated infestations. Vulnerability to weed infestation resulting from canopy removal would be considerably less in the remainder of treatment areas, for which a combination of commercial thinning, liberation, improvement cutting, special cutting and hand piling are proposed. Contract requirements to treat haul routes and to wash off-road equipment before entering NFS lands would reduce but not eliminate the risk of weed spread from project activities. Preventive seeding, monitoring and treatment of areas of disturbance as described in Chapter II would also reduce but not eliminate the risk of weed spread from project activities.

Cumulative Effects

The cumulative effects analysis area describes the area beyond which effects of the proposed activities cannot be detected. Determination of the cumulative effects area for weeds considered the extent of currently documented weed infestations and likely seed dispersal distances. While patterns of dispersal are not known with certainty for many plant species, in studies of *Botrychium virginianum* most spores

fell within three meters of the source plant (Peck et al. 1990). Noxious weed species' seeds that are heavier than *Botrychium* spores might be assumed to have similar if not more restricted dispersal patterns. Transport of weed seeds out of the project area is possible, with occasional transport over long distances (such as on vehicles). However, it would be difficult to predict the extent of such long-distance dispersal. It is likely that most seeds of noxious weeds would fall close to the parent plant.

In addition, road systems and lands adjacent to the project area have noxious weed infestations similar in composition and distribution to those in the project area, so transport of weed seeds to these lands from the project area would have little additional impact. For these reasons, the cumulative effects analysis area for noxious weeds is the project area.

Cumulative effects with regard to noxious weeds from proposed activities are generally described as very low, low, moderate or high, with the following definitions:

- very low = no measurable effect on existing weed infestations or susceptible habitat
- low = existing weed infestations and/or susceptible habitat not likely affected
- moderate = existing weed infestations or susceptible habitat affected, with the potential for expansion into uninfested areas and/or establishment of new invaders
- high =weed infestations and/or susceptible habitat affected, with a high likelihood of expansion into uninfested areas and/or establishment of new invaders.

The period for measuring short-term cumulative effects to noxious weeds and susceptible habitat is ten years following completion of harvest and other restoration projects, or, in the event of selection of the No Action alternative, ten years after the date of the signing of the Record of Decision. The ten-year period is based on the expected recovery and/or establishment of desired species in disturbed areas. Long-term effects to noxious weeds from loss of canopy cover are addressed below.

The following past, current, ongoing and reasonably foreseeable events apply to the cumulative effects analysis for noxious weeds:

Past Activities and Events

- Wildfires (1890-1968)
- Mining (1890-early 1900s)
- Timber harvest on NFS lands (12,169 acres)
- Timber harvest on private lands (4,397acres)
- Road construction
- Wildfire suppression
- Residential development on private lands

Current and Ongoing Activities

- Road and trail maintenance
- Helispot maintenance
- Timber harvest on private lands
- Defensible space mitigation on private lands
- Wildfire suppression

- Residential development on private lands

Reasonably Foreseeable Actions

- Noxious weeds monitoring and treatment

Cumulative Effects Common to Alternatives 1 and 2

This section describes cumulative effects that are expected with the implementation of either alternative. All other cumulative effects of these alternatives are described separately for each alternative.

New Weed Invaders

Under both alternatives, cumulative effects with regard to new invaders are expected to be very low when combined with all of the above past, current, ongoing, and reasonably foreseeable actions. Under Alternative 1, no new disturbance would occur, and current treatment and monitoring would likely continue; therefore, no new invaders would be expected to become established. Under Alternative 3, because of mitigation measures designed to detect and eradicate new invaders, no new invaders are expected to become established.

Existing Infestations

Cumulative effects with regard to existing weed infestations are expected to be low to moderate under both alternatives, considering the following:

Past Activities and Events - Past wildfires, mining, timber harvest , road construction, and residential development provided areas of disturbance of soil, vegetation and canopy cover for invasion by non-native plant species, including noxious weeds. Because of inadequate past weed prevention and control practices, the effects of these activities on noxious weed spread are still evident.

The loss of tree canopy cover from past timber harvest may have been a factor affecting weed spread in the project area. As the tree canopy in open stands closes, shade-intolerant weeds will, over the long term, be displaced. This process could take another 20-30 years or more. In areas with a high shrub component, recovery of the shrub canopy layer has likely been much quicker to affect the density of off-road noxious weed infestations in the project area.

Current and Ongoing Activities - Residential development and defensible space mitigation on private lands may result in ground disturbance that would be conducive to noxious weed introduction and spread. There would be a risk of existing weed populations spreading if private landowners do not monitor and treat noxious weeds.

Helispot maintenance would include noxious weeds monitoring and treatment activities. The risk of weed spread from this activity would be reduced by weed treatment and preventive seeding practices.

Road maintenance activities may result in ground disturbance that would be conducive to new weed invaders becoming established, and to the spread of existing weed populations. The current levels of weed treatment and monitoring on Forest roads in the project area would minimize the risk of weed introduction and spread from road maintenance activities.

Cumulative Effects of Alternative 1 - No Action

When combined with the following past, current and ongoing activities and events, Alternative 1 has potential cumulative effects on the spread of noxious weeds that differ from those of Alternative 2, as discussed below. All other cumulative effects of Alternative 1 are described above under Cumulative Effects Common to Alternatives 1 and 2.

Past Activities and Events

Past wildfire suppression in the project area has increased the risk of severe, stand-replacing fires. Alternative 1 would not address these accumulated fuels in the project area. Fire behavior characteristics associated with severe, stand-replacing fires would be likelier under this alternative than under Alternative 2. There would therefore be a higher risk of widespread vegetation and/or soil disturbance, which would cause an increased risk of weed spread and introduction across the project area.

Ongoing Activities

Ongoing wildfire suppression in the project area would increase the probability of severe stand-replacing fires. Alternative 1 would contribute to the continued accumulation of fuels in the project area. As fuels continue to accumulate, potential fire behavior characteristics would affect the ability to safely suppress an unwanted fire, thus increasing the risk of a severe, stand replacing fire. Should such a fire occur, the resulting widespread vegetation and/or soil disturbance, would lead to an increased risk of weed spread and introduction across the project area.

Reasonably Foreseeable Actions

Noxious weed treatment and monitoring would follow guidelines and priorities established in the Priest Lake Noxious Weeds Control Project EIS (USDA Forest Service 1997). If appropriated funding is available, weed treatment on Forest roads in the project area would likely continue to protect previous investments. However, no Knutsen-Vandenberg (KV) or stewardship funding would be available for any weed treatment.

Determination of Cumulative Effects of Alternative 1

In the short term, the No Action alternative would contribute a low level of cumulative effects to the risk of weed spread. Over the long term, this alternative would further increase the risk of severe stand-replacing fires. Should such a fire occur, it would likely cause existing infestations to spread to previously uninfested areas. It would also provide the disturbance that would allow dormant weed seeds in the soil to germinate. However, the occurrence and intensity of a future wildfire in the project area is difficult to predict.

Cumulative Effects of Alternative 2

Proposed Activities under Alternative 2

Short-term cumulative effects regarding susceptibility to weeds would be associated with ground disturbing activities proposed under this alternative. Proposed mitigation (see Chapter II- Features Designed to Prevent the Spread of Noxious Weeds) would reduce but not eliminate the risk. Over the long term, the loss of tree canopy cover from implementing the proposed activities is considered irretrievable but not irreversible. As tree canopy closes, susceptibility of areas proposed for harvest and/or underburning would decrease. This process could take 40-50 years. In areas with a high shrub component, recovery of the shrub canopy layer would be much quicker. For example, Merrill (1982) found that twig densities on ninebark increased through the third postfire growing season and that shrub heights on burned and unburned sites were equal by the fourth season.

Proposed treatment of existing infestations on haul routes with approved herbicides and preventive seeding and monitoring on skid trails (see Chapter II- Features Designed to Prevent the Spread of Noxious Weeds), would greatly reduce the risk of transporting noxious weeds out of the project area.

Pretreatment of existing infestations on roads proposed for decommissioning followed by preventive seeding would reduce the risk of weed spread over time to current levels. In addition, newly decommissioned roads would be monitored to detect new weed invaders and to assess the success of

preventive measures. With increasing canopy coverage of desired species, the risk of weed spread on decommissioned roads would decline over time to below current levels.

Past Activities and Events

Past wildfire suppression in the project area has increased the risk of severe stand-replacing fires (see the Fire/Fuels analysis). The proposed treatments under this alternative would reduce the current fuel loading, thus reducing the risk of sudden, widespread canopy, vegetation and soil disturbance from severe wildfire.

Current and Ongoing Activities

While wildfire suppression in the project area would continue in order to protect multiple resource values, implementation of Alternative 3 would increase the ability to safely use prescribed fire and periodically reduce fuel loads and to suppress an unwanted wildfire (see Fire/Fuels section). When combined with the proposed activities, ongoing wildfire suppression would decrease the probability of severe, stand-replacing fires on the acres treated. There may be a lower risk of widespread, severe disturbance of vegetation, soil and tree canopy than with Alternative 1 (No Action).

Reasonably Foreseeable Actions

Noxious weed treatment and monitoring would follow guidelines established in the Priest Lake Noxious Weeds Control Project EIS (USDA Forest Service 1997). Mitigation measures to reduce the risk of weed spread from project activities would complement recent investments in weed management made by the District on roads in the project area. Forest roads to be used for hauling during implementation of the project would be treated as needed. In addition, Knutsen-Vandenberg (KV) and/or stewardship funding may be available to supplement appropriated funding for treatment of off-road weed infestations.

Determination of Cumulative Effects

When combined with all of the above activities, cumulative effects under Alternative 3 with regard to existing weed infestations are expected to be low for rush skeletonweed, yellow toadflax and Dalmatian toadflax, given their current levels of infestation. Cumulative effects would be low to moderate for common tansy, oxeye daisy, Canada thistle and bull thistle, given their current infestation levels. Cumulative effects would be moderate for spotted knapweed and goatweed, because these weeds are considered naturalized in the project area, and because they occur in off-road infestations. Cumulative effects for orange and meadow hawkweed would be low to moderate where they are confined to road prisms and moderate to high where they occur off-road adjacent to areas proposed for treatment.

Consistency with the Forest Plan, Other Policy and Regulations

According to the Idaho Panhandle Forest Plan (USDA Forest Service 1987) direction, infestations of many noxious weed species, including knapweed, goatweed and common tansy, are so widespread that control would require major programs that are not possible within expected budget levels (Forest Plan, p. II-7). Forest Plan direction is to "provide moderate control actions to prevent new weed species from becoming established". Alternative 1 meets Forest Plan direction by not creating disturbance conducive to new noxious weed invasions or spread of existing weed populations. Alternative 3 meets Forest Plan direction by providing moderate control actions through project design, as required by the Forest Plan, to prevent new weed species from becoming established.

It should be noted that, since the Forest Plan was implemented in 1987, the issue of weed infestations on national forest lands has evolved to encompass broader issues of native ecosystem integrity and the effects to non-commodity resources and ecosystem processes. Funding levels for noxious weeds prevention, monitoring and treatment since the mid-1990s have increased the likelihood of success of

weed management efforts (see the project file). The forest plan revision process will consider the increased emphasis on weed management.

Mitigation measures described in Chapter II to reduce the risk of weed spread (See Features Designed to Prevent the Spread of Noxious Weeds) are as required in Forest Service Manual Chapter 2080, as amended (2001). In addition, several recommended, but not required, practices related to roads and timber harvest activities are included (see Chapter 2). FSM requirements and regulations related to noxious weeds are included in the project file.

According to Executive Order #13112 (1999), "Federal agencies whose actions may affect the status of invasive species, shall, to the extent practicable and permitted by law,

1. identify such actions;

2. subject to the availability of appropriations and within Administration budgetary limits, use relevant programs and authorities to: (i) prevent the introduction of invasive species; (ii) detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner; (iii) monitor invasive species populations accurately and reliably; (iv) provide for restoration of native species and habitat conditions in ecosystems that have been invaded; (v) conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species; and (vi) promote public education on invasive species and the means to address them; and

3. not authorize, fund or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species…unless…the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions."

At the project level, noxious weeds have been identified and weed prevention measures incorporated into the action alternative. The potential for weed spread was disclosed for the proposed activities. In addition, the consequences of no action with regard to the risk of widespread weed invasion in the aftermath of a severe, stand-replacing fire were analyzed.

3.9 Recreation

Introduction

The Lakeview-Reeder project area includes a variety of recreation opportunities. The existing forest transportation system in the project area provides access to recreation opportunities such as hunting, fishing, camping, hiking, berry picking and motorized recreation.

There is approximately 30 miles of system summer-use trails with five developed summer- use trailheads within the project area. Some, like the Lakeshore Trail #294 and Lakeview Mountain Trail #269 are very popular. The trails are designated for a mix of uses including motorized, foot travel, bicycle and equestrian.

In addition to the variety of trails, the project area includes 50 miles of designated, groomed winter-use snowmobile trails and two winter-use snowmobile trailheads. These groomed snowmobile trails are a combination of system roads and existing non-system roads that are only used during the winter months for snowmobiling. Many of these trails are considered high use snowmobile trails such as Road #302, the primary travel route to the north end of the Ranger District.

One developed campground is within the project area. Reeder Bay campground includes 24 campsites and operates from May thru September. There are many dispersed camping opportunities in the project area and approximately 20 dispersed campsites exist in the project area adjacent to roads and streams.

The project area has no wilderness and no inventoried roadless areas.

This report will outline the regulatory framework guiding recreation management within the analysis area, discuss the issues identified during the scoping process, describe the methodology for analysis, define the affected environment, detail the design features of the project, and disclose the environmental consequences of the alternatives.

Regulatory Framework

The regulations framework provides direction for the management and protection of individual resources. In part, this regulatory framework defines the methodology and scope of analysis (what needs to be analyzed and how) for individual resources. The applicable regulatory framework that provides direction for recreation management comes from the Forest Plan.

Idaho Panhandle National Forest (IPNF) Forest Plan

The Forest Plan for the Idaho Panhandle National Forests identifies these forest wide goals for recreation:

1. Provide for the projected use of developed recreation areas and complete the development of new sites as budget allows.
2. Provide for a variety of dispersed recreation opportunities.

The project area includes Forest Plan Management Areas 1, 4 and 17. These Management Area (MA) goals are more specific to the project area than the forest wide goals. The IPNF Forest Plan used the Recreation Opportunity Spectrum (ROS) to evaluate the recreation potential within each MA. This system defines five types of recreational settings and opportunities ranging from primitive, where human disturbance is minimal, to rural, where roads and users are concentrated.

1. MA-1 goal is to “provide opportunities for dispersed recreation”. Furthermore, the Forest Plan states to “manage primarily for roaded modified and roaded natural ROS classes”.

2. MA-4 goal is to "provide for opportunities for dispersed recreation consistent with wildlife habitat needs". The ROS standard for MA-4 is also roaded modified and roaded natural classes. Motorized use is generally restricted to designated routes.
3. MA-17 goal is to "manage for developed recreation opportunities in a roaded natural and rural recreation setting". Reeder Bay Campground is included in MA-17. The Forest Plan further states to manage the campground "to protect and enhance a natural appearing environment and the opportunities for social interchange between users".

Issues

The scoping process is used to help determine the issues to be addressed and for identifying the significant and non-significant issues related to the proposed action. Some issues relate to specific activities or areas while others pertain to the overall project. Several issues relating to recreation were identified from public comments received in response to multiple scoping efforts during the scoping process. In consideration with the regulatory framework discussed above, issues are used to help define the scope of analysis.

Indicators were identified for each issue to measure how the issue was affected by each alternative. Issue indicators were selected for their ability to show the difference among the alternatives.

The scoping process for this project identified the following issues regarding recreation at within the project area:

Potential effects on OHV use within the project area.

Off Highway Vehicle (OHV) traffic may increase within the project area as a result of the activities that can create openings, skid trails or roads, which encourage this type of use. Increased OHV use may also damage other resources if noxious weeds are introduced, wildlife is disturbed or soils and water resources are impacted by OHV use. Some respondents asked that no additional OHV use results from this project due to the potential for damage to these other resources. Other respondents asked that current existing OHV opportunities be maintained after the project completion.

Indicator 1: Change in the level of OHV use and type of opportunities.

Potential effects on access to National Forest lands and recreation opportunities.

Some respondents asked that current access to recreation opportunities be maintained after the project activities are completed.

Indicator 2: Change in access to recreation opportunities.

Potential effects of project on the recreation experience due to increased noise, dust, smoke and traffic.

Project activities would generate increased noise, dust, smoke and traffic.

Indicator 3: Duration and intensity of disturbance and subsequent effects on recreation opportunities.

Methodology of Analysis

This section details the scope of analysis and describes analysis methods. The scope of analysis has been developed using the applicable laws and regulations and the issues identified during scoping. The analysis methods are based on the potential effects project activities might have on recreation uses within the project area.

Scope of Analysis

For this project, the scope of analysis refers to the activities and areas that need to be analyzed. The scope of analysis was established using issues identified from public comments received during the scoping process and from the regulatory framework pertaining to recreation management.

After considering the regulatory framework and the issues identified during the scoping process, it was determined that the following activities or disturbances were of primary concern and could potentially affect recreation use or access:

- Harvest operations including logging and associated landing development and biomass removal,
- Fuel treatments including piling and burning, prescribed burning, chipping, and masticating,
- Temporary and permanent road construction,
- Road decommissioning,
- Off-road vehicle use and associated trail development,
- Fire suppression, and
- Wildfire risk.

The area used to analyze the recreation resource was the project area and specific roads proposed for decommissioning outside the project area. The analysis was limited to these areas because effects to recreation use and access for dispersed recreation tend to be concentrated close to the activities taking place. Although, project activities may displace some use, the duration and scope would be minor and the effects to other recreation uses outside the analysis areas would be minimal. Therefore, there will be no further discussion on the effects of displacement on recreation uses outside the analysis areas. The duration of direct effects is very short. For example, noise, dust and smoke generated by project activities would end as soon as activities end. The duration of indirect and cumulative effects can last much longer depending on the activity. Increased fire risk, for example, can last for decades.

Methods of Analysis

The first step of the analysis is to assess the existing condition of the analysis area and determine the principal recreational uses that occur within that area. Secondly, the potential effects of each alternative are determined for each of the recreational uses. The issue indicators are used in this step to compare the difference of effects among the alternatives. Lastly, based on the potential effects of the project, a determination is made as to whether or not the project complies with the regulatory framework.

Affected Environment

In 1995, a study was completed on travelers, including recreation and tourists, who use the Priest Lake Basin. The study was designed to measure recreation and travel patterns of users of the basin. The information received from interviews and survey questionnaires was assembled by the University of Idaho into a resource database. The report from this study, Human Dimensions of the Priest Lake Ecosystem (1996), provides information on types of recreation use, levels of use, and areas of use. The north half of the project area is included in Zone 2 of the Priest Lake analysis area while the south half is in Zone 4. Zone 2 had the second lowest recreation use level in the Priest Lake Basin while Zone 4 had the highest recreation use level (Morten, et al., p. 11).

Emphasis of most recreation within the basin is lake-based, especially during the summer months. The 1995 study showed 63 percent of recreation focused on the lake (ibid, p. 5). These activities include boating, swimming, and fishing (ibid, p. 26). Use is concentrated along the lakeshore being adjacent to

homes and recreational cabins, campgrounds and day-use areas, resorts, and dispersed recreational sites. Higher concentrations of these facilities are found in Zone 4 as compared to Zone 2.

Land-based recreation is also popular during the summer months because of the large number of forest visitors. Land-based activities include picnicking, walking, day hikes, mountain bike riding, motorcycle and ATV riding, jogging, hunting and some horseback use. These activities are concentrated along the lake and near residential areas as well, but are also scattered throughout the project area. Huckleberry and mushroom picking and firewood cutting are other important recreation uses on National Forest lands.

More recent national and statewide studies such as the National Visitor Use Monitoring (NVUM) and the Idaho Statewide Comprehensive Outdoor Recreation Plan (SCORP) indicate continued growth in recreation activities (Statewide Trends in Outdoor Recreation p. 146).

The following are descriptions of recreation uses within the project area that could be affected by project activities.

Recreation Trails

The existing trail system is used for several of the above-mentioned land-based activities, especially day-hiking and Mountain biking. Developed trails include #365, Kalispell/Reeder Bay, #269 Lakeview Mountain, #294 Lakeshore, #265 Little Grass and #266 Roosevelt. The primary season of use for these trails is during the summer months although some use occurs in both the spring and fall seasons as well. Weekends and holidays are the heaviest use periods because of the higher number of recreationists and summer home owners. The trails are used by residents, seasonal residents, and visiting recreationists.

Trail #365 is 4.2 miles long and is a popular trail for day use and resort guests. The most popular access is from Elkins Resort with the terminus at Kalispell Bay Road. Trail #269 is 5.3 miles long; the trailhead is located on Highway 57 and terminates at Trail #365. A popular destination on this trail is Lakeview Mountain, providing an expansive view of Priest Lake. Trail #294 is 7.0 miles long with three trailheads off of Forest Road #2512 with the southernmost trailhead near Granite Creek. The trail terminates at Beaver Creek Campground. Trail #265 is 1.0 mile long and is accessed from either the terminus of Forest Road #1014 or Trail #266 and terminates at the peak of Little Grass Mountain. Trail #266 is 4.5 miles long, begins at Forest Road #302 with no developed trailhead and terminates at Trail #265.

The number of OHV trails in the project area could be described as limited. Generally, the terrain features and heavily forested vegetation limit OHV use to open roads and a few multiple-use trails. Some user-built trails exist in the project area but these too are limited by steep terrain and dense vegetation. These trails occur adjacent to private homes and cabins mainly on the north side of Nickelplate Mountain and south and east sides of Copper Mountain. Lakeview Mountain and Kalispell/Reeder trails are the only motorized trails within the project area.

Developed Recreation

Another important recreational activity is the use of developed recreation sites for camping and picnicking. The majority of users at these sites are forest visitors who reside outside the Priest Lake Basin. In a 1995 study of recreation users, 22 percent of all travel parties did some form of camping with about half staying at Forest Service campgrounds (Sanyal, et. al, p.10).

The Reeder Bay campground is a developed facility that includes 24 campsites, a campground host site, paved roads and sites, water system, toilets, swimming beach and handicapped accessible sites. The Ledgewood Day Use Area is near the campground and is a popular swimming area during the heat of the summer. The day use area includes picnic facilities (tables, barbecue grills), toilets and changing rooms, potable water system and a large designated swim area.

Dispersed Recreation

Dispersed recreation provides outdoor recreation activities that occur apart from sites developed for concentrated activities. Such activities as huckleberry picking and mushroom picking are examples of dispersed recreation. Other activities include mountain bike riding, jogging, hunting, fishing, walking, pleasure driving, OHV use, and horseback riding. Most of these activities are located close to open roads or trails in the project area. The major season is summer for these activities.

Dispersed sites typically used for camping are undeveloped sites with none of the improvements found in developed campsites, such as toilets and potable water systems, tables or fire rings. Dispersed sites are most common near streams or other water sources. The Granite Creek dispersed site shown on the map in Figure 1 is a typical dispersed site and access to sites such as these are popular.

The project area is included in three Outfitter-guide permit areas. These permits cover a variety of dispersed recreation activities. Full Spectrum Tours provides rentals and outfitted services for day and overnight trips using sea (i.e. touring) kayaks. Selkirk Guiding and Outfitting provides outfitted services for lake fishing, hunting, snowmobile rentals and guided tours, and horseback riding. Four Season Rentals provides outfitter and guide services and snowmobile tours.

Winter Recreation

Winter recreation has been growing over the past several years. Snowmobiling is the main activity within the project area, and lasts generally from December 15th to March 1st. The weekends and winter holidays are the heaviest use periods.

The majority of the winter use occurs on groomed trails. There is a Cost Share Agreement with the Priest Lake Groomer Association for grooming of the snowmobile trails. The map in figure 1 depicts the location of these groomed snowmobile routes. While most use is on groomed trails, a minor amount of dispersed snowmobiling is scattered through the project area.

Groomed snowmobile trails within the Project area include roads #2242, #2231, #1362, #302, #2512, #638 and #2249. These groomed snowmobile trails are part of a much larger system throughout the Priest Lake Basin. There are approximately 20 miles of snowmobile trails within the project area.

Annual permitted recreation events for dog sled races and snowmobiling occur on National Forest lands in the southwest corner of the project area on the airfield. No activities are proposed in this area and planned activities are not anticipated to affect the dog sled races. Therefore, there will be no further discussion on this winter recreation activity.

Environmental Consequences

The following is a discussion of the effects to recreational opportunities within the project area. The focus of the discussion is land-based recreation. There would be no direct effect to lake-based recreation. The indirect effects would be related to facilities along the lakeshore such as boat launches and campgrounds; these are discussed below.

Direct effects analyzed for these different facilities would be noise and disturbance caused by the project activities. Other direct effects could be impacts to the site itself as a result of fuel treatments. Indirect effects would include fire risk to the site. The effects of implementing the proposed action as disclosed in this analysis incorporate the design features discussed above.

Direct and Indirect Effects

Alternative 1 — No Action

Recreation Trails

Alternative 1 would cause no direct effects. The existing trail system would be maintained for use with no disruption resulting from any timber harvest or fuel treatments. No road construction or decommissioning would occur so current access to trails would remain unchanged.

No clean-up of existing fuels adjacent to recreation trails would be completed. Concentrations of heavy fuels would remain, and would continue to be areas of high risk of ignition by smokers, arson, motorbikes, and other sources compared to Alternative 2.

Developed Recreation

Alternative 1 would cause no direct effects. There would be no actions within the campground or day use area except continuing maintenance. No piling of existing fuels would occur nor any removal of high risk trees. The increase in traffic and noise adjacent to the facilities that could occur in Alternative 2 would not happen in Alternative 1.

No clean-up of existing fuels in the developed recreation sites or in adjacent stands would be completed. Concentrations of heavy fuels would remain, and would continue to be areas of high risk of ignition compared to Alternative 2

Dispersed Recreation

Alternative 1 would cause no direct effects. The noise, dust and smoke generated by proposed activities would not occur. Roads would not be constructed or decommissioned. Access to the existing recreation opportunities would remain unchanged.

No clean-up of existing fuels would be completed. Concentrations of heavy fuels would remain, and would continue to be areas of high risk of ignition by smokers, arson, motorbikes, and other sources compared to Alternative 2.

Winter Recreation

Alternative 1 would cause no direct or indirect effects. The existing winter recreation trail system would be maintained for use with no disruption resulting from any treatments. The existing high fuels on National Forest lands along the major snowmobile routes or groomed cross-country ski trails would not be treated. However, no risk of wildland fire occurs from these activities.

Alternative 2 — Proposed Action

Recreation Trails

Only about four miles of summer-use trails have the potential to be affected by project activities – trail numbers #365, #269 and #294. Concentrations of heavy fuels would be decreased in the vicinity of the trails and risk of ignition would be low compared to Alternative 1.

Trail #365 has three proposed burn units and one treatment unit adjacent to different portions of the trail. Activities would increase noise, create smoke and may force portions or the entire trail to be shut down for public safety. However, these effects would be of short-term duration, occurring only a few days over the course of the project. The treatment unit would be located just above the trail and no skid trails would cross the trail. OHV use is very low in this area and restricted to roads only. Proposed activities would not create increase OHV opportunities.

Trail #269 has three treatment units that are adjacent to the trail. Activities would mostly create increased noise, but would most likely not warrant trail closures. Again, these effects would be short-term duration, occurring in only a few days. The treatment unit would be located below the trail and skid trails would not cross the trail. OHV use is low in this area and restricted to roads only. Proposed activities would not create increased OHV use.

Trail #294 has one treatment unit proposed near the southern trail head. Activities would mostly create increased noise, but would most likely not warrant trail closures. Again, these effects would be short-term duration, occurring in only a few days. The treatment unit would be located above the trail and skid trails would not cross the trail. OHV use is moderate in this area and user created trails exist just west of the proposed unit and trail. Because of terrain and timber stand density, the design feature that discourages trail building by OHV users would be successful here and proposed activities would not create increased OHV use.

Decommissioning road 1014 would limit some access to trail #266, however, alternate access routes currently exist for this trail and the design feature that would create a foot trail on this road would provide for non-motorized access.

Decommissioning road #308 and creating a foot trail on this road would provide for non-motorized access.

Developed Recreation

By following project design features that limit treatment activities quite hours, many times activities are accomplished when these sites are not in use or at their lowest use. This greatly lowers the direct effects to these sites. However, short-term levels of noise, dust, smoke and traffic will still impact some of the recreating public do to treatments in adjacent areas. The risk of catastrophic fire would be lower in this alternative, which would greatly lower the risk that recreation facilities could be damaged or destroyed.

Dispersed Recreation

Proposed activities would cause some short-term disruption in recreation patterns within the project area. Increased noise and dust associated with treatment activities would decrease some recreation use within and near the areas proposed for treatment. Effects to hunting and pleasure driving would be greatest. Activities such as huckleberry and mushroom picking, jogging, fishing and horseback riding would be least affected because opportunities for these activities are few within the analysis area and because the proposed treatments are removed from the areas that these activities do occur.

The increase in openings, skid trails and roads associated with the harvest and vegetation management activities may increase OHV use. The roads to be decommissioned or closed could limit access to these recreation opportunities, while new roads would provide some new recreation opportunities. By following project design features that allow alternate access into areas where roads would be decommissioned, recreation access would continue but some recreation activities like driving would be decreased.

Concentrations of heavy fuels would be decreased within the project area and risk of ignition would be lowered compared to Alternative 1.

Access from the 302 road to the Granite Creek dispersed site would be removed but a new access would be created from the 1362 road.

Winter Recreation

There is approximately 10 miles of groomed snowmobile trails in the project area that have the potential to be affected by project activities. These routes include the southern portion of the 2242 and 2516 roads.

The effects, however, would be short-term lasting only portions of two or three seasons depending on which design feature is implemented.

The duration of activities could be limited to the periods of November 15th to December 15th and March 1st to April 1st. This would keep both snowmobile routes open during the most active part of the season but limit snowmobile use of the trails to this period. This operation would limit the operating period for harvest treatments potentially causing harvest operations to be extended into multiple years

The other option is to stagger the operating period for treatments in these areas. The 2242 road would be closed to snowmobiles and grooming while harvest operations occurred in the area and road 2516 would be left open for all snowmobile traffic going north. Operations could not commence on road 2516 until harvest was complete on the 2242 road and all snowmobile traffic and grooming could be shifted to road 2242. This option would guarantee at least one snowmobile route was open through the entire season while providing for an extended period for winter harvest operations allowing proposed treatments to be completed within two seasons.

Cumulative Effects

Effects Common to All Alternatives – Past Activities

Recreation Trails

Trail construction in the early and mid-1900s created a vast network of trails throughout the analysis area. This trail construction, which was originally done to facilitate fire suppression activities, provided a great amount of access and opportunities for recreational trail users. Over the years, as recreational uses and fire suppression technology changed many of these trails faded from the landscape. Only those trails that have been maintained because of their popularity are the trails that exist on the landscape today.

Developed Recreation

Forest Service recreation projects built these recreation facilities in response to public requests. Every year, maintenance activities that occur before the facilities are opened for use allow the public to enjoy a “naturally” appearing environment.

Dispersed Recreation

Past harvests and wildfires created the forest compositions and structures that support some of the dispersed recreation opportunities (berry and mushroom picking and hunting) that occur in the analysis area today. Past road construction has provided access to these opportunities and has created additional opportunities such as pleasure driving and OHV use. Road decommissioning and lack of road maintenance has decreased some access. Non-native fish introductions have provided some increased fishing opportunities.

Winter Recreation

Past road construction has provided access for snowmobile routes and cross-country ski trails. However, road decommissioning has decreased some access.

Alternative 1 — No Action – Ongoing and Foreseeable Future Activities

Recreation Trails

Continued development on private lands would lead to more trail use in future due to increases in the recreating public. Ongoing mortality due to insects and diseases would require continual trail maintenance. Maintenance activities such as clearing windfall and removing brush would add additional

fuels along trails. The risk of a wildland fire would be highest with this alternative because of the existing fuel loading adjacent to the recreational trails and future fuels resulting from continuing trail maintenance.

In the event of wildfire the intensity and severity of the fire is potentially greater in Alternative 1, with no fuel reduction, than in Alternative 2. Wildfire could result in temporary closure of trails for health and safety of the public.

Developed Recreation

Continued development on private lands may lead to heavier recreation use in the future due to increases in the recreating public. Continued maintenance activities such as clearing windfall would reduce some fuels but only a very limited amount. The risk of a wildland fire would be highest with this alternative because of the existing fuel loading in adjacent stands. In the event of wildfire the intensity and severity of the fire is potentially greater in Alternative 1, with no fuel reduction, than in Alternative 2.

A catastrophic fire would, at the least, change recreation patterns and lessen opportunities, and at the most, damage or destroy recreation facilities such as Reeder Bay campground. Catastrophic fires often increase maintenance of facilities because fire-killed trees become hazards to campers. This situation can persist for years after a fire as trees decay and fall. Ultimately, wildfire could result in temporary closure of facilities for health and safety of the public. Fire prevention policies that ban open fires during very dry times during the active burning season can limit the risk of human caused ignitions, but this has a minor effect on overall fire risk. Therefore, Alternative 1 would result in a higher hazard level and greater probability of recreation resources being damaged by wildfire.

Dispersed Recreation

Continued development on private lands may lead to heavier recreation use in the future due to increases in the recreating public. The risk of a wildland fire would be highest with this alternative because of the existing fuel loading. In the event of wildfire the intensity and severity of the fire is potentially greater in Alternative 1, with no fuel reduction, than in Alternative 2.

A catastrophic fire would, at the least, change recreation patterns and lessen some opportunities. Ultimately, wildfire could result in temporary closure of roads and trails for health and safety of the public. OHV use off designated routes may increase because stands would be more open. Fire prevention policies that ban open fires during very dry times during the active burning season can limit the risk of human caused ignitions, but this has a minor effect on overall fire risk. Therefore, Alternative 1 would result in a higher hazard level and greater probability of recreation resources being damaged by wildfire.

Road decommissioning would create an additional reduction in recreation access. Repairs to the Granite and Beaver Creek bridges would maintain existing access on two main roads. Fish improvement structures may improve fishing opportunities in some creeks. The Granite Reeder land sale would decrease recreational opportunities, mostly hunting, by 80 acres or less than a percent of the project area.

Winter Recreation

With no direct or indirect effects there would be no cumulative effects with the implementation of Alternative 1 on winter recreation.

Alternative 2 – Proposed Action – Ongoing and Foreseeable Future Activities

Recreation Trails

Continued development on private lands would lead to more trail use in the future due to increases in the recreating public. Ongoing mortality due to insects and diseases would require continual trail maintenance. Maintenance activities such as clearing windfall and removing brush would add some

additional fuels along trails. However, the risk of a wildland fire would be lower with this alternative because the existing fuel loading adjacent to the recreational trails would be reduced.

In the event of wildfire the intensity and severity of the fire would be lower than in Alternative 1 with no fuel reduction. Fire suppression efforts would be more successful at keeping fires small and would be less likely to result in temporary closure of trails for health and safety of the public.

Developed Recreation

Recreational use in the day use area and campground way increase as population increases from private development. The risk of a wildland fire would be lower with this alternative because of fuel reduction activities in these sites and in adjacent stands. In the event of wildfire the intensity and severity of the fire would be lower in this alternative than in Alternative 2. Ongoing mortality due to insects and disease would necessitate continued maintenance activities such as clearing windfall and disposing of debris, which would maintain reduced fuel loadings in the future.

With a lower risk of a catastrophic fire a change recreation patterns, a decrease in recreation opportunities and threat to public safety would be lower with this alternative because the risk of damage or destruction of recreation facilities would be less. Fire prevention policies that ban open fires during very dry times during the active burning season can limit the risk of human caused ignitions, but this has a minor effect on overall fire risk.

Dispersed Recreation

Continued development on private lands may lead to heavier recreation use in the future due to increases in the recreating public. The risk of a wildland fire would be lower with this alternative because the existing fuel loading would be reduced. In the event of wildfire the intensity and severity of the fire would be lower in Alternative 2 than in Alternative 1.

With a lower risk of a catastrophic fire a change recreation patterns, a decrease in recreation opportunities and threat to public safety would be lower with this alternative. Fire prevention policies that ban open fires during very dry times during the active burning season can limit the risk of human caused ignitions, but this has a minor effect on overall fire risk. Therefore, Alternative 2 would result in a lower hazard level and less probability of recreation resources being damaged by wildfire.

Road decommissioning would create an additional reduction in recreation access. Repairs to the Granite and Beaver Creek bridges would maintain existing access on two main roads. Fish improvement structures may improve fishing opportunities in some creeks. The Granite Reeder land sale would decrease recreational opportunities, mostly hunting, by 80 acres or less than a percent of the project area.

In 2009, planning for the Motorized Travel Management Plan, including OHV use will begin on the Priest Lake Ranger District. OHV use is increasing; between 2002 and 2006, registrations for OHV vehicles increased by 66 percent (citation). This is expected to increase in the future as population growth in the Priest Lake area increases. Although, specifics of this plan are not available at this time, implementation of the plan may impact OHV use on existing roads and motorized trails. OHV use off designated routes and trails may increase as proposed activities create openings. However, features designed to discourage this user built trails would decrease some the potential of this to occur in some areas.

Winter Recreation

Continued development on private lands may lead to heavier winter recreation use in the future due to increases in the recreating public.

Comparison of Alternatives

Alternative 1 would cause no change in the level of recreation trail use, use of developed recreation sites or amount of dispersed and winter recreation opportunities. Alternative 1 would, however, have a higher wildfire risk than Alternative 2, which creates an increased threat to public safety and may decrease recreation opportunities or damage or destroy recreation facilities should a wildfire occur.

Indicator 1: The level of OHV use and type of opportunities would remain unchanged unless large wildfire occurs, in which case there could be a decrease in opportunities.

Indicator 2: Access to recreation opportunities would remain unchanged unless large wildfire occurs, in which case there could be decreased access.

Indicator 3: Disturbance associated with proposed activities that create increased noise and dust would not occur and therefore, recreation opportunities would not change. However, if a large wildfire occurs there would be an increase in the duration and intensity of noise, dust and smoke and subsequently recreation opportunities would decrease.

Alternative 2 may cause short-term trail closures but create new recreation trial opportunities. Short-term disturbance to recreation sites and dispersed and winter recreation opportunities would occur. Alternative 2 would have a lower wildfire risk than Alternative 1 and decrease the threat to public safety and damage or loss of recreation facilities should a wildfire occur.

Indicator 1: The level of OHV use could increase slightly due to openings and skid trails. Motorized opportunities would change but new road building and road relocation would balance road obliterations. Impacts do to a large fire would be diminished with this alternative.

Indicator 2: Would cause short-term decrease in access for some types of recreation while creating new, long-term access for other recreation opportunities. New road building and trail conversion would balance road obliterations. The risk of losing access to recreation opportunities due to wildfire would be less with this alternative.

Indicator 3: Would increase duration and intensity of noise, dust, and smoke, which may change some recreation patterns but this would be temporary and short-term. Risk of increased duration and intensity of wildfire and subsequent effects to recreation opportunities would be reduced with this alternative.

Compliance with the Forest Plan and Other Regulatory Direction

All alternatives comply with Forest Plan forest wide goals for recreation by providing use of developed recreation areas and a variety of dispersed recreation opportunities. Each alternative also complies with specific MA goals because the ROS class would remain unchanged for each of the management areas.

Dispersed recreation opportunities would be provided for in MA-1 and the ROS class would remain roaded modified and roaded natural. In MA-4, opportunities for dispersed recreation would continue while meeting the needs for wildlife habitat. The ROS class would also remain roaded modified and roaded natural and motorized use would be restricted to designated routes. Reeder Bay Campground, which is included in MA-17, would continue to be managed to “protect and enhance a natural appearing environment and the opportunities for social interchange between users” in a roaded natural and rural recreation setting.

3.10 Visual Resources

Introduction

The Lakeview/Reeder proposed project area includes lands within the urban interface. The area consists of a mix of private property and National Forest System lands within approximately 29,380 acres. The corridor on the east side of the project area, between Priest Lake to the east and Beaver Creek Road (#2512) to the west, is identified in the Forest Plan as having high visual sensitivity, along with the corridor to the east and west of State Highway 57, and the corridor north and south of the Reeder Bay Road (#1339). Meeting the visual quality objectives of maintenance and/or enhancement in these corridors is of utmost public concern. The visual quality of other locations within the project area is of equal importance to the public. See Figure 3-49 for an overview picture of the project area.

Regulatory Framework

Scenery management direction is provided by the Idaho Panhandle National Forests (IPNF) 1987 Forest Plan, and is described in terms of Visual Quality Objectives (VQOs). Objectives are based on an area's visibility from travel corridors, viewpoints, and by the number of viewers having concern for an area. The Visual Management System (VMS) was revised and officially replaced in 1995 by "Landscape Aesthetics: A Handbook for Scenery Management" (USDA Forest Service, 1995). Once the revised Forest Plan is implemented, the Scenery Management System (SMS) will be used. Until that time, the IPNF is required to use the VMS for scenery analysis.

The Visual Quality Management System is described in the "National Forest Landscape Management, Volume 2", (USDA Forest Service, 1974). In addition "National Forest Landscape Management, Volume 2, Chapter 5, Timber" (USDA Forest Service, 1977) describes sale planning and design methods using the VQO system. Further visual quality/scenery management objectives are defined in the Forest Service Manual 2300 – Recreation, Wilderness and Related Resource Management, Chapter 2380 – Landscape Management.

In the IPNF Forest Plan, under "Forest-Wide Management Direction", goal number 3 states: "Manage the visual resource by maintaining the visual quality objectives."

The Forest Plan divided the lands within the Idaho Panhandle National Forests into 19 Management Areas (MA). All MA's include as a goal that they meet visual quality objectives. The Lakeview/Reeder area consists primarily of two MA's (1 and 4), with a small portion of the project area in MA 9.

Through development of the Forest Plan, and ongoing project planning, the public has continually indicated the importance of maintaining the visual integrity of project areas as viewed from Priest Lake and other important travel ways and trails. This includes the Lakeview/Reeder project.

Public Comments

A public scoping process was conducted during the development of the Lakeview/Reeder project. The concern for scenery is summarized as follows:

- Maintain the current high quality scenery.
- Keep the scenic condition in a natural appearance, not a "man made" appearance.
- Maintain the scenic views from the lake.

Issues

During scoping for the development of the Idaho Panhandle National Forests1987 Forest Plan, scenery was determined to be an important issue. Meeting visual quality objectives is one of the goals that must be met, and the Visual Management System was used to map the Forests' important features, landmarks and views.

A main premise of the importance of scenery is based upon studies of people's images of forest areas. Although the studies result in varied responses from one geographic region to another, one factor generally remains constant. People expect to see a naturally appearing character within each general region. (USDA Forest Service, Agriculture Handbook Number 462. National Forest Landscape Management. Volume 2. Washington, DC, page 2.)

While maintaining the scenic integrity of an area is important, the methods of harvest recommended for fuel reduction projects are not always compatible with maintaining the Forest Plan assigned VQOs. In these cases, it is the resource specialist's responsibility to attempt to develop a balance to meet both fuels reduction goals and visual objectives in the long-term, though not all of the resource goals may be met in the short-term.

Methodology for Analysis

Management activities such as timber harvesting, burning, thinning and the construction of roads or log landings, along with the type of equipment used can affect the forest scenic quality by changing the form, color, line, or texture of a given view. The degree of visibility of the visual impacts from management activities depends on certain elements, such as where the area is viewed from, the slope and aspect of the land, the condition and kind of surrounding landscape and the frequency and duration of view.

The above factors (line, form, color, texture, frequency and duration of view) have been incorporated into the analysis of effects of each alternative, along with other elements used in the development of the VMS.

Some of the definitions used in the analysis of the visual resource are listed as follows:

- **Visual Resource**: The composite of terrain, geological features, water features, vegetative patterns, and land use effects that typify a land unit and influence the visual appeal the unit may have for visitors.
- **Visual Quality Objectives (VQOs)**: A desired level of scenic quality and diversity of natural features based on physical and sociological characteristics of an area. Refers to the degree of acceptable alterations of the characteristic landscape. All VQOs except "Preservation" imply there will be management activities.
- **Preservation (P)**: Provides for ecological change only. Management activities are prohibited except for recreation facilities with very low visual impact. Human activities are not detectable to the visitor.
- **Retention (R)**: Human activities are not evident to the casual Forest visitor.
- **Partial Retention (PR)**: Human activities may be evident, but must remain subordinate to the characteristic landscape.
- **Modification (M)**: Human activity may dominate the characteristic landscape but must, at the same time, utilize established form, line, color and texture. It should appear as a natural occurrence when viewed as background (from 3-5 miles to infinity).
- **Maximum Modification (MM)**: Human activity may dominate the characteristic landscape, but should appear as a natural occurrence when viewed as background.

- **Rehabilitation**: A short-term management alternative which is done with the express purpose of increasing positive visual variety where little variety now exists.

Dominance Elements

The dominance elements are the simplest visual recognition parts which make up the characteristic landscape. An observer sees landscapes in terms of form, line, color and texture. The potential visual strength of each dominance element over the broad spectrum of landscape varies. In the Pacific and Inland Northwest this relationship between the elements has generally been found to be as follows:

- **Form** →(Strongest) ---- **Line** ---- **Color** ---- **Texture** → (Weakest)

Variety Classes

Variety Classes are classifications of landscapes into degrees of diversity of landscape characteristics. Variety Class determinations label landscapes as most important to having lesser value from a scenic standpoint. Classifications are based on the premise that all landscapes have some value, but those with the most variety or diversity have the greatest potential for high scenic value. The three classes that describe the natural landscape are:

- Distinctive (A)
- Common (B)
- Minimal (C)

For the Lakeview/Reeder project area, an example of a **Distinctive** (A) landscape would be Priest Lake, universally recognized as an outstanding visual resource.

A **Common** (B) landscape within the project area would be the area along State Highway 57.

There are no **Minimal** (C) landscapes within the project area.

Sensitivity Levels

Sensitivity Levels are a measure of people's concern for the scenic quality of the National Forests. The sensitivity levels are:

- Level 1 (Highest Sensitivity)
- Level 2 (Average Sensitivity)
- Level 3 (Lowest Sensitivity)

Sensitivity Level 1

Areas visible within the project area or outside of the boundaries where the project area can be viewed with Level 1 sensitivity are as follows:

- Priest Lake
- Highway 57
- Lakeshore Trail (# 294)
- Hanna Flats
- Ledgewood Picnic Area
- Reeder Bay Campground

- Kalispell Island
- Kalispell Boat Launch
- Kalispell Bay Road (#1338)
- Reeder Bay Road (#1339)
- Coolin

Sensitivity Level 2

- Areas in view from the East Side Priest Lake road.
- Nordman/Metaline Road (#302)

These sensitivity levels are defined in the IPNF, Forest Plan, Appendix D, page 18.

Distance Zones

Distance Zones are divisions of a particular landscape being viewed. They are used to describe the part of the characteristic landscape that is being evaluated. There are three distance zones described as follows:

- **Foreground** – The limit of this zone is based upon distances at which details can be perceived. Normally in foreground views, the individual boughs of trees form texture. It is usually limited to areas within ¼ to ½ mile of the observer, but must be determined on a case-by-case basis. Foreground is indicated on the VQO map by the symbol **Fg**.
- **Middleground** – This zone extends from foreground zone to 3 to 5 miles from the observer. Texture normally is characterized by the masses of trees in stands of uniform tree cover. Individual tree forms are usually only discernible in very open or sparse stands. Middleground is indicated on the VQO map by the symbol **Mg**.
- **Background** – This zone extends from middleground to infinity. Texture in stands of uniform tree cover is generally very weak or non-existent. In very open or sparse timber stands, texture is seen as groups or patterns of trees. Background is indicated on the VQO map by the symbol **Bg.**

Visual Quality Objectives (VQOs)

The Visual Quality Objective Map shows symbols to indicate the determined VQOs for the IPNF's land areas. For example, the following symbols:

$$\frac{\textbf{Fg1A}}{\textbf{R}}$$

Represent an area in Foreground (Fg) as viewed from a Sensitivity level (1) area, having a Distinctive Variety Class (A), with a Visual Quality Objective of Retention (R). Please refer to Figure 2, page 14 for the VQO map for the project area.

The Foreground area near the shoreline of Priest Lake on the eastside of the project area (approximately 3500 acres) is classified as a "Distinctive" landscape. The remaining, (approximately 26,000 acres) are classified as a "Common" landscape.

Vegetation Prescriptions

Vegetation prescriptions may consist of several types of treatment. Generally, the following treatments will apply to the Lakeview/Reeder project:

Thin: Forest stands containing numerous, healthy trees of a desirable species would be proposed for "commercial thin". Thinning would focus on selective removal of smaller trees and trees having the greatest hazardous fuel loads. The treatment would emphasize retention of larger trees and/or longer-lived trees tending to be more resistant to insect and disease infestations. After thinning, the harvested hazardous fuels would be mechanically piled and burned.

Regeneration: Stands with fewer healthy trees or higher densities of tree species tending to be shorter-lived and/or less resistant to insect and disease infestations, would generally be treated with a "regeneration cut". The majority of merchantable trees in the stand would be removed. Following harvest, new seedlings would be planted in the created openings. After the cutting, the hazardous fuels would be mechanically piled and subsequently burned, or left un-piled and a broadcast burn would be done under prescribed conditions. After burning the hazardous fuels, a mix of site-appropriate conifer seedling species would be planted in the treatment areas.

Burn Only: This treatment would not involve cutting and removing any trees of a merchantable size. In this treatment, some small (unmerchantable) trees and shrubs might be cut down to create desirable fuel conditions for burning. These areas would then be broadcast burned to help reduce the quantity of hazardous fuels and modify their condition. Many of the stands are currently dominated by old shrub fields with interspersed conifer patches. Burning these shrub fields would reduce the dead fuels and encourage new sprouting. This would enhance the ability of these shrub fields to act as fuel breaks, while creating more desirable browse for deer, elk and moose.

Pile and Burn: This treatment would entail cutting some of the small, unmerchantable trees and piling slash. In certain areas, smaller trees, needing removal, would be machine or hand cut, depending on site conditions. The slash would be piled by machine or by hand. Fuels would be burned under prescribed conditions.

For more detailed descriptions of the vegetation prescriptions, refer to Chapter 2.

One of the factors that can affect the visual quality is the openness of an area relative to the existing conditions before and after treatment. The various treatment types will open up the tree canopy closure by varying degrees. Depending on the existing characteristics, including landforms, slope, current stand densities, number and species of seedling/sapling size trees and openness of surrounding terrain that is untreated and the points or areas where units are viewed from, the amount of canopy closure may contribute to the visual quality of an area.

Canopy closure will be perceived more in Middleground and to a certain degree Background landscape views. In Foreground views, generally the viewer is looking more directly into a unit so the viewer will see the boles of the trees which will be further apart than the canopy closure indicates. In instances where the unit is either above of below the viewer's eye level, canopy closure may be more important from a visual sense.

Another factor that contributes to the scenic quality and viewing an area after treatment is the amount of evidence that treatment has occurred. Generally, a few tall stumps, some scorching of the boles and branches of trees along with some blackened areas on the ground from burning does not create dominant features and in fact can have the look of a natural fire occurrence. Within a few years after treatment as the red needles fall off of branches and the treated areas start to green up from the growth of brush species and tree seedlings, this effect will be even less noticeable.

Please refer to Table 3-63for the estimated existing canopy closure before treatment and predicted canopy closure after treatment.

Table 3-63. Estimated canopy closure before and after treatment.

Treatment Type	*Average Existing Canopy Closure*	*Average Predicted Post Treatment Canopy Closure*	*Difference*
Commercial Thin	77 %	52 %	25 %
Liberation Cut	45 %	40 %	5 %
Improvement Cut	59 %	45 %	14 %
Irregular Shelter wood	67 %	30 %	37 %
Seed Tree	55 %	8 %	47 %
Special Cut	71 %	63 %	8 %
Burn Only (Brush Fields)	24 %	11 %	13 %

Existing Condition

The project area consists of a mix of private and Forest Service lands. Past timber sale activities, fires and development of private and Forest Service property have affected the current scenic quality of the project area. Currently, Sensitivity Level 1 viewpoints of Forest Service lands meet VQOs, with the exception of a clear cut unit on the southeast side of Indian Mountain. This unit was logged in the late 1980s. As viewed from Priest Lake and Highway 57, this unit should meet a VQO of Partial Retention; however it currently meets a Maximum Modification VQO.

Environmental Consequences

Alternative 1—No Action

Direct and Indirect Effects- No Action

The “No Action” alternative would not produce any visual disturbances or directly reduce the project area’s existing scenic characteristics. Many of the scattered, minor disturbances would continue to gradually diminish through time and vegetation growth. There would be other changes throughout the project area due to natural processes. Depending on what occurred, the changes could be gradual or drastic. These changes could include occurrences such as fires, wind events, insect and disease outbreaks.

However, the potential for adverse indirect scenic effects would become more likely with the No Action alternative, as the risk of extreme wildfire events continue to increase in the future decades throughout the project area. These potential effects include excessively large burned openings in the forest canopy that are uncharacteristic to the more characteristic largely continuous vegetation, as well as fire suppression-associated disturbances such as firelines, charred trees, stumps, roads and other scenery disturbances.

Cumulative Effects- No Action

The activities that occurred in the past have affected the current scenic integrity of the project area. Over time, the timber harvest, burning and road building and any other ground disturbing activities that occurred on National Forest would blend in and be less noticeable. This would include any devastating wildfire effects; however, the length of time for the area to recover visually from a catastrophic fire would be longer in duration.

Development of private land would continue to occur and might or might not affect the scenic integrity, depending on the amount of development and its location. Management of private lands is outside the scope of this analysis for the scenery management resource.

The proposed land exchange for the Granite Reeder Sewer District would continue. Sewer hook-ups would cause additional ground disturbance on private lands, permitted recreation residence lots, and at campgrounds and resorts. However, the visual affects from these activities should be minimal.

Alternative 2 — Proposed Action

Direct Effects and Indirect Effects - Proposed Action

Several features common to all alternatives (discussed above as Design Features) would be used to mitigate the effects to the scenic integrity. These include stumps cut as close to the ground as possible, maintenance of healthy advanced vegetation adjacent to the roads, “feathering” of harvest treatments adjacent to roads, and by leaving islands of uncut trees to screen the Lakeshore Trail #294 trailhead parking area. Other mitigations include removing flagging and boundary signs from units where the boundaries are visible from Sensitivity Level 1 viewpoints and/or adjacent private property. Log landings would be set back from main roads and trailheads, and designed not to be noticeable from major travel ways (Highway 57, Reeder Bay Road #1339, Beaver Creek Road #2512, and the Lakeshore Trail #294 parking area).

The proposed burn units would have short-term effects to the scenic integrity. Within a year after burning, the units would start to green up with new vegetative growth. Needles that are red from being scorched would fall from the individual trees and be less noticeable within two to three years. If individual trees were burned, they would not be noticeable after two to three years as new growth in the treated units “greens up”. In addition, individual burned trees already exist in these stands due to past natural fire activity from lightning storms so individually burned trees would appear as a natural occurrence.

The units planned for “Pile and Burn” would have short-term visual effects. Once the piles were burned, the area would green up and not be evident.

The proposed action would not only reduce hazardous fuels within the project area, but would reduce the risks to the highly valued scenery resource from excessively large or intense forest canopy changes due to wildfires, insect and disease outbreaks. This would be accomplished by activities that achieve conditions reflecting the historic range of variability within the project area (more historic species composition, structure and function).

Cumulative Effects- Proposed Action

As with the No Action alternative, development of private lands would continue and could affect the scenic integrity of the project area.

Considering the effects of past, present and future actions, the scenic integrity should be maintained on National Forest lands in the Action alternative.

Development of private land would continue to occur and might or might not affect the scenic integrity, depending on the amount of development and its location. Management of private lands is outside the scope of this analysis for the scenery management resource.

The proposed land exchange for the Granite Reeder Sewer District would continue. When property owner’s hook up to the sewer, there would be additional ground disturbance both on private lands and at Forest Service permitted recreation residence lots, campgrounds and resorts as they hook up to the sewer facilities, however the visual affects from these activities should be minimal.

Mitigation Measures & Monitoring

Forest Plan Monitoring

The 1987 Forest Plan identified specific monitoring items for each resource. For Scenery Management, Decision Documents are reviewed annually for Forest Plan Visual Quality (VQO) compliance. Closed sales are reviewed. The objective of the review is to determine if the VQOs have been met as disclosed in the decision document for a particular sale. A ten percent departure from Forest Plan direction after five years initiates further evaluation as to why the VQOs are not being met.

Project Monitoring

Monitoring would occur before, during and after sale activities to ensure design criteria are included. The goal is for all activities to meet the assigned VQOs for the area.

Compliance with the Forest Plan and Other Regulatory Direction

The following Issue Indicators will be used to determine if this project meets the Forest Plan and other regulations pertaining to scenery:

- Do the project and individual units meet or exceed the assigned Forest Plan Visual Quality Objectives?
- Determine the number of acres and types of treatment located within each Visual Quality Objective for comparison with Forest Plan goals for acres by VQO.

If the treatments units are designed using the required mitigation measures, the units viewed as Middleground and Background should meet VQOs once treatment is complete. For the Retention units viewed as Foreground, initially there would be some changes outside of a Retention VQO. Within 3 – 5 years when the slash piling and burning is complete and the units start to green up, they should meet the Forest Plan assigned VQO of Retention.

Figure 3-49. Overview of the project area viewed approximately 4 miles north of Coolin, ID along the Eastside Priest Lake Road - looking west. Picture taken February 2008.

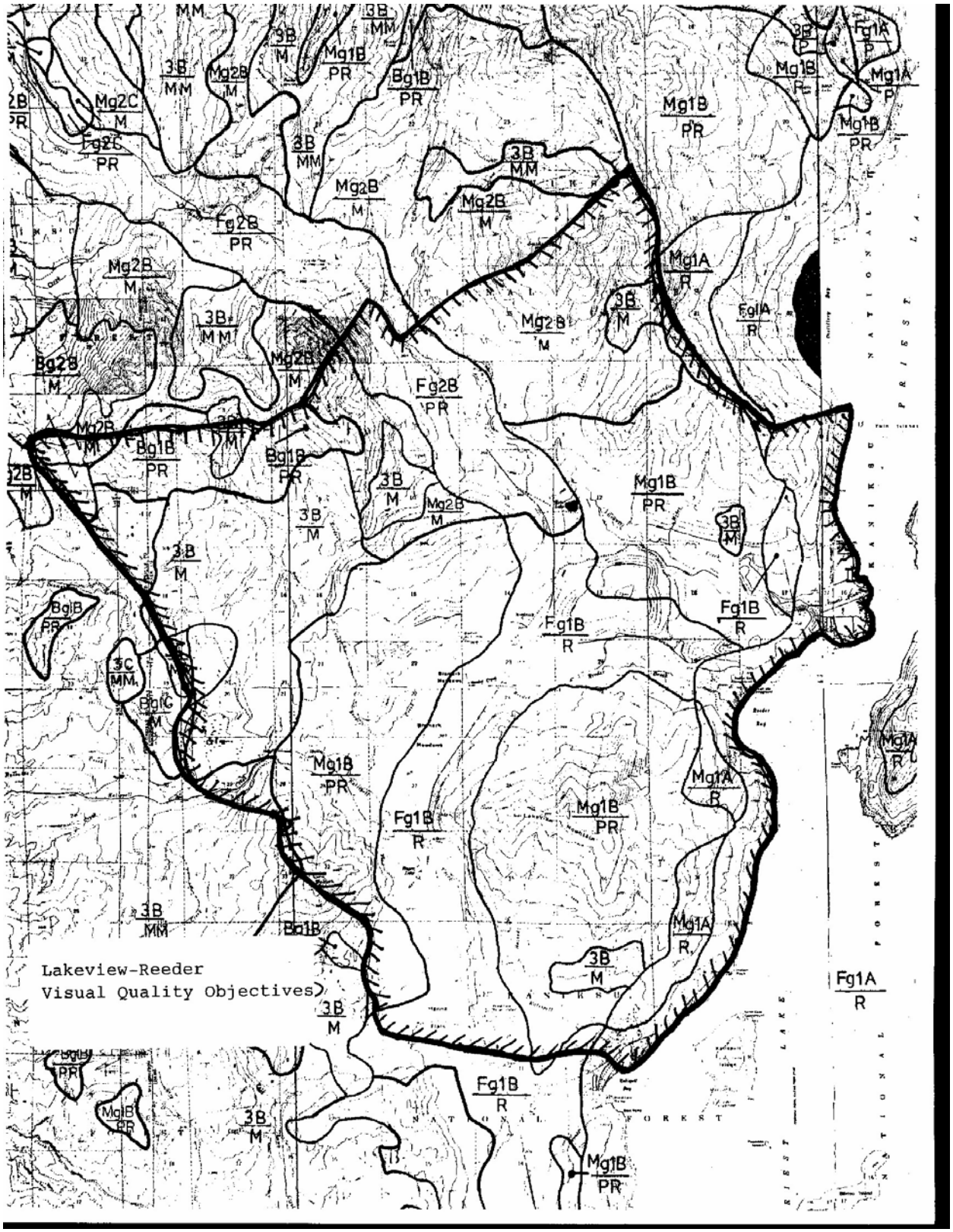


Figure 3-50. Visual Quality Objectives Map.

3.11 Economics

Introduction

This project is designed: 1) to reduce hazardous forest fuels within the project area to decrease the risk of a wildfire negatively impacting the communities in the project area, public and firefighter safety, public infrastructure, private and National Forest System lands and resource values; and 2) to restore, enhance and protect forest ecosystem components to improve forest health, increase biological diversity, as well as reduce threats from catastrophic wildfire and insect and disease infestations.

The purpose of this report is to analyze and disclose the potential economic effects of each alternative and to document compliance with the regulatory direction and applicable laws. The analysis will examine the feasibility and financial efficiency of the project.

Regulatory Framework

Laws and regulations provide direction for the management and protection of individual resources. Forest Service manuals and handbooks and individual forest plans identify the methods and guidelines that individual actions must follow in order to comply with the laws and regulations. In part, this regulatory framework defines the methodology and scope of analysis (what needs to be analyzed and how) for individual resources. The applicable regulatory framework that provides direction for economic analysis procedures comes from the following principal sources:

- National Environmental Policy Act of 1969 (NEPA)
- Code of Federal Regulations for Forest Planning (40 CFR 1502.23)
- OMB Circular A-94
- FSM 1970.3
- FSM 2430
- FSM 5152
- FSH 2409.18
- FSH 1909.17
- 1987 Idaho Panhandle National Forest Forest Plan

National Environmental Policy Act

Section 102 [42 USC § 4332] 2(B) insures that economic factors be given appropriate consideration in decision making.

Code of Federal Regulations for Forest Planning

40 CFR Part 1502 Section 23, 2007, states that when a cost-benefit analysis is prepared, the relationship between that analysis and any analyses of unquantified environmental impacts, values, and amenities must be disclosed. Weighing the merits and drawbacks of the various alternatives need not be displayed in a monetary cost-benefit analysis and should not be when there are important qualitative considerations. In any event, an environmental impact statement should at least indicate those considerations, including factors not related to environmental quality, which are likely to be relevant and important to a decision.

OMB Circular A-94

The goal of this circular is to promote efficient resource allocation through well-informed decision making by the Federal Government. It provides general guidance for conducting benefit-cost and cost-effectiveness analyses. It also provides specific guidance on the discount rates to be used in evaluating Federal programs whose benefits and costs are distributed overtime. A-94 suggests that agencies prepare an efficiency analysis for projects and prescribes Present Net Value (PNV) as the criterion for an efficiency analysis.

FSM 1970.3

FSM 1970.3 requires that economic analyses consider economic efficiency along with other factors to determine the costs, benefits, and effects of proposed actions on the public. In addition, this manual provides direction to select cost effective methods of conducting economic analyses to ensure that the degree of analysis is commensurate with the scope and complexity of the proposed action.

FSM 2430

FSM 2432.1 requires that a timber sale project plan be used as an early overview of a proposed project to verify the feasibility of the project and to determine if further investment in the proposal is warranted.FSM 2432.2 requires that a financial and, if necessary, economic analysis be completed, as guided by FSH 2409.18, for projects that are expected to exceed $100,000 in advertised value. The purpose of these analyses is:

- To develop projects that meet Forest plan standards and guidelines in the most cost-efficient manner and to integrate resource analyses with estimates of financial and economic effects to provide decision makers with an understanding of the trade-offs between alternatives.
- To determine which alternative, including the “no action” alternative, will be implemented to achieve Forest plan objectives. Projects will be analyzed to develop cost-efficient alternatives and identify the most cost-efficient alternative. In all projects, the least expensive activities that will achieve the resource management objectives will be used.

FSM 5152

FSM 5152 requires that conventional economic evaluation procedures are used to determine the most cost efficient fuel treatment activities.

FSH 2409.18

This handbook guides the financial and economic efficiency analysis for projects. Financial efficiency is measured by a revenue/cost ratio and PNV is used to compare all monetarily valued costs to benefits for an economic efficiency analysis.

FSH 1909.17

This handbook prescribes measures, provides direction for identification of inputs and outputs, and outlines methods for cost analysis.

1987 Idaho Panhandle National Forest Plan

The Forest wide goal in the IPNF Forest Plan (p. II-2) that is applicable to the economic analysis for this project is to complete reforestation of the lands in need of rehabilitation which is cost effective and cost efficient in meeting the management area goals.

The Forest-wide objectives in the IPNF Forest Plan (p. II-8) are as follows:

- Investments in timber management activities will be based on project economic analysis in conjunction with timber management objectives.
- Management activities will continue to contribute to local employment, income, and lifestyles. The Forest will be managed to contribute to the increasing demand for recreation and resource protection while at the same time continuing to provide traditional employment opportunities in the wood products industry.

The applicable Forest-wide standards included in the Forest Plan (pp. II-32 and 33) are:

- Cost effective fire protection programs will be developed to implement management direction based on on-site characteristics that affect fire occurrence, fire effects, fire management costs and fire caused changes in values.
- Vegetation management will favor the use of fire, hand treatment, natural control, or mechanical methods wherever feasible and cost effective.

Issues

The scoping process is used to help determine the issues related to the proposed action. Some issues relate to specific activities or areas while others pertain to the overall project. Issues relating to economics were identified from public comments received in response to multiple scoping efforts during the scoping process. In consideration with the regulatory framework discussed above, issues are used to help define the scope of analysis.

The issues and how they are addressed in this document are outlined in Table 3-64 below.

Table 3-64. Issues relating to project feasibility and financial efficiency.

Issue	*How the Issue is Addressed*
Making cost effective decisions on how to accomplish the goals will be the difference in a good or great project.	Cost effectiveness is addressed with both the project feasibility and financial efficiency analyses. These methods determine how well revenues cover costs.
Harvesting the excess fuels for cost credits or general area upgrades should be addressed.	This project is designed to use revenues to pay for improvements both within and outside of the project area.
What are the sources of funding for the proposed plan? The EA/EIS must explicitly state the funding mechanisms that would be used to carry out all the post-logging slash ("fuel") treatment. How certain would each funding source be, i.e., how likely is it that slash could remain untreated?	Revenue from the sale of timber is the primary funding source for post-logging slash treatment, mitigation work, and additional opportunities. Revenues for slash disposal are generated through BD collections and land management credits when the project sells. Any deficits are covered by appropriated funds.
There are no references to costs. Has a cost/benefit ratio been calculated?	A cost/benefit ratio is one of the indicators of financial efficiency and is addressed in that analysis.
The public at large, and private landowners, must understand the implications of the long-term efforts, including the amount of funding necessary, and the likelihood based on realistic funding scenarios for such a program to be funded both adequately and in a timely manner.	This project is designed to reduce fuels for relatively long timeframes. Fire behavior in treated stands would be reduced for 20 to 40 years. Revenues generated within the estimated project lifetime of seven years would pay for fuel reduction activities as described in the financial efficiency discussion.
How many board feet are you expecting to pull out over the project time period? Are you looking at the potential timber harvested in this area as a means of offsetting the costs of fuel reduction in other areas?	An estimated 13 million board feet would be harvested over seven years. Revenues generated from this project would be used to pay for fuel reduction work within the project area.

Analysis Methods

This section describes the scope of analysis or what was analyzed and how. The scope of analysis has been developed using the applicable laws and regulations and the issues identified during scoping. Project feasibility and financial efficiency are the two methods used for this economic analysis.

Project Feasibility

Project feasibility generally relies on the Region 1 Transaction Evidence Appraisal (TEA) System (http://www.fsweb.r1.fs.fed.us/forest/sales/appraisal/index.html). The Region 1 TEA approach uses past projects and market transactions to estimate average stumpage prices and average project characteristics.

Then, the project being appraised is compared to the average project in the data base, adjustments are made, and the estimated selling price (high bid resulting from the timber sale auction) of the project being appraised is calculated. The Region 1 TEA equation is updated every six months (January 15th and July 15th, approximately) to reflect changes in the timber sale characteristics, lumber markets and local stumpage markets. The update consists of "dropping" the oldest six months of data and "adding" the newest six months of data.

Unfortunately, with the current market slump and the low number of sold projects to calculated accurate averages, the current TEA equation overestimates stumpage prices and consequently the estimated selling price is unrealistically high. Therefore, a simplified process, developed by the Region 1 economist, was used to estimate the stumpage price and estimated selling value for each of the alternatives. This process uses project specific costs, average logging and hauling costs, and current Western Wood Products Association (WWPA) indices to provide a better estimate of selling price during market slumps.
The estimated selling price for the project was compared to the base rates (revenues considered essential to cover regeneration plus minimum return to the federal treasury) for the project. If the estimated selling price exceeds the base rates, the project is considered feasible. If the feasibility analysis indicates that the project is not feasible (estimated selling price is less than the base rates), the project should be modified or postponed (36 CFR 223.61 and FSM 2430.2).

Financial Efficiency

Financial efficiency is measured by the present net value (PNV) (OMB A-94) and benefit-cost ratios (B/C) (40 CFR Part 1502 Section 23) of the alternatives. PNV is defined as the value of discounted benefits minus discounted costs. Similarly, a B/C ratio is the ratio of discounted benefits to discounted costs. The financial efficiency analysis takes a national perspective and derives the PNV using federal revenues and costs. A positive PNV or B/C ratio greater than 1 indicates that the alternative is financially efficient[79]. The financial efficiency analysis is not intended to be a comprehensive analysis that incorporates a monetary expression of all known market and non-market benefits and costs that is generally used when economic efficiency is the sole or primary criterion upon which a decision is made. Many of the values associated with natural resource management are best handled apart from, but in conjunction with, a more limited financial efficiency framework. These non-market benefits and costs associated with the project are discussed throughout the EIS.

Quick-Silver was used to determine the PNV and B/C ratio. Quick-Silver is a computer based project analysis tool for use by forest managers to determine the economic performance of long-term investments. This program simply discounts projected future costs and revenues to current dollars in order to provide a balanced comparison between alternatives.

Environmental Consequences

Direct and Indirect Economic Effects

Project Feasibility

The estimation of project feasibility took into account logging system, timber species, volume removed, current market prices, costs for slash treatment, and the cost of specified roads, temporary roads and road maintenance. The estimated selling price for alternative 1 is $0.00 per CCF and $69.20 per CCF for alternative 2 (PF-ECON-005). The base rate for alternative 1 is $0.00 per CCF and $34.23 per CCF for

[79] The PNV measure should be used when the PNV measure leads to a different conclusion than the B/C ratio, since there are some problems with the B/C ratio. Benefit-cost ratios give the (discounted) benefits per dollar of (discounted) cost. Thus, the smaller of two projects may have a higher B/C, yet yield a smaller total net benefit (Sassone and Schaffer, 1978).

alternative 2. The estimated selling value of $69.20 per CCF for alternative 2 exceeds the base rates. This indicates that alternative 2 is feasible.

Financial Efficiency

The financial efficiency for the project was evaluated based on several assumptions. These assumptions are summarized in Table 3-66 below. The financial efficiency analysis includes consideration for fuels reduction harvest, reforestation and required mitigation.

Table 3-65. Financial Efficiency Assumptions.

Discount Rate	*Timber Revenue*	*Harvest Volume and Logistics*	*Timing and Project Cost*	*Treatment Acres*	*Discounting Calculations*
4% (real basis) Source: FSM 1971.21	$98.20 Source: Stumpage Price Spreadsheet	27,912 CCF From: Lakeview-Reeder Fuel Project estimates of harvest volume and logging plan	7 year project life From: IPNF North Zone and Regional averages	4,055 acres From: Lakeview-Reeder Fuel Project proposal	From: Derived formulas in Quick-Silver

Table 3-67 below summarizes the financial efficiency, including the discounted revenue, cost, PNV, and B/C of each alternative. The alternatives are listed across the top of the table. The details of the analysis, timelines, and the definitions of the evaluation items can be found in the project file (PF-ECON-001 to PF-ECON-012). The values were calculated by discounting formulas in the Quick-Silver program. The stumpage price was calculated using average logging and hauling costs, volume removed, timber species and current market prices.

Table 3-66. Fuel Reduction Economic Efficiency Summary (2007 dollars).

Evaluation Item	*Alternative 1*	*Alternative 2*
Volume harvested (CCF*)	0	27,912
Discounted revenue	$0	$2,356,071.15
Discounted cost	$0	-$2,752,650.34
Present net value (PNV)	$0	-$396,579.19
Benefit/cost ratio (B/C)	0	.86

The estimated costs to the Forest Service are included in the PNV calculations (PF-ECON-006). These costs include:

- timber sale preparation,
- timber sale administration,
- engineering prep and supervision,
- burning slash, and
- certification exams

Planning costs (NEPA) were not included in any of the alternatives since they are sunk costs. The NEPA costs for this project are estimated to be $1,000,000 based on regional averages.

- The Proposed Action (Alternative 2) returns a negative PNV in terms of the overall financial efficiency. This would require appropriated dollars, dollars from other stewardship projects or grants to cover the remaining costs. Alternatively, the current market would have to improve to the point that the stumpage value would increase to at least $114.77 per CCF, which would cover all costs. In addition, historically prospective purchasers have overbid the estimated selling value of projects on the IPNF. This would create additional revenues to cover costs.
- The No Action Alternative has no revenue producing projects associated with it (i.e. no timber harvest operation).
- The no action alternative would not plant or take other restorative actions and therefore would incur no costs.
- The timber harvest operation is assumed to be feasible for alternative 2 given the positive value generated by the timber appraisal.

In addition to the actions required to mitigate the effects of the proposed fuel reduction activities, the proposed action also includes measures that would meet Forest Plan objectives. These activities include decommissioning roads to bring the Kalispell-Granite and Lakeshore Bear Management Units above standards and further improve conditions within the Kalispell, Reeder and Granite Creek watersheds. Additionally, two fish passage barriers would be repaired. The costs of this additional mitigation would be $395,665.61. Again, funding for these activities would require appropriated dollars, dollars from other stewardship projects or grants.

Compliance with the Forest Plan and Other Regulatory Direction

This section describes whether and how the alternatives comply with IPNF Forest Plan as well as other federal regulatory direction.

National Environmental Policy Act

This analysis provides the appropriate information so that the economics of this project can be given appropriate consideration in decision making.

Code of Federal Regulations for Forest Planning

A cost-benefit ratio was computed for project activities and the analysis of unquantified environmental impacts, values and amenities that are relevant to the decision are disclosed within the EIS.

OMB Circular A-94 and FSH 2409.18

An efficiency analysis has been prepared for this project using PNV as the criterion to compare all monetarily valued costs to benefits.

FSM 1970.3

This economic analysis considers economic efficiency along with other factors to determine the costs, benefits, and effects of proposed actions on the public.

FSM 2430

A timber sale project plan was used as an early overview of a proposed project to verify the feasibility of the project and to determine if further investment in the proposal is warranted. A financial and economic analysis has been completed for both alternatives to determine which alternative would achieve Forest plan objectives in the most cost-efficient manner.

FSM 5152

Conventional economic evaluation procedures are used to determine the most cost efficient fuel treatment activities.

FSH 1909.17

Direction in this handbook was used for the identification of inputs and outputs and analysis of cost.

1987 Idaho Panhandle National Forest Forest Plan

Alternative 2 meets all Forest plan direction but alternative 1 fails to meet all Forest plan goals, objectives and standards pertaining to economic analysis.

The Forest wide goal in the IPNF Forest Plan (p. II-2):

- Alternative 2 would reforest lands in need of rehabilitation using the most cost effective and cost efficient methods to meet the management area goals. Alternative 1 would not.

The Forest-wide objectives in the IPNF Forest Plan (p. II-8):

- An economic analysis has been used to evaluate investments in timber management activities in conjunction with timber management objectives.
- Both alternatives would continue to contribute to local employment, income, and lifestyles, however, alternative 1 would not contribute to wood products based employment or income.

The applicable Forest-wide standards included in the Forest Plan (pp. II-32 and 33):

- Fuel treatments identified in alternative 2 have been designed to enhance cost effective fire protection within the project area based on on-site characteristics that affect fire occurrence, fire effects, fire management costs and fire caused changes in values. Alternative 1 has no fuel treatments identified.
- Vegetation management activities associated with alternative 2 favor the use of fire, hand treatment, natural control or mechanical methods wherever feasible and cost effective. Alternative 1 has no vegetation management activities.

3.12 Required Disclosures

Potential Conflicts with Plans and Policies of Other Jurisdictions

Water Quality

Section 313 of the Clean Water Act requires Federal Agencies to comply with all Federal, State, interstate and local requirements, administrative authority, and process and sanctions with respect to the control and management of water pollution. Executive Order 12088 also requires the Forest Service to meet the requirements of the Act. The action alternative (Alternative 2) would comply with the Clean Water Act and Idaho State Water Quality Standards. The alternative would incorporate Soil and Water Conservation Practices and Best Management Practices, avoid channel degradation, and comply with the Forest Plan.

Air Quality

The fuels reduction treatments include underburning and pile burning, which has the potential to affect local air quality. This activity would be conducted in accordance with the Montana/Idaho Airshed Group joint operating plan. Daily operations are monitored and coordinated by the monitoring unit in Missoula, Montana.

Cultural Resources

The laws and policies that govern cultural resource protection on Federal Lands are coordinated with the State Historic Preservation Office (SHPO) of Idaho, who serves in an advisory capacity. The policies for the US Forest Service and SHPO are consistent.

Wildlife

The Forest Service and the Idaho Department of Fish and Game (IDFG) work together to manage wildlife, but the missions of the two agencies are different. The Forest Service manages the land and affects wildlife habitat through implementation of fuels reduction and silvicultural treatments, and through management of the transportation system and access to National Forest System lands. The IDFG manages wildlife and has affects to the wildlife by implementation of hunting regulations (adjusting seasons, harvest and day limits) and enforcing other rules that affect fish and wildlife populations.

Probable Adverse Environmental Effects Which Cannot Be Avoided

Implementation of any alternative (Alternative 1 or 2) would inevitably result in some adverse environmental effects. The severity of the effects of the action alternatives can be minimized by adhering to the features of the alternatives, such as Best Management Practices. If management activities occur, however, some effects cannot be avoided. Even the No Action Alternative has effects.

Scenic Resources, Roadless Areas and Recreation

There are no roadless areas present in the vicinity of any proposed activities. The fuels reduction treatments would add a variety of line, form, color and texture to the landscape. Proposed activities would have a short-term adverse affect on scenic resources in some areas while activities are occurring and until the in-growth of vegetation begins to mask the evidence of management activities. Removing the understory and intermediate size trees would create stumps, which could remain on the landscape for five to 20 years or more depending on the rate of decomposition, burning consumption during the underburning, and the tree species.

Cultural Resources

There is no assurance that every cultural resource site would be located in advance of all planned management activities. Some ground-disturbing activity may affect an undiscovered historic or pre-historic site. Sites discovered in this manner would be immediately protected from further disturbance.

Wildlife

The availability of various elements of wildlife habitat (such as stand structure, composition, and species-specific habitat elements) are dynamic and change over time. Consequently, wildlife populations associated with specific habitat conditions also change with time. Alternative 2 would trend habitat conditions within or toward historic ranges. Such changes can result in changes in local populations of specific species.

Air Quality

Temporary seasonal effects on air quality are not completely avoidable under either of the alternatives, including the No Action Alternative. Fuels reduction treatments include underburning and pile burning as an integral part of management activities that would fulfill the purpose and need for this project. These activities would be conducted when air dispersion meets the Montana/Idaho Airshed Group requirements and effects would be monitored by the Missoula, Montana monitoring unit. See Chapter 3 Fire/Fuels discussion for additional information.

Relationship Between Short-Term Use and Long-Term Productivity

Short-term uses are those that generally occur annually. Long-term productivity, in this sense, refers to the ability of the land to produce a continuous supply of a resource. Refer to the individual resource sections in Chapter 3.

Water Quality

The duration of effects of fuels reduction and silvicultural treatments on the water resource is highly variable and dependent on site-specific characteristics and features. Under the action alternatives, road construction, culvert replacement, and decommissioning may temporarily introduce a small amount of sediment into streams. The long-term benefits of culvert replacement and road decommissioning would reduce the amount of sediment reaching streams; over time increasing water quality and improving habitat conditions for fish. See the water quality and fisheries sections of Chapter 3 provide more information.

Vegetation

The capability of the land to produce timber, high quality water, and forage would not be impaired by any of the action alternatives. Silvicultural treatments would reduce competition and improve growth of individual trees, and maintain the health and vigor of timber stands, thus enhancing long-term productivity of the area. In the short-term, harvesting stands at high risk of mortality would utilize commercially valuable wood products that would otherwise not be used as forest products. Reforestation would contribute to maintaining these lands in a productive state.

Silvicultural treatments that trend toward desired species composition and stocking levels, planting of genetically improved trees, management of stocking levels to reduce competition and improve vigor of trees, and intermediate treatments to maintain the health and vigor of stands are all means of trending toward and maintaining sustainable conditions. Thus, managed stands produce a greater rate of growth over time than unmanaged stands – maintaining the long-term yield of forest stands.

In the short-term, harvesting stands that are at a high risk of mortality captures the economic value that would otherwise be lost. Reforestation (natural or planted) keeps the land back in a productive growing condition.

Silvicultural and fuels reduction treatments can affect the levels of organic matter within an activity area, which could reduce long-term site productivity. These management activities include measures designed to maintain varying levels of organic matter and to maintain or improve soil characteristics that affect site productivity (see discussion of the Soil Resource throughout the EIS). Reforestation of treatment areas could change plant succession, stand development, and species composition.

Wildlife

As explained above, the availability of various elements of wildlife habitat (such as stand structure, composition, and species-specific habitat elements) are dynamic and change over time. Appropriate scheduling of fuels reduction/silvicultural treatments and road improvement activities, as well as ongoing access management, can provide for and help sustain a mosaic of habitat conditions. The number of snags to be left for wildlife and other benefits is determined by a protocol based on the best available information on the appropriate size, species, and numbers of snags needed for wildlife, and the snags that can be protected during harvest activities. The short-term need to protect snags from wildfire through reduction of wildfire risk has been addressed by the fuel treatment features of the alternatives. Disturbance to wildlife during project implementation would be minor and short-term due to restrictions on public use of designated roads.

Air Quality

The temporary impacts of smoke from underburning and pile burning, and road dust from vehicles associated with the proposed activities would have minor short-term effects on visual quality and recreation use as described in the EIS. The short-term impacts are traded for by minimizing the risks to the watersheds from wildfire and meeting the other goals and objectives for this project. Wildfires generally produce significantly more air pollution, sometimes such affects occur when the air quality is already being impacted by other wildfires within the airshed.

The Forest Service would voluntarily cease prescribed burning activities when necessary to avoid violation of Airshed agreements and State air quality standards. Prescribed burning of fuels and logging slash would take place primarily in early spring when air quality and weather patterns are more conducive to better air quality. During other times of the year activities such as agricultural field burning, slash burning on private forest lands, use of wood stoves, and dust from the Palouse and Columbia Basins can compete for use of a monitored airshed.

Irreversible and Irretrievable Commitment of Resources

An *irreversible* commitment of resources refers to the loss of production, or use of a non-renewable resource, due to a land use decision that, once executed, cannot be changed. An *irretrievable* commitment applies to loss of production or use of renewable resources for a period of time.

Water Quality

Best Management Practices and other design criteria and mitigation items would be effective in avoiding irreversible and irretrievable effects on water quality and aquatic habitats.

Soil Productivity

Best Management Practices and other design features described in Chapter 2 would be used to avoid soil productivity losses from Alternative 2. The No Action Alternative (Alternative 1) could have losses as an

indirect effect of wildfire. See the Soil Resource discussions in the EIS for information concerning effects.

Scenic Resources, Roadless Areas and Recreation

Active management would cause an irretrievable, but not irreversible, effect to the forest stands since the specific trees and biomass removed cannot be replaced, and the future maintenance of fuels and fuel buffers would prevent the proposed treatment areas from returning to the existing condition. However, the effects are not irreversible, since trees and vegetation always grow back over time. Evidence of management activities such as stumps, would reduce the natural integrity of the area until regrowth of vegetation and decomposition of stumps improve the apparent naturalness in five to 20 years depending on decomposition rates.

Air Quality

The impact of pile burning and underburning would have temporary seasonal impacts on the air quality in Alternative 2.

Heritage Resources

Any activity that would disturb a cultural resource is an irreversible commitment.

Wildlife

Loss or modification of habitat for certain wildlife species is an irretrievable (time-related) commitment of resources.

Vegetation

The harvest of trees is an irreversible commitment of resources since the individual trees cannot be replaced; however trees are a renewable resource that will grow back, thus it is not an irretrievable commitment. Acres not proposed for vegetation treatments that are at high risk of insect and disease or fire would experience adverse effects if tree mortality or a wildfire occurs.

Noxious Weeds

Any activity carries the risks of introducing or spreading weeds. Mitigation measures such as washing logging and construction equipment, closing temporary roads, and seeding disturbed areas would help reduce but not totally eliminate the risk of spreading weeds. Weed infestations are, and will continue to be, treated under the direction of the Priest Lake Noxious Weed Control Project FEIS

Specifically Required Disclosures

Administration of the Forest Development Transportation System

A roads analysis has been prepared for the Lakeview-Reeder HFRA Project in accordance with the Roads Policy at 36 CRF Part 212, published in the Federal Register on January 12, 2001.

Effects of Alternatives on Social Groups

Executive Order 12898 (issued in 1995) required federal agencies to identify and address the issue of environmental justice (i.e. adverse human health and environmental effects of agency programs that disproportionately impact minority and low income populations). At this time, no minority or low-income populations have been identified in the Lakeview-Reeder HFRA project analysis area.

Based on past experience with similar projects on the Priest Lake Ranger District, none of the action alternatives would substantially affect minority or low-income individuals, women, or civil rights. The

implementation of this project is expected to provide job opportunities in communities such as Priest River, Coolin and Nordman. Some of these communities include minority populations that may benefit from the economic effects. Small or minority-owned businesses would have an opportunity to compete for some of the work.

Data for Bonner County as of the 2000 census year shows the population is 96.6 percent white, not of Hispanic/Latino origin; 1.6 percent persons of Hispanic or Latino origin; .9 percent persons of American Indian and Alaska Native origin. Black or African American, Asian, Native Hawaiian and Other Pacific Islanders each represent less than 1 percent of the population.

Effects on Floodplains, Wetlands and Water Quality

The Inland Native Fish Strategy (INFS) standards and guidelines implemented with this project would protect floodplains and wetlands.

In order to implement the stream restoration work that is proposed adjacent to the road obliteration on FSR 308, the Forest Service will need to submit and receive approval through the Corps of Engineers (COE) 404 permitting process.

Effects on Threatened and Endangered Species

Threatened and endangered wildlife, fish, and plant species may be affected by the proposed action and alternatives (including No Action). See wildlife discussions for more information. A biological assessment was prepared and submitted to the US Fish and Wildlife Service for concurrence according to the Endangered Species Act to insure protection of these species.

Energy Requirements and Conservation Potential of Alternatives

There are no rangelands or grazing permits on National Forest System lands within the project area. The definition of prime forest land does not apply to lands within the National Forests. Lands administered by the Forest Service within the project area do not include prime range lands or farm lands. Under Alternative 2, National Forest System lands would be managed with the appropriate consideration to the effects on adjacent lands.

Migratory Bird Treaty Act

On January 10, 2001, President Clinton signed an Executive Order outlining responsibilities of federal agencies to protect migratory birds. There would be no significant loss of migratory bird habitat from implementation of Alternative 2. This alternative would move stand structure, composition, patch size, and specific wildlife habitat elements within/towards historic ranges. Proposed actions are expected to maintain sufficient amounts and types of habitats to allow migratory birds to inhabit and reproduce within the Lakeview-Reeder HFRA project area.

The action alternative contains certain practices that avoid or minimize, to the maximum extent practicable, adverse impacts on species of migratory birds.

Incomplete or Unavailable Information

There are some incomplete or unavailable portions of records of past timber harvest and road construction activities on National Forest System lands and private lands within the project area – as stated in the discussions of past activities. The relevance of the incomplete or missing data depends on what it lacking. For instance, the name of a particular sale would be of little value in evaluating the environmental effects of the harvest. For many elements of past activities, knowledge is gained through field visits, interpretation of aerial photos, or both. Note that past actions are reflected in the current condition of the project area to the extent that they are still affecting the particular resource being

analyzed; thus, the effects of past actions are accounted for in the assessment and description of the existing condition.

List of Preparers

The following individuals participated in the formulation and analyses of the alternatives and the subsequent preparation of the Lakeview-Reeder HFRA Draft EIS.

David Cobb – Co-Interdisciplinary Team Leader and silviculturist

Luke Hixson – Co-Interdisciplinary Team Leader, financial analysis, and harvest system input

Tim Layser – Wildlife Biologist

Jill Cobb – Hydrologist

Matt Fairchild – Fishery Biologist

Matt Davis – Fishery Biologist

Dan Jackson – Transportation Analysis

Debbie Butler – Scenery Analysis

Mark Vander Meer – Soils

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Vincent Archer – Soils

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Laura LeMieux – Recreation

Richard Kramer – District Ranger

DeWayne Thornburgh – Deputy District Ranger

Matt Butler – Fuels and Air Quality

Glen Palfrey – Fuels and Air Quality

Jennifer Costich-Thompson – Forester

List of Recipients

The following persons, agencies, and organizations received a letter notifying them of the availability of the EIS on the IPNF website. The notification also listed the availability of the EIS in electronic or hardcopy format upon request.

This list is not all inclusive due to the fact that other persons can request copies following this initial release to the public.

Grant and Karen Brockus
Mr. and Mrs. Miller
Thompson Leasing Co. LLC
Arnold Beresford and Susanne Tuson
Don and Kathryn Pratt
Keith McIvor
WA Dept. of Fish and Wildlife
Gerald and Terry Rose
Liz Johnson-Gebhardt PCFC
Kootenai Environmental Alliance
Randall and Carrie Moore
Cougar Run Homeowners's Assn.
Robert Benner
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David Dilts
Ann and Nicolas Meneses
Mark Kabush
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Russell and Zenetta Cykendall
Linda and Rick Dixon
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Michael and Linda Donahoe
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Idaho State Parks & Recreation
Jim Anderson
Cecil Hayter
Keith Sterling
Ross and Barbara Burgess
Pat and Sue Kautzman
James Brown
Greg and Margie Williams
Wild West Institute
Darlene Martin
Harold Jeffs
Neil Beese
Don Smith
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Sandra Cortright
Idaho Native Plant Society
Mike Brown - KPND Radio Sandpoint
Vital Ground Foundation
West Priest Lake Fire District
George Earle
Mike Sudnikovich
Robert Anderson
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Jim Wigginton
Daniel Howell
Tom Weitz
R.R. Schreiber
Selkirk Conservation Alliance
Priest Lake Chamber of Commerce
Priest Lake Trails and Snowmobile Club
Albert Leonard III

Dennis Aho
Bruce Duncan
Priest Lake (Kaniksu) Lions' Club
Liz Sedler – Selkirk Conservation Alliance
The Lands Council

The following persons, agencies, and organizations received copies of the EIS.

US Environmental Protection Agency – Seattle and Washington, DC
USDI Office of Environmental Affairs – Washington, DC
USDA National Agricultural Library, Beltsville, MD
USDA Forest Service – Ecosystem Management – Washingon, DC

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Appendix A – Best Management Practices (BMPs)

Introduction

The Clean Water Act, as amended, (33 U.S.C. 1323) directs the Forest Service to meet state, interstate and local substantive as well as procedural requirements respecting control and abatement of pollution in the same manner, and to the same extent as any non-government entity. The Forest Service has the statutory authority to regulate, permit and enforce land-use activities on the National Forest System lands that affect water quality. As the designated management agency, the Forest Service is responsible for implementing nonpoint source pollution control and the Idaho's State Water Quality Standards on National Forest System lands. The Forest Service's water quality policy is intended to:

1) promote the improvement, protection, restoration and maintenance of water quality to support beneficial uses on all national forest service waters;

2) promote and apply approved Best Management Practices (BMPs) to all management activities as the method for control of non-point source pollution;

3) comply with established state or national water quality goals; and

4) design monitoring programs for specific activities and practices that may affect or have the potential to affect instream beneficial uses on National Forest System lands.

The Forest Service also coordinates all water quality programs, on National Forest System lands within its jurisdiction, with the local, state and federal agencies, affected public lands users, adjoining land owners, and other affected interests.

The Environmental Protection Agency and the State of Idaho are responsible for enforcement of these standards. The Forest Plan for the Idaho Panhandle National Forests states that the Forest will "maintain high quality water to protect fisheries habitat, water based recreation, public water supplies and be within state water quality standards" (Forest Plan, Chapter II, p. 27). The use of BMPs is also required in the Memorandum of Understanding between the Forest Service and the State of Idaho as part of our responsibility as the Designated Water Quality Management Agency on National Forest System lands. The State's water quality standards regulate nonpoint source pollution from timber management and road construction activities through application of Best Management Practices (BMPs). The BMPs were developed under authority of the Clean Water Act to ensure that Idaho's waters do not contain pollutants in concentrations that adversely affect water quality or impair a designated use. State-recognized BMPs that would be used during project design and implementation are contained in *Rules and Regulations pertaining to the Idaho Forest Practices as adopted by the State of Idaho.*

Many of the rules and regulations for stream channel alterations are contained, in slightly different forms, in a Memorandum of Understanding (MOU) between the Forest Service and the State of Idaho. This MOU is incorporated into the Forest Manual and R-1 Supplement 31 and it contains provisions that are not currently state-recognized BMPs. Please refer to Chapter II of this Environmental Analysis for site-specific and project-specific BMPs and Soil and Water Conservation Practices ("Water Quality Best Management Practices").

The practices described herein are tiered to the practices in FSH 2509.22. They were developed as part of the NEPA process, with interdisciplinary involvement, and meet state and Forest water quality objectives.

The purpose of this appendix is to establish the connection between the Soil and Water Conservation Practice (SWCP) employed by the Forest Service and BMPs identified in the Idaho Forest Practices Rules and Regulations (IDAPA 20.02.01), and to identify how the Soil and Water Conservation Practice Standard Specifications for the Construction of Roads and the Timber Sale Contract provisions meet or exceed the rules and regulations pertaining to the Idaho Forest Practices Act, Title 38, Chapter 13.

The objective of this appendix is to provide conservation practices for use on National Forest System lands to minimize the effects of management activities on soil and water resources. The conservation practices were compiled from Forest Service manuals, handbooks, contract and permit provisions, to directly or indirectly improve water quality, reduce losses in soil productivity and erosion, and abate or mitigate management effects, while meeting other resource goals and objectives. They are of three basic forms: administrative, preventive, and corrective. These practices are neither detailed prescriptions nor solutions for specific problems. They are purposely broad. These practices are action-initiating process mechanisms which call for the development of requirements and considerations to be addressed prior to and during the formulation of alternatives for land management actions. They serve as checkpoints that are considered in formulating a plan, a program, and/or a project.

Although some environmental impacts may be characteristic of a management activity, the actual effects on soil and water resources would vary considerably. The extent of these management effects on soil and water resources is a function of:

1. The physical, meteorological, and hydrologic environment where the activity takes place (topography, physiography, precipitation, channel density, geology, sol type, vegetative cover, etc.).

2. The type of activity imposed on a given environment (recreation, mineral exploration, timber management, etc.) and its extent and magnitude.

3. The method of application and the duration of the activity (grazing system used, types of silvicultural practice used, constant vs. seasonal use, recurrent application or one time application, etc.).

4. The season of the year that the activity occurs or is applied.

These factors vary within the National Forests in the Northern Region and from site to site. It follows then that the extent and kind of impacts are variable, as are the abatement and mitigation measures. No solution prescription, method, or technique is best for all circumstances. Thus the management practices presented in the following include such phrases as "according to the design", "as prescribed," "suitable for," "within acceptable limits," and similar qualifiers. The actual prescriptions, specifications, and designs are the result of evaluation and development by professional personnel through interdisciplinary involvement in the NEPA process. This results in specific conservation practices that are tailored to meet site-specific resource requirements and needs.

Items Common to All Soil and Water Conservation Practices

Responsibility for Implementation: The District Ranger (through the Presale Forester) is responsible for insuring the factors identified in the following SWCPs are incorporated into: Timber Sale Contracts through the inclusion of proper B and/or C provisions; or Public Works Contracts through the inclusion of specific contract clauses. The Contracting Officer, through his/her official representative (sale administrator and/or engineering representatives for timber sale contracts; and Contracting Officers Representative for public works contracts) is responsible for insuring that the road construction and timber sale provisions are properly administered on the ground.

Monitoring: Implementation and effectiveness of water quality mitigation measures are also monitored annually. This includes routine monitoring by timber sale administrators, road construction inspectors, and resource specialists, which is documented in diaries and project files. Basically, water quality monitoring is a review of BMP implementation and a visual evaluation BMP effectiveness. Any necessary corrective action is taken immediately. Such action may include modification of the BMP, modification of the project, termination of the project, or modification of the state water quality standards.

Format of the BMPs

Each Soil and Water Conservation Practice (SWCP) is described as follows:

Title: Includes the sequential number of the SWCP and a brief title.

Objective: Describes the SWCP objective(s) and the desired results for protecting water quality.

Effectiveness: Provides a qualitative assessment of expected effectiveness that the implemented BMP will have on preventing or reducing impacts on water quality. The SWCP effectiveness rating is based on: 1) literature and research (must be applicable to area 2) administrative studies (local or within similar ecosystem); and 3) professional experience (judgment of an expert by education and/or experience). The expected effectiveness of the SWCP is rated either High, Moderate or Low.

> **High**: Practice is highly effective (>90%) and one or more of the following types of documentation are available:
>
> a) Literature/Research - must be applicable to area
> b) Administrative studies - local or within similar ecosystem
> c) Experience - judgment of an expert by education and/or experience.
> d) Fact - obvious by reasoned (logical response).
>
> **Moderate**: Documentation shows that the practice is effective less than 90% of the time, but at least 75% of the time.
>
> Or
>
> Logic indicates that this practice is highly effective, but there is little or no documentation to back it up.
>
> Or
>
> Implementation and effectiveness of this practice will be monitored and the practice will be modified if necessary to achieve the objective of the BMP.
>
> **Low**: Effectiveness unknown or unverified, and there is little to no documentation
>
> Or
>
> Applied logic is uncertain in this case, or the practice is estimated to be less than 75% effective.
>
> Or
>
> This practice is speculative and needs both effectiveness and validation monitoring.

The effectiveness estimates given here are general, given the range of conditions throughout the Forest. More specific estimates are made at the project level when the BMPs are actually prescribed.

Compliance: Provides a qualitative assessment of how the implementation of the specific measures will meet the Forest Practice Act Roles and Regulations pertaining to water quality.

Implementation: This section identifies: (1) the site-specific water quality protection measures to be implemented and (2) how the practices are expected to be applied and incorporated into the Timber Sale Contract.

Abbreviations

TSC = Timber Sale Contract
TSA = Timber Sale Administrator
PWC = Public Works Contract
SCA = Stream Channel Alteration Act
BMP = Best Management Practices
SPS = Special Project Specifications
CFR = Code of Federal Regulations
SAM = Sale Area Map
COR = Contracting Officer Representative
EPA = Environmental Protection Agency
SWCP= Soil and Water Conservation Practices
SMZ = Streamside Management Zone

Soil and Water Conservation Practices for Lakeview Reeder

Key Soil and Water Conservation Practices

Class * Soil and Water Conservation Practice (FSH 2509.22)
*** Classes of SWCP (BMP)**
A = Administrative
G = Ground Disturbance Reduction
E = Erosion Reduction
W = Water Quality Protection
S = Stream Channel Protection/Stream Sediment Reduction

11 WATERSHED MANAGEMENT
W 11.01 Determination of Cumulative Watershed Effects
W 11.02 Soil and Water Resource Monitoring and Evaluation
W 11.03 Watershed Improvement Planning and Implementation
W 11.04 Floodplain Analysis and Evaluation
W 11.05 Wetlands Evaluation and Analysis
W 11.06 Public Supply Watershed Management
W 11.07 Oil and Hazardous Substance Spill Contingency Planning
W 11.09 Management by Closure to Use
W 11.11 Petroleum Storage and Delivery Facilities & Management
W 11.14 Management of Snow Survey Sites

13 VEGETATION MANIPULATION
G 13.02 Slope Limitations for Tractor Operation
G 13.03 Tractor Operation Excluded from Wetlands, Bogs, and Wet Meadows
E 13.04 Revegetation of Surface Disturbed Areas
E 13.05 Soil Protection During and After Slash Windrowing
E 13.06 Soil Moisture Limitations for Tractor Operation

14 TIMBER
A 14.02 Timber Harvest Unit Design
A 14.03 Use of Sale Area Maps for Designating Soil and Water Protection Needs
A 14.04 Limiting the Operating Period of Timber Sale Activities
E 14.05 Protection of Unstable Areas
A 14.06 Riparian Area Designation
G 14.07 Determining Tractor Loggable Ground
E 14.08 Tractor Skidding Design
E 14.09 Suspended Log Yarding in Timber Harvesting
A 14.10 Log Landing Location and Design
E 14.11 Log Landing Erosion Prevention and Control
E 14.12 Erosion Prevention and Control Measures During Timber Sale Operations
E 14.13 Special Erosion Prevention Measures on Areas Disturbed by Harvest Activities
E 14.14 Revegetation of Areas Disturbed by Harvest Activities
E 14.15 Erosion Control on Skid Trails
E 14.16 Meadow Protection During Timber Harvesting
S 14.17 Streamcourse Protection (Implementation and Enforcement)
E 14.18 Erosion Control Structure Maintenance

A 14.19 Acceptance of Timber Sale Erosion Control Measures Before Sale Closure
E 14.20 Slash Treatment in Sensitive Areas
A 14.22 Modification of the Timber Sale Contract

15 ROADS AND TRAILS
A 15.02 General Guidelines for Road Location/Design
E 15.03 Road and Trail Erosion Control Plan
E 15.04 Timing of Construction Activities
E 15.05 Slope Stabilization and Prevention of Mass Failures
E 15.06 Mitigation of Surface Erosion and Stabilization of Slopes
E 15.07 Control of Permanent Road Drainage
E 15.08 Pioneer Road Construction
E 15.09 Timely Erosion Control Measures on Incomplete Road and Streamcrossing Projects
E 15.10 Control of Road Construction Excavation & Sidecast Material
S 15.11 Servicing and Refueling of Equipment
S 15.12 Control of Construction In Riparian Areas
S 15.13 Controlling In-Channel Excavation
S 15.14 Diversion of Flows Around construction Sites
S 15.15 Stream crossings on Temporary Roads
S 15.16 Bridge & Culvert Installation (Disposition of Surplus Material and Protection of Fisheries)
E 15.17 Regulation of Borrow Pits, Gravel Sources, and Quarries
E 15.18 Disposal of Right-of-Way and Roadside Debris
S 15.19 Streambank Protection
E 15.20 Water Source Development Consistent with Water Quality Protection
E 15.21 Maintenance of Roads
E 15.22 Road Surface Treatment to Prevent Loss of Materials
E 15.23 Traffic Control During Wet Periods
G 15.24 Snow Removal Controls
E 15.25 Obliteration of Temporary Roads
E 15.27 Trail Maintenance and Rehabilitation

18 FUELS MANAGEMENT
E 18.02 Formulation of Fire Prescriptions
E 18.03 Protection of Soil and Water from Prescribed Burning Effects
E 18.05 Stabilization of Fire Suppression Related Watershed Damage

Site Specific Best Management Practices

PRACTICE 11.01 – Determination of Cumulative Watershed Effects
PRACTICE 11.02 – Soil and Water Resource Monitoring and Evaluation
PRACTICE 11.03 – Watershed Improvement Planning and Implementation

Objectives: To determine the cumulative effects or impacts on beneficial water uses by multiple land management activities. Past, present or reasonably foreseeable future actions in watershed are evaluated relative to natural or undisturbed conditions. To monitor baseline watershed conditions for comparison with State standards, Forest Plan Standards, and estimation of long-term trend; to ensure the health and safety of water users; to evaluate SWCP's effectiveness; and to determine the adequacy of data, assumptions, and coefficients. To improve degraded watershed conditions, to minimize soil erosion, and to improve water availability or quality.

Effectiveness: High

Compliance: Meets FPS rules

PRACTICE 11.04 – Floodplain Analysis and Evaluation
PRACTICE 11.05 - Wetlands Analysis and Evaluation

Objectives: To delineate floodplains and wetlands within sale areas in order to prevent damage to facilities or degradation of soil and water resources. To protect floodplains and wetlands and avoid, where possible, the long and short-term adverse impacts to soils and water resources associated with the occupancy and modification of such.

Effectiveness: High

Compliance: FPA Rule 4.d.v(c) – Meets

PRACTICE 11.06 – Public Supply Watershed Management

Objectives: To manage community and non-community public supply watersheds to comply with State water quality standards.

Effectiveness: High

Compliance: Meets FPA rules

PRACTICE 11.07 – Oil and Hazardous Substance Spill Contingency Planning
PRACTICE 11.11 – Petroleum Storage and Delivery Facilities & Management
PRACTICE 15.11 – Servicing and Refueling of Equipment

Objective: To prevent contamination of waters from accidental spills of fuels, lubricants, bitumens, raw sewage, wastewater and other harmful materials by prior planning and development of Spill Prevention Control and Countermeasure Plans (SPCC).

Effectiveness: Although SPCC Plans cannot eliminate the risk of materials being spilled and escaping into waters, they can, if followed, be effective at reducing adverse effects to tolerable levels. Depending

on the location and quantity of a spill, a properly implemented Plan can provide for up to 100 percent containment of a spill.

Compliance: Meets Forest Practices Act Rules

Implementation: The timber sale contract holds the Purchaser responsible for taking appropriate preventative measures to insure that any spill of oil or oil products does not enter any stream or other waters of the United States. If the total oil or oil products storage exceeds 1,320 gallons, or if any single container exceeds the capacity of 660 gallon, the Purchaser would prepare a Spill Prevention Control and Countermeasure Plan. The plan shall meet EPA requirements including certification by a registered professional engineer. If necessary, specific requirements for transporting oil to be used in conjunction with the contract would be specified in the contract.

The Forest Service would designate the location, size and allowable uses of service and refueling areas. The criteria below would be followed at a minimum:

1. Petroleum product storage containers with capacities of more than 200 gallons, stationary or mobile, would be located no closer than 100 feet from stream, watercourse, or area of open water. Dikes, berms, or embankments would be constructed to contain the volume of petroleum products stored within the tanks. Diked areas would be sufficiently impervious and of adequate capacity to contain spilled petroleum products.

2. Transferring petroleum products: During fueling operations or petroleum product transfer to other containers, there shall be a person attending such operations at all times.

3. Equipment used for transportation or storage of petroleum products shall be maintained in a leakproof condition. If the Forest Service Representative determines there is evidence of petroleum product leakage or spillage he/she shall have the authority to suspend the further use of such equipment until the deficiency has been corrected.

4. For longer term storage, a sump pond lined with plastic will be constructed equal to the volume of fuel stored on the site.

In the event any leakage or spillage enters any stream, water course or area of open water, the operator will immediately notify the COR who will be required to follow the actions to be taken in case of hazardous spill, as outlined in the Forest Hazardous Substance Spill Contingency Plan.

PRACTICE 11.09 - Management by Closure to Use
PRACTICE 15.23 - Traffic Control During Wet Periods

Objective: To reduce the potential for road surface disturbance during wet weather and to reduce sedimentation probability by excluding activities that could result in damages to facilities or degradation of soil and water resources.

Effectiveness: Moderate

Compliance: Meets Forest Practices Act Rules

Implementation: Closures (seasonal, temporary, or permanent) are made when the responsible line officer determines that a particular resource or facility needs protection from use. Specific guidelines for

closure of roads during the period of the contract and at the end of the Purchaser's operations would be spelled out in this EIS and the timber sale contract.

Roads that must be used during wet periods should have a stable surface and sufficient drainage to allow such use with a minimum of resource impact. Rocking, paving and armoring are measures that may be necessary to protect the road surface and reduce erosion potential. Roads not constructed for all weather use should be closed during the wet season. Where winter field operations are planned, roads may need to be upgraded and maintenance intensified to handle the traffic without creating excessive erosion and damage to the road surface.

PRACTICE 11.14 – Management of Snow Survey Sites

Objectives: To protect snow courses and related date sites from effects by land management activities.

Effectiveness: High

Compliance: Meets Forest Practices Act Rules

PRACTICE 13.02 – Slope Limitations for Tractor Operation
PRACTICE 13.03 - Tractor Operation Excluded from Wetlands, Bogs, & Wet Meadows

Objective: To reduce gully and sheet erosion and associated sediment production. To maintain wetland functions and avoid adverse soil and water resource impacts, turbidity, and sediment production associated with the destruction or modification of wetlands, bogs and wet meadows. To reduce sediment production resulting from compaction, rutting, runoff concentration, and subsequent erosion.

Effectiveness: Much of this mitigation consists of avoiding the impact [40 CFR 1508.20(a)]. The Forest Service has near-complete control over construction operations. Effectiveness is expected to be high.

Compliance: FPA Rule 3.h.iii – Meets

Implementation: At a minimum, the following specific protective requirements for wetlands identified on the Sale Area Map (SAM) will be incorporated into B6.62 (Wetland Protection) and C6.62 (Site Specific Wetlands Protection Measures):

1. Soil and vegetation along lakes, bogs, swamps, wet meadows, springs, seeps, or other sources where the presence of water is indicated will be protected from disturbance which would cause adverse effects on water quality, quantity, and wildlife and aquatic habitat (FPA Rule 3.h.iii].
2. An equipment exclusion zone shall extend a minimum of 50 feet from the wetlands, bogs, and wet meadows.

PRACTICE 13.04 - Revegetation of Surface Disturbed Areas
PRACTICE 14.13 – Special Erosion Prevention Measures on Areas Disturbed by Harvest Activities
PRACTICE 14.14 - Revegetation of Areas Disturbed by Harvest Activities

Objective: To protect soil productivity and water quality by minimizing soil erosion.

To establish a vegetative cover on disturbed sites in order to reduce erosion and sedimentation on disturbed areas where **normal revegetation methods and other contract provisions will not apply**.

Effectiveness: Revegetation can be moderately effective at reducing surface erosion after one growing season following disturbance and highly effective in later years. Effectiveness has been shown to vary from 10 percent on 3/4:1 slopes to 36 percent on 1:1 slopes to 97 percent on 1:1 slopes in later years (Burroughs and King. 1989).

Compliance: FPA Rules 3.d.iii & e.i, ii - Meets
Implementation: As determined necessary, temporary roads, landings skid trails, and anywhere else that soil has been severely disturbed by Purchaser's harvesting or road construction operations would be seeded within one year after harvesting is completed. Seed mixes (consisting of native species) and fertilizer specifications would be incorporated into timber sale contract provisions. The timber sale contract would also include specifications for scarification/ripping of compacted landing and closed roads where this is deemed necessary by the interdisciplinary team. If erosion problems still occur on these areas, or other problem areas are discovered or are brought to the attention of the Sale Administrator, KV Plans will be revised to reseed and/or fertilize, or provide for other control measures. If KV Funds are not available, Appropriated Funds will be used.

PRACTICE 13.05 – Soil Protection During and After Slash Windrowing

Objective: To prevent removal or severe disruption of the productive surface soil and minimize losses from erosion.

EFFECTIVENESS: Moderate

COMPLIANCE: Meets Forest Practices Act rules.

IMPLEMENTATION: Windrowing or piling of slash with tractor or grapple piling machine is a common method of fire hazard abatement and site preparation. Potential for damage to soils and water are high. On slopes, windrows should be contoured as much as possible to act as a filter barrier that catches sediment and detains water runoff. Such piling would only be conducted on slopes greater than 50 percent upon the recommendation of a soils scientist or hydrologist. Care must be taken to minimize disturbance to the surface soil layer during these operations. Equipment would be prohibited from operating within 50 feet of streamcourses except at designated crossing areas. Areas where such slash disposal operations are acceptable would be identified in the environmental impact statement, field, and/or the timber sale contract. Slash windrows will be installed 100 feet on both sides of all new stream crossings where sediment delivery from the fill slope can be expected. Slash filter windrows will also be used on fill slopes where there is a possibility of erosion or sedimentation into a nearby stream or channel (STD FS Spec 201).

PRACTICE 13.06 - Soil Moisture Limitations for Tractor Operation

Objective: To minimize soil compaction, puddling, rutting, and gullying with resultant sediment production and loss of soil productivity.

Effectiveness: Responsible implementation and enforcement are required for high effectiveness.

Compliance: No Related Forest Practices Act rules.

Implementation: Tractor operations would be limited to periods when the soil moisture content is 18 percent or less, the ground is frozen, or there is at least 18 inches of snow depth. Tractor operations would only be allowed outside of these specifications through the use of designated skid trails. These requirements would be incorporated into provision of the timber sale contract.

PRACTICE 14.02 – Timber Harvest Unit Design;
PRACTICE 14.08 – Tractor Skidding Design
PRACTICE 14.10 – Log Landing Location and Design

Objective: To insure that timber harvest unit design will maintain water quality and soil productivity by locating/designing landings and skidding patterns to best fit the terrain and avoid soil erosion.

Effectiveness: Restricting tractor skidding to designated skid trails can reduce the areal extent of soil disturbance from the typical 18-36 percent to 10 percent or less. Properly located landings and skid trails produce similar results. Effectiveness is expected to be moderate

Compliance: FPA Rules 3.c.iii; 3.d.i & ii – Meets

Implementation: TSC provision B6.422 (Landings and Skid Trails) requires that the location of all skid trails and landings must be agreed upon before construction. Specific criteria that will be addressed during sale-layout andpre-work with the operator will include:

General:

All new or reconstructed landings, skid trails, and fire trails shall be located on stable areas outside riparian areas. Sidecasting will be held to a minimum [FPA Rule 3.d.i].

Skid Trails:

a.Skid trails shall be kept to the minimum feasible width and number [FPA Rules 3.c.iii].

b.Locate skid trails to avoid concentrating runoff and provide breaks in grade and waterbars.

Landings:

1. Landing sizes will be the minimum necessary for safe, economical operation [FPA Rule 3.d.ii].

2. Landings and log decks will not be located within Riparian Areas.

3.Landings, log decks, and/or burn piles will be located a minimum of 100 feet from streams, far enough away that direct (unfiltered) entry of sediment, bark, or ash and burning products, will not occur.

PRACTICE 14.03 – Use of Sale Are Maps for designing Soil and Water Protection Needs.

Objective: To delineate the location of protection areas and special treatment areas, to insure their recognition, proper consideration, and protection on the ground.

Effectiveness: High

Compliance: No related FPA rule

Implementation: The following features will be designated on the SAM:
The stream courses (perennial, intermittent, and ephemeral) listed below will be designated as Stream Course Protection areas to be protected under the TSC. During layout of the units these areas will be excluded where possible. Where these areas cannot be easily excluded from the unit, these areas will be excluded by designating the timber as leave trees. INFS standards and protected stream courses will be applied to the following areas:

1. Any unnamed channels that are shown on the sensitive landtype map.
   a. Wetlands (meadows, lakes, potholes, etc.) to be protected per the timber sale contract clauses are those designated on the Fish and Wildlife Service 1:24000 scale wetland maps.
   b. Ephemeral channels will be protected through unit layout, marking plans, and/or designation on sale area maps.
   2. Named Streams/waterbodies include the following: Reeder, Granite, Fedar, Indian, Kalispell and Priest Lake.

The Purchaser and the Sale Administrator prior to harvesting will review these features on the ground. A hydrologist, soils scientist, or fisheries biologist will work with the Presale Forester to insure that the above features have been designated on the Sale Area Map during contract development.

PRACTICE 14.04 - Limiting the Operating Period of Timber Sale Activities;
PRACTICE 15.04 - Timing of Construction Activities

Objective: To minimize soil erosion, sedimentation and loss in soil productivity by insuring that the Purchaser conducts his operations, including erosion control work, road maintenance, etc., in a timely manner, within the time period specified in the timber sale contract.

Effectiveness: Moderate

Compliance: FPA 4.c.ix – Meets

Implementation: Limited operating periods are identified and recommended during the environmental analysis by the Interdisciplinary Team. Contract language specifies contract termination date and operating periods within that contract. Purchaser's plans must show intent to operate within these time frames prior to approval to commence work. Extensions of time (except for contract term adjustments) and waiver of specified operating periods should be granted only after interdisciplinary team review.

PRACTICE 14.05 – Protection of Unstable Areas
PRACTICE 15.05 – Slope Stabilization and Prevention of Mass Failures

Objective: To identify and protect unstable areas and to avoid triggering mass movements of the soil mantle and resultant erosion and sedimentation.

Effectiveness: Avoidance is the most effective measure on high-risk landforms. Risk assessment based on experience is essential. Effectiveness is expected to be moderate

Compliance: FPA Rule 3.d.iii - Meets

Implementation: Unstable areas will be avoided by project design within the sale area. The following are guidelines that will be followed:

1. Avoid road locations or timber harvesting on or adjacent to active landslides, slump blocks and other mass wasting processes.
2. To prevent landslides, fill material used in landing construction shall be free of loose stumps and excessive accumulations of slash. On slopes where sidecasting is necessary, landings shall be stabilized by use of seeding, compaction, riprapping, benching, mulching, or other suitable means [FPA Rule 3.d.iii].
3. If road construction is necessitated in an area of moderate instability, the embankment should be layer placed or as recommended by a geotechnical engineer.
4. Identify any opportunities to stabilize existing unstable areas or minimize the adverse impacts associated with the unstable areas.

PRACTICE 14.06 - Riparian Area Designation
PRACTICE 15.12 - Control of Construction in Riparian Areas

Objective: To minimize the adverse effects on Riparian Areas with prescriptions that manage nearby logging and related land disturbance activities.

Effectiveness: Moderate

Compliance: FPA Rules 3.g.ii, iii, & iv; 3.f.iv - Meets

Implementation: Riparian areas will be protected through the following requirements that will be incorporated into timber sale layout, or into the timber sale contract as identified below:

1. Provide the large organic debris, shading, soil stabilization, wildlife cover, and water filtering effects of vegetation along Class I and Class 2 streams [FPA Rule 3.g.i-iii]. The following measure(s) are implemented during sale layout:
    (a) A Stream Protection Zone that consists of a buffer of 300 feet slope distance from the edge of the channel for fish bearing streams.
    (b) A Stream Protection Zone that consists of a buffer of 150 feet slope distance from the edge of the channel for year round non-fish bearing streams.
    (c) A Stream Protection Zone that consists of a buffer of 50 feet slope distance from the edge of the channel for the intermittent tributaries.

2. Waste resulting from logging operations, such as crankcase oil, filters, grease and fuel containers, shall not be placed inside the Stream Protection Zones [FPA Rule 3.f.iv and TSC Provision BT6.34].

PRACTICE 14.07 - Determining Tractor Loggable Ground

Objective: To reduce gully & sheet erosion and associated sediment production by restricting tractor operation to slopes where corrective measures for proper drainage are easily installed and effective.

Effectiveness: In general, the less the slope percentage, the less are the chances of rilling, gullying, and soil displacement as a consequence of tracked or wheeled skidding.

Compliance: FPA Rules 3.c.i. & c.ii - **VARIES FROM FPA RULE** 3.c.i

Implementation:

Example 1:

1) Tractor or wheel skidding shall not be conducted on geologically unstable, saturated, or easily compacted soils. On slopes exceeding 35 percent gradient, tractor or wheel skidding shall be conducted during the winter with a minimum of 18 inches of snow cover or with a softtrack skidding machine. On slopes exceeding 45 percent gradient and which are immediately adjacent to a class I or II stream, tractor or wheel skidding shall not be conducted unless the operation can be done without causing accelerated erosion. Where slopes in the area to be logged exceed 45 percent gradient, skidding shall be done in the winter with a minimum of 18 inches of snow cover and a softtrack skidding machine shall be used. [FPA Rule 3.c.i.]

2. Constructed skid trails on geologically unstable, saturated, or highly erodible or easily compacted soils on slopes over 20 percent will be prohibited [FPA Rule 3.c.ii and TSC Provision B6.42 and C6.6].

Example 2: Tracked or wheel skidding shall not be conducted on geologically unstable, saturated, or easily compacted soils or on slopes exceeding 30 percent. Constructed skid trails on geologically unstable, saturated, or highly erodible or easily compacted soils on slopes over 20 percent will be prohibited [FPA Rules 3.c.i and ii and TSC Provision B6.42 and C6.6].

Mandatory: When tractor skid trails are required on geologically unstable, saturated, or highly erodible or easily compacted soils, the maximum grade of the trail shall be limited to 30 percent. The Forest Service shall document any differences from the FPA Rule requirements in a variance and so note the variance in the Decision Document.

PRACTICE 14.09 – Suspended Log Yarding in Timber Harvesting

Objective: To protect the soil from excessive disturbance and accelerated erosion and to maintain the integrity of the Riparian Area and other sensitive watershed areas.

Effectiveness: The more suspended log yarding can be used, the less soil disturbance will result. Effectiveness is expected to be moderate

Compliance: FPA Rule 3.g.ii - Meets

Implementation: The TSC provision B1.1, item (n), requires that areas requiring special yarding, as identified in TSC provision B6.42 (Skidding and Yarding), be identified on the SAM. Cable yarding (partial or full suspension) will be used on all areas identified for such logging on the SAM. Uphill cable yarding is preferred. Where downhill yarding is used, reasonable care shall be taken to lift the leading end of the log to minimize downhill movement of slash and soils [FPA Rule 3.c.iv].

PRACTICE 14.11 - Log Landing Erosion Prevention and Control;
PRACTICE 14.12 - Erosion Prevention & Control During Timber Sale Operations;
PRACTICE 14.15 - Erosion Control on Skid Trails.

Objective: To protect water quality by minimizing erosion and subsequent sedimentation derived from log landings and skid trails.

Effectiveness: Moderate

Compliance: FPA Rules 3.e.i, ii; 3.d.iii - Meets

Implementation: The following minimum criteria will be used in controlling erosion and restoring landings and skid trails to minimize erosion:

General:

1. Deposit waste material from construction or maintenance of landings and skid and fire trails in geologically stable locations at least 100 feet outside of the appropriate Stream Protection Zone and Riparian Habitat Conservation Areas [FPA Rule 3.f.iii].
2. Skid trails and landings will be seeded with a mix specified in C6.601 (Erosion Control Seeding).

Landings:

1. Landings will not be located in ephemeral draws or swales that were created by or are prone to landslides.
2. During period of use, landings will be maintained in such a manner that debris and sediment are not delivered to any streams.
3. Landings shall be reshaped as needed to facilitate drainage prior to fall and spring runoff. Landings shall be stabilized by establishing ground cover or by some other means within one year after harvesting is completed [FPA Rule 3.e.ii].
4. Landings will drain in a direction and manner that will minimize erosion and will preclude sediment delivery to any stream.
5. After landings have served the Purchaser's purpose, the Purchaser shall ditch or slope them to permit the water to drain or spread [Provision BT6.63 (Landings)].

Skid Trails:

1. Unit design and location will facilitate logging with a minimum amount of excavated skid trails. Where excavated trails are constructed they will be kept to a minimum and must be obliterated by the purchaser following completion of the logging activities. The obliteration will include restoring natural slope contours and placing slash and logs on top of the disturbed soil, and use of seeding where needed.

2. Skid trails and fire trails shall be stabilized whenever they are subject to erosion, by waterbarring, cross-draining, outsloping, scarifying, seeding, or other suitable means. This work shall be kept current to prevent erosion prior to fall and spring runoff [FPA Rule 3.e.i].
3. The sale administrator and/or watershed specialist will designate the spacing of water bars on skid trails. [Reference FSH 7709.56]

Corridors:

1. Corridors that have become entrenched below the litter layer into the top soil and could channel water, will be water-barred and/or covered with debris.

PRACTICE 14.16 – Meadow Protection During Timber Harvesting

Objective: To avoid damage to the ground cover, soil and water in meadows.

Effectiveness: High

Compliance: No Related FPA Rule

Implementation: Vehicular or skidding equipment shall not be used on meadows except where roads, landings, and tractor roads are approved. In all cases, soil and vegetation will be protected from disturbance which would cause adverse affects on water quality, quantity and aquatic habitat. The TSC Provision B6.61 (Meadow Protection) is a standard provision in all contracts.

Unless otherwise agreed, trees felled into meadows shall be removed by end-lining, and resulting logging slash shall also be removed. Damage to meadows, stream courses, and riparian areas caused by unauthorized Purchaser's operations shall be repaired by the Purchaser in a timely manner to restore and prevent further damage.

PRACTICE 14.17 – Streambank Channel Protection (Implementation and Enforcement)
PRACTICE 15.19 – Streambank Protection

Objective: To protect stream beds and streamside vegetation, during and after forest practice operations and road construction, by (1) maintaining unobstructed passage of stormflows; (2) reducing sediment and other pollutants from entering streams; and (3) restoring the natural course of any stream, as soon as practical, if the stream is diverted as a result of timber management activities.

Effectiveness: High

Compliance: Meets Forest Practices Act rules

Implementation: Protecting stream channels during timber harvesting is accomplished by contract clause incorporated into the sale contracts. This is normally accomplished by designating particular streams as protected stream courses and limiting or restoring timber management operations in streamside zones. There is substantial overlay between timber sale provisions to protect stream channels, and regulations that govern road construction and other practices.

The intent of the regulations and clauses is to protect the integrity of stream channels and minimize adverse impacts to the channel and downstream resources and beneficial uses. The following items are a minimum that would be incorporated into the timber sale contract specifically to govern channel protection in the project area.

1. Purchaser shall repair all damage to a stream course if the Purchaser is negligent in their operations, including damage to banks and channel, to an acceptable condition as specified by the Forest Service.

2. All project debris shall be removed from stream course, in an agreed manner that would cause the least disturbance. Specifically:

   Whenever possible trees shall be felled, bucked, and limbed in such a manner that the tree or any part thereof would fall away from any streams. Within 24 hours, slash and other debris that enters streams as a result of harvesting or road construction operations shall be removed. If the slash would be beneficial (i.e. provide sediment filtering) then the Sale Administrator may allow the Purchaser to leave the slash in place below culverts.

3. Location and method of stream crossing would be designed and agreed to prior to construction.
4. Wheeled or track laying equipment shall not be permitted to operate within 50 feet slope distance of the streams except at approved crossings.
5. On perennial streams, dewatering with filter fabric and/or diversion shall be considered prior to excavation for culvert placement.
6. Filter cloth, erosion control blankets, plastic, straw bales, and rip- rap would be used as appropriate to keep live water from contacting new fill during culvert installations.
7. When dewatering of a stream crossing is required, a non-erodible conduit, flex pipe or geotextile fabric would be used on all crossings. Silt fences shall be constructed below the stream crossing(s) prior to any streambank disturbance.
8. The construction activities in or adjacent to the stream may be limited to specific times to protect beneficial water uses.
9. Logs would be end-lined out of streamside and Riparian Areas. Equipment is permitted to enter streamside areas only at locations and times agreed by the Forest Service.
10. Material from temporary road and skid trail stream crossings would be removed and streambanks restored to an acceptable condition.
11. When cable yarding across or inside the riparian areas is necessary, logs should be fully suspended across a stream and immediately above streambanks. Yarding shall be done in such a manner as to minimize streambank channel disturbance.
12. Construction equipment may cross, operate in or operate near streamcourses only where so agreed to and designated by the Forest Service prior to construction. Crossing of perennial stream channels would be done in compliance with the specifications included in the contract.
13. On perennial streams, stream channel alteration specifications would include the following:

    a. Ford the stream only at one location.
    b. Any cofferdams or temporary crossings should be designed to handle high stream flows.
    c. Protect streambank vegetation as much as possible.
    d. All fill materials shall be placed and compacted in horizontal lifts.
    e. If rip rap is used, it shall extend at least one foot above anticipated high water mark, and meet minimum size criteria.
    f. Rip rap shall extend far enough upstream and downstream to reach stable areas.

14. If the channel is damaged during construction, it would be restored as nearly as possible to its original configuration without causing additional damage to the channel, prior to fall rains.
15. Construction methods shall provide for eliminating or minimizing discharges of turbidity, sediment, organic matter or toxic materials. A settling basin may be required for this purpose.

PRACTICE 14.18 - Erosion Control Structure Maintenance

Objective: To ensure that constructed erosion control structures are stabilized and working effectively.

Effectiveness: High

Compliance: No directly related FPA Rule

Implementation: The timber sale contract requires that during the period of the contract, the Purchaser shall provide maintenance of soil erosion control structures constructed by the Purchaser until they become stabilized, but not for more than one year after their construction. After 1 year, any erosion control work needed is accomplished through the Forest Service funding.

The timber sale contract also requires the Purchaser to maintain the erosion control structures concurrently with his operations under the sale, and in any case, not later than 15 days after completion of skidding each unit or subdivision.

PRACTICE 14.19 - Acceptance of Timber Sale Erosion Control Measures Before Sale Closure

Objective: To assure the adequacy of required timber sale erosion control work on timber sales.

Effectiveness: High

Compliance: No directly related FPA Rule

Implementation and Responsibility: Timber Sale Contract provision B6.35 requires that upon the purchaser's written request and assurance that work has been completed, the Forest Service shall perform an inspection. Areas that the purchaser might request acceptance for are specific requirements such as logging, slash disposal, erosion control, or snag felling. In evaluating acceptance the following definition will be used by the Forest Service: "Acceptable" erosion control means only minor deviation from established standards, provided no major or lasting impact is caused to soil and water resources. Certified Timber Sale Administrators will not accept as complete erosion control measures that fail to meet these criteria.

PRACTICE 14.20 - Slash Treatment in Sensitive Areas

Objective: To protect water quality by protecting sensitive tributary areas from degradation which would result from using mechanized equipment for slash disposal.

Effectiveness: Moderate

Compliance: No directly related FPA Rule

Implementation: All such sensitive areas, including riparian harvest areas, bogs and meadows will be identified on the sale area map, the slash treatment map, and in the contract.

(a) Dozer fire lines will not be constructed on sensitive landtypes on greater than 30 percent slopes

(b) Jackpot burning within Streamside Management Zones will be utilized rather than broadcast burning on slopes greater than 35 percent.

(c) Grapple piling of slash will be used on all machine pile units.

PRACTICE 14.22 - Modification of the Timber Sale Contract

Objective: To modify the Timber Sale Contract if new circumstances or conditions indicate that the timber sale will cause irreversible damage to soil, water, or watershed values.

Effectiveness: High

Compliance: No directly related FPA Rule

Implementation: Over time, the Forest Service adopts new policies and direction that amend how we address timber harvest operations. An example is the recent change in direction to leave some large organic debris in stream channels instead of removing it all. In cases such as this, modifications to the TSC would occur under provisions B2.37 or B8.32.

If evidence indicates that unacceptable impacts would occur to soil and water resources if the sale was harvested as planned, the Forest Service Representative will request the Contracting Officer to gain Regional Forester advice and approval to proceed with a resource environmental modification, mutual cancellation, or unilateral cancellation of the Timber Sale Contract as allowed by TSC Provisions B8.3 or B8.33. If the decision is for a resource environmental modification, once the action is approved by the Regional Forester, the appropriate Line Officer will assign an interdisciplinary team to make recommendations of implementation.

PRACTICE 15.02 - General Guidelines for the Location and Design of Roads and Trails

Objective: To locate and design roads and trails with minimal soil and water resource impact while considering all design criteria.

Effectiveness: Moderate

Compliance: Exceeds Forest Practices Act rules

Implementation: As the timber sale contract is assembled, road location and design criteria are assembled from several volumes of standards, and optional specifications and guidelines. Specific roads and road segments often have specifications that are unique to the road or road segment. The following listed items, however, are general road location and design guidelines for minimizing impacts on water quality.

1. Fit the road to the topography - Use natural benches, follow contours, avoid long, steep road grades. Balance cut/fill where possible to avoid waste areas.
2. Locate on stable topography. Whenever possible, avoid slumps and slide prone areas and steep side hills.
3. Locate roads a safe distance away from streams and other water bodies, and provide an adequate buffer zone to trap sediment before it enters into any water body.
4. Minimize the number of stream crossings and choose stable sites. Structures would be designed (sized) for long-term stability, generally for the Q100+ (or greater) and then bumped up to the next

culvert size and would provide for fish passage, if present. Use the IPNF Hydraulic analysis developed by Bob Embry to determine the Q100.

5. Locate and design roads to drain naturally by appropriate use of outsloping and insloping with cross drainage and grade changes, where possible. Cross drains would be installed to 1) carry intercepted flow across constructed areas; 2) to relieve the length undrained ditch; and 3) to reduce disruption of normal drainage patterns. Road and trail drainage should be channeled to effective buffer areas, either natural or man-made, to maximize sediment deposition prior to entry into live water.
6. Ditch lines and road grades would be designed to minimize unfiltered flow into streams. A rolling dip, relief culvert or similar structure would be installed as close as practical to crossings to minimize direct sediment and/or water input directly into streams. The drainage would be routed through the SMZ, buffer strips, or other sediment settling structures where possible.
7. At a minimum, windrows would be installed 100 feet on both sides of live stream crossings and where installation would minimize sediment delivery to nearby streams or channels. Windrows would also be installed where fill slope erosion is possible, or where road derived erosion may be delivered; (i.e. outflow area of culverts or rolling dips, etc.). The average height of the windrows would be 4 feet high and 4 feet wide. Openings for wildlife corridors would be incorporated at regular and appropriate intervals. No breaks in the windrow would occur within 150 feet of any stream course.
8. Design to the standard necessary to accomplish anticipated use and equipment needs safely, while providing for long-term protection of the soils and water.
9. Seeding and fertilization of erodible surfaces exposed during construction would be accomplished. Next season seeding would be done where original treatment is less than 50% successful.
10. Road construction occurring outside the normal operating season would have additional restrictions on the amount of pioneered road and additional erosion control measures.

PRACTICE 15.03 - Road and Trail Erosion Control Plan

Objective: To minimize the effects of erosion and the degradation of water quality through erosion control work and road design.

Effectiveness: Moderate

Compliance: No Related FPA Rule

Implementation: Prior to the start of construction, the Contractor shall submit a schedule for proposed erosion control work as required in the Standard Specifications. The schedule shall include all erosion control items identified in the specifications. Erosion control work to be done by the Contractor will be defined in Standard Specification 204 and/or in the Drawings. The schedule shall consider erosion control work necessary for all phases of the project. The Engineer will certify that the Contractors Erosion Control Plan meets the specifications of Std. FS Spec. Section 204.

PRACTICE 15.06 - Mitigation of Surface Erosion and Stabilization of Slopes

Objective: To minimize soil erosion from road cutslopes, fillslopes and travelways

Effectiveness: Moderate

Compliance: FPA Rule 4.c.iii & d.ii - Meets

Implementation: Areas requiring mitigation of surface erosion may occur anytime during the life of the timber sale contract. When these are found, the following provisions would be implemented.

a. All disturbed areas associated with road construction and reconstruction would be seeded. The first seeding would be applied as soon as practical after cuts and fills are brought to grade within seeding seasons as established in the timber sale contract. A second seeding in the fall or spring season following road construction would be required where original seeding did not adequately revegetate exposed soil areas.

b. Where surface erosion is occurring because of inadequate vegetative cover, additional seeding and re-fertilization would occur using recommended seed and fertilizer mixes. If the Purchaser has done his required seeding, or bare spots are not caused by the Purchaser, seeding would be done by the Forest Service.

c. Where ditches are carrying erosion products into stream channels, erosion cloth ditch blocks would be installed to "short-circuit" the delivery. Seeding of the eroding surfaces and seeding of the stored sediment in the ditch would also be accomplished.

d. Where either straw bale/erosion cloth structures are not felt to be effective, underdrains or other measures would be installed to drain the ditches onto suitable ground, or at least reduce erosion impacts to the stream.

e. Slumping of cutslopes would require a combination of both mechanical and vegetative controls. If/when this problem is found, a solution would be determined in consultation with Engineers, geotechnical and resource specialists and appropriate actions taken to remedy the situation or minimize adverse impacts.

f. Additional underdrains (i.e. French drains) would be constructed where intercepted moisture is encountered on incised stream approaches. Erosion control blankets and straw bales would be used to dissipate ditch scour and stabilize fill slopes.

g. At ditch relief culvert locations, or at culvert locations in dry or intermittent wet draws, the slash piles shall not be broken but shall be placed a minimum of 20 feet below the culvert outlet. At culvert locations in live streams, slash piles shall not be broken but shall be continued at the toe of the embankment over the top of the culvert. No slash shall be allowed to restrict the flow of water from the culvert.

Unless caused by the Purchaser during his maintenance operations, or known before sale award and included in timber sale contract, these items (a-g) would be beyond the scope of Purchaser responsibility. Repair and/or improvement would be then handled by contract modification or by the Forest Service.

PRACTICE 15.07 - Control of Permanent Road Drainage

Objective: To minimize the erosive effects of concentrated water and the degradation of water quality by proper design and construction of road drainage systems and drainage control structures.

Effectiveness: Moderate. Designed and controlled ditches, cross drain spacing, and culvert discharge prevent water from running long distances over exposed ground.

Compliance: FPA Rules 4.c.viii; 4.d.iii(a) & (b) - Meets

Implementation: The following items will be included in the timber sale contract provisions or road contract special project specifications.

1. Drainage ways shall be cleared of all debris generated during construction and/or maintenance that potentially interfere with drainage or water quality [IFPA Rule 4(c)(ii), Timber Sale Contract Clause C6.661, and Standard Road Specifications-Special Project Specification 204.04].
2. During and following operations on out-sloped roads, out-slope drainage shall be retained and berms shall be removed on the outside edge except those intentionally constructed for protection of road grade fills [IFPA Rule 4(c)(vi).
3. Cross drains and relief culverts shall be constructed to minimize erosion of embankments. The time between road construction and installation of erosion control devices shall be minimized. Drainage structures or cross drains shall be installed on uncompleted roads which are subject to erosion prior to fall or spring runoff. Relief culverts shall be installed with a minimum grade of 1 percent [IFPA Rule 4(c)(viii) and Standard Road Specifications-Special Project Specification 204.1].
4. Cross drains and relief culverts will be installed so as to minimize concentrations of intercepted water (see also Practice 15.02 f.(3)).

PRACTICE 15.08 - Pioneer Road Construction

Objective: To minimize sediment production and mass wasting associated with pioneer road construction.

Effectiveness: Moderate **COMPLIANCE:** No directly related FPA Rule

Implementation: The following contract specifications will be required:

1. Construction of pioneer roads shall be confined to the designed location of the road prism unless otherwise approved by the Contracting Officer (Std. FS Spec. 203.11).

2. Pioneering shall be conducted so as to prevent undercutting of the designated final cut slope, and to prevent avoidable deposition of materials outside the designated roadway limits (Std. FS Spec. 203).

3. Permanent culverts will be installed at wet crossings during the pioneer phase unless positive control of sediment can be accomplished during installation, use, and removal of the temporary structure.

PRACTICE 15.09 - Timely Erosion Control Measures on Incomplete Road and Stream crossing Projects

Objective: To minimize erosion of, and sedimentation from, disturbed ground on incomplete projects.

Effectiveness: Moderate

Compliance: FPA Rules 4.c.ii,iii,iv; & 4.d.iii - Meets

Implementation: The following measures will be implemented during projects:

1. Temporary culverts, side drains, flumes, cross drains, diversion ditches, energy dissipaters, dips, sediment basins, berms, debris racks, or other facilities needed to control erosion will be installed as deemed necessary by the hydrologist, soils scientist, or fisheries biologist. The removal of temporary culverts, culvert plugs, diversion dams, or elevated stream crossing causeways will be completed as soon as practical;
2. The removal of debris, obstructions, and spoil material from channels and floodplains;
3. Seeding with an erosion control seed mix approved for use on the Idaho Panhandle National Forests to minimize erosion.
4. Install drainage structures or cross drain uncompleted roads that are subject to erosion prior to fall or spring runoff. (Std Spec 204)

Erosion control measures must be kept current with ground disturbance, to the extent that the affected area can be rapidly "closed," if weather conditions deteriorate. Areas must not be abandoned for the winter with remedial measures incomplete.

PRACTICE 15.10 - Control of Road Construction Excavation and Sidecast Material
PRACTICE 15.18 - Disposal of Right-of-Way and Roadside Debris

See also Practice 13.05

Objective: To insure that unconsolidated excavated and sidecast material, construction slash, and roadside debris, generated during road construction, is kept out of streams and to prevent slash and debris from subsequently obstructing channels.

Effectiveness: High

Compliance: FPA Rule 4.c.iii,iv; & 4.d.i,ii,iii

The slash windrow and other erosion control devices will not be placed in existing stream channels or obstruct culvert outfalls. Large limbs and cull logs may be bucked into manageable lengths and piled alongside the road for fuelwood.

Implementation: In the construction of road fills near streams, compact the material to reduce the entry of water, minimize the amount of snow, ice, or frozen soil buried in the embankment. No significant amount of woody material shall be incorporated into fills. Slash and debris may be windrowed along the toe of the fill, but in such a manner as to avoid entry into a stream and culvert blockage.

Where slash windrows are not desirable or practical, other methods of erosion control such as erosion mats, mulch, and straw bale or fabric sediment fences will be used (Must be agreed upon by the hydrologist, soils scientist, or fisheries biologist). Where exposed material (excavation, embankment, borrow pits, waste piles, etc.) is potentially erodible, and where sediments would enter streams, the material will be stabilized prior to fall or spring runoff by seeding, compacting, rip-rapping, benching, mulching or other suitable means.

The following standard specs will be included in all road contracts that include clearing and excavation.
1. Standard Specification 201 (Slash Treatment)
2. Standard Specification 203 (Excavation and Embankments)

PRACTICE 15.13 - Controlling In-Channel Excavation

Objective: To minimize downstream sedimentation by insuring that all in-channel excavations are carefully planned.

Effectiveness: High

Compliance: SCA Rule 9,1(a) - Meets

Implementation: Location and method of stream crossings will be designed and agreed to prior to construction. The following items highlight some of the principal provisions incorporated into the TSC that will govern channel protection:

1. Construction equipment may cross, operate in, or operate near streamcourses **only** where so agreed to and designated by the Forest Service prior to construction (B6.5). Crossing of perennial stream channels will be done in compliance with the specifications in the Stream Channel Alteration Act Rules and Regulations and included in the project specifications.

2. No construction equipment shall be operated below the existing water surface except that fording the stream at one location only will be permitted, and work below the water level that is necessary for culvert bedding or footing installations will be permitted to the extent that it does not create unnecessary turbidity or stream channel disturbance [SCA Rule 9,1 (a) and Standard Road Specifications-Special Project Specification 204.04].

3. Wheeled or track laying equipment shall not be permitted to operate within 5 feet slope distance of the apparent high water mark of Class II streams and 75 feet of Class I streams.

4. Construction of any hydraulic structures in stream channels will be in compliance with the Rules and Regulations pertaining to the Stream Channel Protection Act, Title 42, Chapter 38, Idaho Code).

PRACTICE 15.14 – Diversion of Flows around Construction Sites

Objective: To minimize downstream sedimentation by insuring that all stream diversions are carefully planned.

Effectiveness: High

Compliance: Meets SCA Rules

Implementation: Flow in stream courses may only be diverted if the Forest Service deems it necessary for the contractor to meet contractual specifications. Such a diverted flow shall be restored to the natural stream course as soon as practicable. Stream channels impacted by construction activity will be restored to their natural grade, condition, and alignment.

PRACTICE 15.15 - Stream Crossings on Temporary Roads

See also Practice 15.13

Objective: To keep temporary roads from unduly damaging streams, disturbing channels, or obstructing fish passage.

Effectiveness: Moderate

Compliance: SCA Rules - Meets

Implementation: Culverts, temporary bridges, low-water crossings, or log-fords will be required on all temporary roads and crossings. Streams that will have flowing water during the life of the temporary crossing will normally use culverts or a bridge. The number of temporary crossings will kept to the minimum needed for access.

a. Temporary crossings on temporary roads will be removed when no longer needed, and any fills will be removed and the channel restored to pre-project condition (TSC B6.62, C6.62#).

b. Material from temporary road and skid trail stream crossings will be removed and streambanks restored to an acceptable condition. (B6.62 Temporary Roads)

c. Temporary crossings on temporary roads will only be allowed where anticipated or calculated flow is 40 CFS or less (approx. 48" CMP). Flow situations greater than this will normally not allow temporary crossings. Larger temporary crossing structures may be allowed following IDT review.

PRACTICE 15.16 - Bridge and Culvert Installation (Disposition of Surplus Material and Protection of Fisheries)

See also Practice 15.13.

Objective: To minimize sedimentation and turbidity resulting from excavation for in-channel structures.

Effectiveness: High

Compliance: SCA Rule - Meets

Implementation: The following preventive measures will be included in contract specifications for such installations:

1. Diverting stream flow through or around project sites if needed during construction in order to minimize erosion and downstream sedimentation. Active streams will be de-watered or diverted during culvert installations.
2. Erodible material shall not be deposited into live streams.
3. Any material stockpiled on floodplains shall be removed before rising waters reach the stockpiled material.
4. During excavation in or near the streamcourse, it may be necessary to use suitable coffer dams, caissions, cribs or sheet piling. This will usually be the case where groundwater is contributing a significant amount of water to the immediate excavation area. If any of the aforementioned devices are used, they will be practically watertight and no excavation will be made immediately outside of them.
5. Water pumped from foundation excavation shall not be discharged directly into live streams, but shall be pumped into settling ponds or into locations where water will not re-enter water.
6. All fill material shall be placed and compacted in horizontal lifts. Areas to be filled shall be cleared of all vegetation, debris, and other materials that would be

objectionable in the fill [SCPA Rule 9,1(d) and Standard Road Specifications-Special Project Specification 203.15].

PRACTICE 15.17 - Regulation of Borrow Pits, Gravel Sources and Quarries

Objective: To minimize sediment production from borrow pits, gravel sources, and quarries, and limit channel disturbances in those gravel sources suitable for development in floodplains.

Effectiveness: High

Compliance: No Related FPA Rule

Implementation: Minimize opportunities for erosion from Borrow pits and gravel sources from entering streams.

1. Complete any crushing and/or screening of excavating bedload away from any active stream channels and minimize future opportunities for waste materials to enter area streams, even under flood conditions.
2. Identify and implement opportunities to minimize erosion from existing borrow pits within the drainage.
3. If development of new rock sources is needed within the watershed, complete a pit development plan or rock source development plan which outlines all mitigation measures needed to control future erosion of the rock source.

PRACTICE 15.19 – Streambank Protection

Objective: To minimize sediment production from streambanks and structural abutments in natural waterways.

Effectiveness: Moderate

Compliance: Meets Forest Practices Act Rules

Implementation: To reduce sediment and channel bank degradation at sites disturbed by construction of stream crossing or roadway fill, it may be necessary to incorporate "armoring" in the design of a structure to allow the water course to stabilize after construction. Riprap, gabion structures, and other measures are commonly used to armor stream banks and drainage ways from the erosive forces of the flowing water. These measures must be sized and installed in such a way that they effectively resist erosive water velocities. Stone used for riprap should be free from weakly structured rock, soil, organic material and materials of insufficient size, all of which are not resistant to stream flow and would only service as sediment sources. Outlets for drainage facilities in erodible soils commonly require rip-rapping for energy dissipation. See conservation practice 14.17 for additional measures.

PRACTICE 15.20 – Water Source Development Consistent With Water Quality Protection

Objective: To supply water for road construction and maintenance and fire protection while maintaining water quality.

Explanation: Water source development is normally needed to supply water for road construction, dust control, mixing surface, compaction, planting and for fire control requirements of the timber Purchaser. Water source development should aim toward the construction of durable, long term water sources rather than the construction of hasty, expedient developments. Permanently designed sources, such as tanks, will result in the lowest, long term impact to the affected streams.
Other considerations in the development of water sources should be:

a. Downstream flow should not be reduced so as to detrimentally affect aquatic resources, fish passage, or other uses.
b. Temporary cofferdams should be constructed of sandbags containing sand or clean gravel, or of other materials and means which will not induce sediment in the stream.
c. Overflow should go directly back into the stream.
d. All temporary facilities for gathering water will be removed prior to causing any resource damage.

Implementation: Certified Sale Administrators and Engineering Representatives in conjunction with technical resource staffs should evaluate streams in which water developments may be constructed. Project location and detailed mitigative measures are developed by the interdisciplinary approach during the environmental analysis. Forest Service supervisors are responsible for insuring that In-Service projects meet design standards and management requirements. For contracted projects, compliance with contract specifications and the operating plan is assured by the Contracting Officer and/or engineering Representative.

Any damage to resources caused by Purchaser's operations or fire suppression activities shall be retired by purchaser or fire suppression crews in a timely and agreed manner to the extent practical to restore and prevent further resource damage.

References: Standard Specification 207; Timber Sale Contract Provisions; SWCP 14.03; Timber Sale Administration Handbook (FSH 2409.150; see references in "Best Management Practice" Definition (05--2 and 3).

PRACTICE 15.21 - Maintenance of Roads

Objective: To conduct regular preventive maintenance operations to avoid deterioration of the roadway surface and minimize disturbance and damage to water quality, and fish habitat.

Effectiveness: Moderate

Compliance: FPA Rule 4.d.i, ii, iii, iv, v – Meets

Implementation:

Active Roads: For roads in active timber sale areas, standard timber sale contract provisions require the Purchaser to perform or pay for road maintenance work commensurate with the Purchaser's use. Purchaser's maintenance responsibility shall cover the before, during and after operations period during any year when operations and road use are performed under the terms of the Timber Sale Contract. All maintenance work shall be done concurrently, as necessary, at least to the following minimum standards:

1. Culverts and ditches shall be kept functional.
2. During and upon completion of seasonal operations, the road surface shall be crowned, out-sloped, in-sloped or waterbarred, and berms removed from the outside edge except those intentionally constructed for protection of fills.

3. The road surface shall be maintained as necessary to minimize erosion of the subgrade and to provide proper drainage.
4. If road surface stabilizing materials are used, apply them in such a manner as to prevent their entry into streams.
5. Sidecast of all material associated with road maintenance would be done in a manner to prevent its entry into streams.
6. Slumps, slides and other erosion features causing stream sedimentation would be kept repaired and stabilized.

Inactive Roads: An inactive road is a forest road no longer used for commercial hauling but maintained for access (e.g., for fire control, forest management activities, recreational use, and occasional or incidental use for minor forest products harvesting). The following maintenance shall be conducted on inactive roads.

1. Following termination of active use, ditches and culverts shall be cleared and the road surface shall be crowned, out-sloped or in-sloped, water barred or otherwise left in a condition to minimize erosion. Drainage structures will be maintained thereafter as needed.
2. The roads may be permanently or seasonally blocked to vehicular traffic [FPA Rule 4.d.iv].
3. Roads will be seeded and fertilized.
4. The roads may be permanently or seasonally blocked to vehicular traffic.

Abandoned Roads. An abandoned road is not intended to be used again. No subsequent maintenance of an abandoned road is required after the road is made hydrologically inert:

1. The road is left in a condition suitable to control erosion by out-sloping, water barring, seeding, or other suitable methods.
2. Ditches are cleaned.
3. The road is blocked to vehicular traffic.
4. The department may require the removal of bridges and culverts except where the owner elects to maintain the drainage structures as needed.

Roads not in an active timber sale area: Road maintenance must still occur at sufficient frequency to protect the investment in the road as well prevent deterioration of the drainage structure function. This will be accomplished by scheduling periodic inspection and maintenance, including cleaning dips and cross drains, repairing ditches, marking culvert inlets to aid in location, and cleaning debris from ditches and culvert inlets to provide full function during peak runoff events (FSH 7709.15). **It is recommended that roads be completely obliterated and/or made hydrologically inert in lieu of continued road maintenance.**

PRACTICE 15.22 - Road Surface Treatment to Prevent Loss of Materials

Objective: To minimize the erosion of road surface materials and consequently reduce the likelihood of sediment production.

Effectiveness: High

Compliance: No directly related FPA Rule

Implementation: On timber sale roads, the Purchaser shall undertake measures to prevent excessive loss of road material if the need for such action has been identified. Road surface treatments may include: watering, applying magnesium chloride, sealing, aggregate surfacing, chip-sealing, or paving.

PRACTICE 15.24 - Snow Removal Controls

Objective: To minimize the impact of snow melt on road surfaces and embankments and to reduce the probability of sediment production resulting from snow removal operations.

Effectiveness: Moderate

Compliance: No directly related FPA Rule

Implementation: For Forest roads that will be used throughout the winter, the following measures will be employed:

1. The Purchaser is responsible for snow removal in a manner that will protect roads and adjacent resources.
2. Rocking or other special surfacing and/or drainage measures may be necessary before the operator is allowed to use the roads.
3. During snow removal operations, banks shall not be undercut nor shall gravel or other selected surfacing material be bladed off the roadway surface. Ditches and culverts shall be kept functional during and following roadway use. If the road surface is damaged, the Purchaser shall replace lost surface material with similar quality material and repair structures damaged in blading operations.
4. Snow berms shall not be left on the road surface or shall be placed to avoid channelization or concentration of melt water on the road or erosive slopes. Berms left on the shoulder of the road shall be removed and/or drainage holes opened at the end of winter operations and before the spring breakup. Drainage holes shall be spaced as required to obtain satisfactory surface drainage without discharge on erodible fills. On insloped roads, drainage holes shall also be provided on the ditch side, but care taken to insure that culverts and culvert inlets are not damaged.

PRACTICE 15.25 – Obliteration of Temporary Roads

Objective: To reduce sediment generated from temporary roads by decommission or obliterating them at the completion of their intended use.

Effectiveness: High

Compliance: Meets FPA Rules

Implementation: Effective obliteration is generally achieved through a combination of the following measures:

1. Recontouring stream crossings to natural gradient and width restoring full floodplain and valley features to natural contour.
2. Recontour unstable fill or cutslopes to natural contours. Decompact the bench portion of the road prism a minimum of 14 inches before placing excavated fill against the cutslope and on the prism.

3. Provide adequate cross drainage for the road. Waterbars placed on a maximum spacing of 30 feet will be the primary means of cross draining roads with stable cut and fill slopes. Outsloping will be the primary means of cross draining unstable road segments.
4. Road returned to resource production through revegetation. Stream crossings will be seeded with a seed mix approved for erosion prevention and covered with straw mulch. Natural regeneration of grass, brush, and trees can usually be relied upon to revegetate the portions of the road prism between stream crossings. Available or recruited wood debris, vegetation, and slash will be used to promote revegetation and protection of disturbed soil surfaces.

PRACTICE 15.27 – Trail Maintenance and Rehabilitation

Objective: To minimize soil erosion and water quality problems resulting from trail erosion.

Explanation: Trails often have erosion problems due to poor location, improper maintenance, and the amount or type of use. This deterioration can often be minimized by proper maintenance, restriction of certain types of use, and/or relocation.
Mainline and heavy use trails should have a functional drainage systems (waterbars, culverts at small stream crossings, corduroy, puncheon or boardwalks in boggy areas). Additional measures (lateral ditching, trail relocation, reconstruction, and so forth) may be required in heavy sue or problem areas.

Implementation: Each District will develop a trail maintenance plan which determines level, timing and frequency of maintenance. The need for closures will be identified through Forest Transportation Planning. Closure is done by authority of the Forest Supervisor (SWCP 11.09).

References: SWCP 11.03, 11.09, 15.01, 15.02, and 15.03; FSH 7709.56b, Drainage Structures Handbook; see references in "Best Management Practice" Definition (05--2 and 3).

PRACTICE 18.02 – Formulation of Fire Prescriptions
PRACTICE 18.03 – Protection of Soil and Water from Prescribed Burning
PRACTICE 18.05 – Stabilization of Fire Suppression Related Watershed Damage

Objective: To maintain soil productivity, minimize erosion, and prevent ash, sediment, nutrients and debris from entering surface water. To stabilize all areas that have had their erosion potential significantly increased, or their drainage pattern altered by suppression related activities.

Effectiveness: High

Compliance: No Related FPA Rule

Implementation: Forest Service and/or other crews are used to prepare the units for burning. This includes water barring firelines and reducing fuel concentrations. The interdisciplinary team identifies Riparian Areas and soils with water repellant tendencies as part of the environmental analysis. Some of the techniques used to prevent soil erosion and water quality degradation are:(1) construct water bars in fire lines; (2) reduce fuel loadings in drainage channels; (3) maintain the integrity of the Riparian Area; (4) avoid intense fires, which may promote water repellency, nutrient leaching, and erosion; (5) retain or plan for sufficient ground cover to prevent erosion of the burned sites and (6) removal of all debris added to stream channels as a result of prescribed burning, unless debris is prescribed to improve fisheries habitat.

1. Foaming agent will not be used in streams above domestic water sources. Foaming agents (if used outside of riparian areas) will not be used for water control lines where any of the ephemeral channels could carry the material to intermittent or perennial streams.
2. Machine constructed firelines will not be used on the sensitive landtypes displayed on the Soils Map.
3. Firelines must be frequently waterbarred (not to exceed 50 foot spacing when going up and down the hill).
4. Maintain large organic debris appropriate to the habitat type (see "Managing Coarse Woody Debris in the Forests of the Rocky Mountains" by Graham et. al. 1994).
5. Limit prescribed burning to those times when surface soil moisture is above 25 percent to reduce the potential for damage from hot burns.

Appendix B

Introduction

This project is designed: 1) to reduce hazardous forest fuels within the project area to decrease the risk of a wildfire negatively impacting the communities in the project area, public and firefighter safety, public infrastructure, private and National Forest System lands and resource values; and 2) to restore, enhance and protect forest ecosystem components to improve forest health, increase biological diversity, as well as reduce threats from catastrophic wildfire and insect and disease infestations.

The purpose of this report is to organize and disclose the past, ongoing and reasonably foreseeable actions that may have a cumulative impact when considered with proposed activities.

Regulatory Framework

This section discusses the principle regulations and case law that govern how cumulative effects are analyzed and disclosed.

Case Law

In *Lands Council v. Powell*, the U.S. Court of Appeals for the 9th Circuit held that, under the circumstances presented in the case, proper cumulative impact analysis required some cataloging of past projects and their effect on the current project area. Furthermore, such cataloging should provide sufficient detail to allow for analysis of the differences between prior projects and proposed projects, which could provide the information necessary to consider alternatives that might have less impact on the environment.

CEQ Regulations

The Council on Environmental Quality (CEQ), whose responsibility it is to coordinate federal environmental efforts and work closely with agencies and other White House offices in the development of environmental policies and initiatives, provided guidance to federal agencies on the consideration of past actions in cumulative effects analysis (CEQ Memorandum to the Heads of Federal Agencies regarding Guidance on the Consideration of Past Actions in Cumulative Effects Analysis, June 24, 2005; PF-CE-01). CEQ stated that "the environmental analysis required under NEPA is forward looking, in that it focuses on the potential impacts of the proposed action that an agency is considering. Thus, review of past actions is required to the extent that this review informs agency decision making regarding the proposed action," (CEQ memo, p. 1). They further state, "Generally, agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historic details of individual past actions" (CEQ memo p. 2). Cumulative impact is defined in CEQ's NEPA regulations as the "impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions…" (40 CFR 1508.7). CEQ has interpreted this regulation as referring only to the cumulative impact of the direct and indirect effects of the proposed action and its alternatives when added to the aggregate effects of past, present, and reasonably foreseeable future actions (CEQ memo p. 2).

In addition, CEQ regulations stipulate that "As part of the scoping process the lead agency shall;… determine the significant issues to be analyzed in depth… and identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3), narrowing the discussion of these issues in the statement to a brief presentation of why they will not have a significant effect on the human environment or providing a reference to their coverage elsewhere" (40 CFR 1501.7).

Within this report and the EIS we have provided information of relevant past, ongoing and reasonably foreseeable projects/activities that have occurred, are occurring, or are proposed to occur within each of the resource cumulative effects areas examined in this analysis. A discussion of the effects of these past, ongoing, and reasonably foreseeable activities has been provided to promote an informed assessment of environmental considerations and aide in assessing whether one form or another of vegetative treatment would assist in meeting the project's purpose and need for action with minimal environmental harm.

Comparison of Past and Current Land Management Practices

With respect to past actions, during the scoping process and subsequent preparation of this EIS, the Forest Service determined what information regarding past actions was useful and relevant to the analysis of cumulative effects. While CEQ found that cataloging past actions and specific information about the direct and indirect effects of a past project's design and implementation could in some contexts be useful to predict the cumulative effects of the proposal, and in *Lands Council v. Powell*, the U.S. Court of Appeals for the 9th Circuit held that, under the circumstances presented in the case, proper cumulative impact analysis required some cataloging of past projects and their effect on the current project area, these regulations do not require the Forest Service to catalog or exhaustively list and analyze all individual past actions (CEQ memo p. 3).

This section discusses the differences in past and current land management practices in regards to road construction and timber harvest. These activities have had some of the most discernable impacts to natural resources and it is important to understand the marked differences in past and current practices in order to accurately analyze the effects of each.

Road Construction

On the Idaho Panhandle National Forests, early to mid-20th century road construction activities focused construction mainly through river valleys, riparian areas, floodplains, and adjacent hillsides. The roads efficiently provided access but decreased the land's effectiveness as wildlife habitat and constricted stream channels, providing a new avenue for erosion and discharge of sediment into streams. Roads on national forest lands often were simply an expansion of existing trails and paths that provided access so that they would accommodate newer equipment and current land uses. In some situations, roads were developed on abandoned railroad beds. In both cases, the location and design were predetermined from the previous use and era. As time progressed, roads were "designed" and located to achieve their primary purpose, which was to provide access and haul product at a minimal cost. In the decades following World War II (1950s –'70s), the road network was rapidly expanded to support the domestic need for lumber in housing construction.

Over the last twenty years, both road design and location have evolved as necessary tools to provide efficient access, while protecting the valuable watershed resources they encroached upon. Forest Service Best Management Practices (FSH 2509.22 Soil and Water Conservation Practices Handbook) have been incorporated into road construction/reconstruction activities on the forest. Road surfacing (gravel, etc.) was incorporated to provide better trafficability and to prevent and control erosion from the road surface. Road controls are now being incorporated into designs that reduce the erosive flows in ditches by providing frequent cross-drains to relieve ditch flows, avoid water movement down the road by dispersing the drainage quickly by crowning or outsloping the road surface; stabilize ditches by lining; dispersing drainage water that often carries sediment onto stable, forested slopes before ditches discharge into waterways; and allow new and existing stream crossings to safely pass extreme events (such as a 100-year flood event).

Special construction techniques and designs have been utilized (i.e., full- or partial-benching of roads) to avoid unstable side casting of waste materials; windrowing clearing slash to prevent sediment delivery to streams from construction activities themselves as well as from erosion of road fills and treads that are not

yet protected with erosion control vegetation. Some roads now are designed to take advantage of the non-uniformities of the slopes they cross by "rolling grades" and grade breaks to prevent the potential for accumulations of water or excessive ditchflows that have destabilized the road bed or cause surface erosion in the past. Designers and planners develop road networks that avoid highly erosive or unstable slopes utilizing the land system inventory, hydrologists, soil scientists, and geotechnical engineers.

Road crossings are being located at more stable sites and crossing designs are now considering water quality and fish passage as primary design criteria, rather than criteria that just account for costs and traffic efficiency. Roads are being located well away from streams and their riparian areas where ever practicable; and the number of crossing sites is being minimized. These features are in stark contrast to past road locations that sometimes resulted in chronic sources of sediments, extended exposure of streams to direct sunlight resulting in temperature elevations, and nearly permanent reductions of the replacement sources of the structural components of streams and aquatic cover, riparian deadfall.

In the past, when a road's utility ended, the road was simply abandoned. These abandoned roads have been a substantial water quality and slope stability issue as they have deteriorated, especially without any maintenance. Current practice is to restore key abandoned or no longer useful roads to a "hydrologically neutral" condition in which their remnants are self-maintaining and are no longer disturbing slope stability or the movement of slope water, either on or below the soil surface or the natural functions and adjustments of streams, wetlands, and other water bodies.

Impacts to forest water and soil resources from logging practices and road activities have also been reduced over the past 20 years with the introduction of Best Management Practices (BMPs) and Inland Native Fish Strategy (INFISH) management direction. Based on research studies, current BMPs and INFISH Riparian Habitat Conservation Areas (RHCAs) can reduce sediment yields compared with historical practices (Lee et al 1997, p. 1346, PF-CE-02; USDA 1995; PF-CE-03).

In 1972, Section 208 of the Clean Water Act Amendments established the regulatory framework for non-point source pollution control thorough use of BMPs. BMPs are defined in Idaho as a practice or combination of practices determined to be the most effective and practicable means of preventing or reducing the amount of pollution generated by non-point sources (IDAPA 20.02.01). BMP monitoring is annually conducted by the forest to validate the implementation and effectiveness of BMPs associated with land management activities. Monitoring results are used to adapt future management actions where improvements in meeting water quality objectives are indicated. Forest monitoring of BMPs indicates that in most cases they continue to function as expected and are meeting their intent (IPNF 2002, 2003; PF-CE-04 and 05).

At the time the IPNF Forest Plan was written (circa 1987), the emphasis was on developing a commodity production strategy while minimizing impacts to watersheds and aquatic resources, including fish. The strategy for watershed management was constructed in the Forest Plan as a "maintenance" objective. In some situations, thresholds, or "minimum impact" standards defined the criteria for maintenance. To ensure that watersheds and aquatic resources were maintained during forest management activities, BMPs were applied. Despite the existing forest plan standards and BMPs, the condition of fish habitat on the forest was declining, primarily due to timber harvest and road building activities (IPNF 1992; PF-CE-06).

In 1995, the Forest Plan was amended to include INFISH management direction (USDA 1995; PF-CE-03), which gave greater protection to aquatic resources, especially riparian-dependent systems. The management direction provided by the INFISH amendment is designed to protect and maintain the structure and function of riparian and aquatic systems. INFISH contains goals for healthy, functioning watersheds, riparian areas, and associated fish habitats; Riparian Management Objectives (RMOs), and performance-based standards and guidelines for land management activities (i.e., timber, roads, grazing, recreation, minerals, fire/fuels, lands, riparian area management, watershed restoration, fisheries and

wildlife restoration). Instead of allowing some "acceptable" level of effects on riparian and aquatic systems, INFISH aims to protect aquatic resources from detrimental effects. INFISH gives riparian-dependent resources priority over other resources in the Riparian Habitat Conservation Areas (RHCAs), so that while RHCAs are not "lock out" zones, activities that occur in them must either benefit riparian and aquatic resources or at least "not slow the rate of recovery below the near natural rate of recovery if no additional human caused disturbance was placed on the system" (USDA 1995; PF-CE-03). Incorporation of the INFISH management direction into the Forest Plan has led to improvement in the condition of aquatic resources by offering greater protections to the critical riparian areas. In addition, INFISH allows for and encourages watershed restoration, which has occurred over the last several years across the IPNF. For example, over 1,300 miles of roads have been decommissioned on the IPNF from 1991-2003 (IPNF 2003; PF-CE-05).

As described in Chapter 1, the Proposed Action includes permanent road construction (2.5 miles), temporary road construction (1 mile), road reconstruction (2.5 miles plus new 308), road maintenance (20 miles), road obliteration (10 miles) in the Lakeview-Reeder Project Area. Specific BMPs will be followed during implementation of all project activities, as will standards and guidelines of the Inland Native Fish Strategy. Monitoring will occur to ensure BMP effectiveness and compliance with the Inland Native Fish Strategy.

Timber Harvest

Harvest methods and removal of timber products from the national forest have changed substantially over time. Early harvest methods (1950s, '60, and '70) focused primarily on financial objectives of providing low cost wood products. Harvest placement often occurred in the highest volume, easily accessible stands. Timber harvest often occurred within riparian areas and adjacent to streams. Most of the harvest prescriptions were primarily designed to produce healthy young stands with shorter rotation ages. Modern timber harvest prescriptions and design emphasize desired conditions of the forest after the harvest. This usually results in the retention of various amounts of trees in a post-harvest stand, addressing objectives that may include wildlife habitat, watershed conditions, hazardous fuels, visual quality, soil productivity, forest health and others. On sites determined suitable for timber production, timber harvest may also produce timber products on a regulated basis while compatible with these other resource objectives and values. Some examples where timber production and resource objectives can be achieved simultaneously are:

- Reducing tree densities to decrease bark beetle hazard, thereby prolonging the development of the forest and maintaining tree cover;
- Managing tree canopies to limit fire spread from the forest floor to the tree crowns;
- Developing flammulated owl habitat in ponderosa pine forest through removal of smaller stems crowding larger trees, thereby providing more room to grow for the remaining trees, and open stand conditions favored by the owl;
- Designing harvest patterns across the landscape to facilitate wildlife movement, such as providing corridors and preserving travel routes for ungulates. Also, using harvest prescriptions and landscape patterns as part of a wildfire hazard reduction strategy;
- Increasing the amount of native western white pine, western larch and ponderosa pine, which generally are insect and disease resilient and are long-lived, as well as increasing western red cedar in valley bottoms, where it historically was more abundant than today;
- Using variable retention harvests to meet visual management objectives.

Other elements of modern harvest prescriptions that address specific resource objectives include retention of snags for cavity nesters, retention of down wood for soil nutrition and wildlife habitat, maintaining

sediment filtering vegetation near riparian areas, and maintaining vegetation diversity through hardwood retention and protection of rare plants.

Increased environmental awareness has also led to improvements in logging systems that we use to remove trees from the forest. Early harvests emphasized cheap, labor intensive logging methods, such as railroad, horse, short-distance jammer systems, and tractor logging. Logging systems were selected primarily by the least expensive method to transport the trees from the forest to the mill. This sometimes involved harvesting on steep slopes, creating excessive soil disturbance and increasing the risk of erosion. Streams were sometimes used as a method to transport logs from the harvest site, causing impacts to the aquatic system and adjacent riparian habitat. Road systems were sometimes dense (10 miles of road per square mile of land area) to facilitate rapid and inexpensive removals, in some cases compromising water quality.

Today's logging systems recognize and reduce the threat of environment harm in a number of ways. Tractor logging generally occurs on slopes 35 percent or less, and is limited to designated locations, reducing soil impacts. Skyline and other cable yarding systems are used on steeper slopes, greatly reducing the amount of soil disturbance. Increasingly, helicopter logging is used, which extends yarding distances and thereby reduces road densities. In the Lakeview-Reeder Project Area, 18 percent of the logging would use helicopter yarding, 65 percent would use skyline and other cable yarding, and 17 percent would use tractor yarding. A suite of best management practices and forest plan standards and guidelines aids in the development of the least impactive design possible. Monitoring during and after the sale is completed provides a valuable feedback loop that quickly identifies and corrects variances should they occur.

The Forest ceased regeneration harvest of allocated old growth stands a number of years ago. Presently, our focus is on maintaining the old growth stands that we have and allocating additional stands for future old growth as they mature. On drier sites, restoration of old growth may include various mixes of prescribed fire, and thinning to restore historic more open old growth stand structures and reduce risk of stand replacing fire. Planting of shade-intolerant, fire-adapted species may also be done if these are in short supply. On these dry sites, our objective is to restore and sustain the old growth by retaining the large old trees, preserving the old growth characteristics, and restoring historic old growth structures and processes (IPNF 2003; PF-CE-05).

In the Lakeview-Reeder Project Area, fire-resilient species such as ponderosa pine and western larch will be the highest priority for protection. Activities under the Proposed Action are consistent with NFMA requirements and Forest Plan standards for vegetation management.

Conclusion

For the above stated reasons, changes in road construction/reconstruction and maintenance practices; implementation of watershed Best Management Practices and management direction under the Inland Native Fish Strategy; and changes in harvest practices and objectives; we believe that an individual analysis of past projects cannot further aid in assessing whether one form or another of the proposed activities would assist in meeting the project's purpose and need for action with minimal environmental harm. The evolution that has occurred in land management practices (specifically related to road construction and timber harvest) is the result of science and our ongoing monitoring actions. However, the incremental effects of the Proposed Action (when added to the effects of the past, present and reasonably foreseeable actions) are displayed, and provide a complete assessment of cumulative effects.

Issues

The scoping process is used to help determine the issues to be addressed and for identifying the significant and non-significant issues related to the proposed action. Some issues relate to specific

activities or areas while others pertain to the overall project. Several issues relating to cumulative effects analysis were identified from public comments received in response to multiple scoping efforts during the scoping process. In consideration with the regulatory framework discussed above, these issues were used to help define the scope of the cumulative effects analysis. In general, concerns focus on the effects that past timber sales have had on water quality, wildlife habitat, and vegetation characteristics.

The issues and how they are addressed in this document are outlined in Table B-1 below.

Table B-1. Issues pertinent to the cumulative effects analysis.

Issue	How the Issue is Addressed
The cumulative effects analysis (CEA) needs to provide high quality information with expert agency comments that will indicate which of the following FS timber sale listed below occurred within the project area after 1976. (See comment letter in project file for list of Timber Sales). The CEA analysis also needs to provide high quality information listing each of the FS timber sales sold after 1976 in the project area that removed in excess of 3 MMBF.	*The effects of past timber sales are important for each resource concern, but the CEA area for each resource is different. For example, the vegetation analysis uses the project area boundary while the aquatics analysis uses the watershed boundaries. In addition, both analyses require information on timber sales occurring before 1976. Therefore, information on every timber sale on record occurring within these boundaries was used. This included those timber sales listed in the comment letter that occurred within the project area after 1976, and those timber sales that removed 3 MMBF or more.*
The EIS for the Lakeview-Reeder Fuel Reduction Project must assess impacts over the entire project area, and it is of particular importance to consider the effects of other past, present and future project in the area together with the proposed actions, including those by entities other than the Forest Service, if applicable. We request the DEIS detail all other projects (private, State, and National Forest) in and around the project area that would lead to cumulative effects as required by NEPA. We request that a cumulative effects analysis, including private & state land, as well as previous FS logging and burning activities, be completed with respect to water quality, soils, motorized recreation use, quality of wildlife habitat blocks, winter range, and wildlife. The FS needs to disclose whether other logging projects in the area could be proposed in the future.	*The effects of other past, present and future foreseeable projects in the CEA area, including applicable projects by entities other than the Forest Service, are analyzed in the EIS together with the proposed action. A map of past logging, wildfires, and burning has been included in the EIS along with the year the activity took place and other pertinent information.*

Issue	How the Issue is Addressed
Please disclose the names of all other past logging and burning projects (implemented since the original Forest Plan) whose analysis area(s) encompass the areas to be logged under this proposal. We request that the EA/EIS include a map showing the location of past logging and burning and that displayed the approximate year the activities occurred	
This project is not far from other recent and anticipated projects: Lakeface Lamb, Outlet Flats and High Bridge, so there are presumably impacts to the area from multiple projects. The EIS must consider the cumulative impacts on resources in the project area of all past, current and foreseeable timber sales, including Lakeface Lamb, Outlet and High Bridge, etc.	*Lakeface Lamb Fuel Reduction Project and High Bridge and Outlet Fuel Reduction Projects are outside the boundaries of any CEA area for all resources. Therefore, these projects were not included in this cumulative effects analysis.*
The FS must factor in fire, insects, tree diseases, and other natural disturbances in specifying the structural conditions assumed to be representative of the present condition.	*The effects of past, present and predicted wildfires, insects and diseases, and wind events have been analyzed to determine past, present and predicted structural and forest composition changes (see Vegetation section Chapter 3 of the EIS).*
There is a very high potential for adverse cumulative effects. The proposal's over-emphasis on logging public lands, despite adverse cumulative effects attributable to previous logging, is extremely troubling. The proposal as written indicates that timber production is too high a priority.	*The EIS documents both beneficial and adverse cumulative effects. The priority of this proposal is to reduce fuels on public lands and provide for numerous resources improvements.*
The cumulative effects analysis needs to describe and list the names of any missing Priest Lake Ranger District NEPA documents that were written fro[m] previous timber sales within the CEA area. In the event NEPA documents and project files are missing, there needs to be expert agency comments that describe how past impacts to aquatics, fisheries, wildlife and soils are being analyzed due to missing information.	*Where data is missing, incomplete or never existed resource specialists have interpreted or extrapolated effects based on information that does exist.*

Issue	How the Issue is Addressed
The EA/EIS must disclose the ecological or economic cumulative impacts of fire suppression.	*The ecological and economic impacts from fire suppression are disclosed in the Fire and Fuels section of Chapter 3 of the EIS.*
The official record needs to include the Forest Service NEPA documents produced for previous timber sales in the CEA area that indicated each timber sale would be in compliance with CWA [Clean Water Act].	*Information pertaining to the CWA on past timber sales is disclosed in the Aquatics section of Chapter 3 of the EIS.*
The EA/EIS must also disclose the cumulative impacts of the ever-increasing motorized recreation use on wildlife species--both legal and illegal.	*The impacts to wildlife from motorized recreation use are addressed in the wildlife section of Chapter 3 of the EIS.*
The EA/EIS must consider the cumulative impacts of all past, current and foreseeable timber sales in winter range on ungulate habitat in the vicinity of the project area. Please disclose the amount of thermal cover that will be removed and describe the effects on ungulates. The EA/EIS and Biological Evaluation should consider cumulative and indirect effects of timber sales in winter ranges [deer and moose]. There are many other sales in winter range outside of MA(4), in MA (4) proper and entire WUI which could affect big game populations, and predator/prey relationships with mountain caribou.	*The Wildlife section of Chapter 3 of the EIS discloses the predicted cumulative impacts of all past, current and foreseeable timber sales on winter range habitat within the project area including changes in the amount of thermal cover. See the Wildlife section of Chapter 3 of the EIS for the effects of this project on Mountain Caribou.*
By providing adequate analysis regarding the size and quality of habitat blocks needed by the pileated woodpecker and other species, the analysis should begin to disclose the quantitative or qualitative significance of cumulative effects due to past logging in the area.	*The cumulative impacts from past, present and foreseeable activities on the size, distribution, quantity and quality of wildlife habitat within the CEA area is discussed is the Wildlife section of Chapter 3 of the project file.*

Methodology for Analysis

This section details the scope of analysis and describes analysis methods. The scope of analysis has been developed using the applicable regulations and the issues identified during scoping. The methodology section details how the data was gathered and disclosed.

Scope of Analysis

For this project, the scope of analysis refers to the activities and areas that need to be analyzed. Activities were determined using issues identified from public comments received during the scoping process and from the applicable laws and regulations pertaining to each resource. The analysis area differs for each species or resource of concern.

Activities Analyzed

After considering the regulatory framework for cumulative impact analysis and the issues identified during the scoping process, it was determined that the following activities or disturbances were of primary concern (see Table B-2 below). This discussion includes both natural events and management-related activities on National Forest and privately owned lands in the cumulative effects analysis areas for the Lakeview-Reeder project.

These activities were categorized into those that have the potential for significant effects and those that do not have the potential for significant effects. Activities that could have significant effects are discussed in this report and analyzed in detail in the EIS and individual resource reports. Activities that would not have significant effects are discussed in this report but eliminated with rationale from detailed analysis in the EIS. The potential for a significant effect to exist or not was determined based on the scope of the activity and whether or not the effects would be observable. In general, those activities that are considered non significant occurred or would occur at a very minor scale with regard to other actions and/or the effects are no longer, or are not predicted to be, discernible.

Furthermore, these activities are identified as having occurred in the past, are ongoing, occurring in the foreseeable future or a combination thereof. Past activities have shaped the existing condition of the resource area and are the impetus for the purpose and need of the project. Ongoing and foreseeable future activities may add to the effects of the proposed action when considered together.

Table B-2. Past, Ongoing and Foreseeable Future Significant and Non Significant Activities.

Potentially Significant Activity	Past	Ongoing	Foreseeable Future
Large Wildfires	X		X
Fire Suppression	X	X	X
Brushfield Burning	*X*		
Historic Snagging Operations	X		
Timber Harvests - Private/Company - Slash Compliance	X	X	X
Timber Harvests - FS Lands	*X*		
Historic Timber Harvests – FS Lands	*X*		
Site Preparation (Slashing, Dozer Piling, Dozer	*X*		

Potentially Significant Activity	Past	Ongoing	Foreseeable Future
Trampling, Rx Burning, Pile Burning)			
Tree Planting	X		
TSI (Weed and Release, Pruning, Pre-commercial Thinning) – Past	X		
Insects/Disease - Blister Rust, Beetles, Root Rot - Current and Predicted	X	X	X
Noxious Weed Treatments – Past	X		
Noxious Weed Treatments - Ongoing and Foreseeable not Associated with Project		X	X
Road Repair and Bridge Construction			X
Road Construction - Private/Company	X	X	X
Road Construction - Past - Mining, Logging, Fire Access	X		
Trail Construction - FS Lands	X		
Road Decommission/Storage for Sediment Reduction/Grizzly Security - Other Projects	X		X
Aquatic Restoration Activities	X		
Woody Debris Removal in Streams	X		
Non-native Fish Introductions	X		
Motor Vehicle, ATV, and Snowmobile use on Designated Routes and Areas	X	X	X
Motor Vehicle use off Designated Routes and Areas	X	X	X
Residential Development	X	X	X
Land Sale/Exchanges - (Granite Sewer)			X
Climate Change		X	X

Potentially Significant Activity	Past	Ongoing	Foreseeable Future
Hunting	X	X	X
Fish Improvement Structures - Other than Proposed Action			X

Not Significant Activity	Past	Ongoing	Foreseeable Future
Defensible Space Projects	X	X	X
Small Wildfires	X	X	X
Mining	X		
Blister Rust Control	X		
Fishing	X	X	X
Mass Failures/Washouts	X		
Fish Improvement Structures - Other than Proposed Action – Past	X		
Recreational use in Rec. Sites and Campgrounds	X	X	X
Road and Trail Maintenance – FS and County	X	X	X
Special Forest Products	X	X	X
TSI (Weed and Release, Pruning, Pre-commercial Thinning)			X

Analysis Area

The cumulative effects analysis area is defined differently for each species or resource in question. For example, the CEA for grizzly bears is the extent of the Bear Management Units (BMU) that the project occurs within, while the CEA for aquatics resources is the sub-watershed boundaries. The CEA for each resource is disclosed in Table B-3 below and discussed in greater detail in the respective resource sections in the EIS and in the individual resource reports.

Table B-3. CEA for each resource and species of concern.

Affected Resource	Species	CEA
Wildlife	Woodland Caribou	Not within a caribou management unit (CMU); only transient animals; not analyzed in detail
	Bald Eagle, Gray Wolf, Northern bog lemming, Fringed myotis, Townsend's big-eared bat, Western toad, Coeur d' Alene salamander, Pileated woodpecker, White-tailed deer, Northern goshawk, Forest land birds, Cavity Nesting Birds, Neotropical Migratory Birds, Black swift, Common loon, Flammulated owl, Harlequin duck, Pygmy nuthatch, American peregrine falcon	Project Area
	Canada Lynx	Sema, Willow and Kalispell Lynx Analysis Unit
	Grizzly Bears	Kalispell Granite and Lakeshore BMU's
	Fisher and American Marten	Lower end of Kalispell and Granite Drainages
	North American wolverine	Some mountain habitat present but only transient animals; not analyzed in detail
Aquatics including hydrology and fisheries	Bull Trout and Westslope Cutthroat Trout	Kalispell, Reeder, and Granite Creek watershed boundaries
Forest Vegetation/Insects & Disease, Fire and Fuels, Rare or Sensitive Plants, Soils, Noxious Weeds		Project Area
Air Quality		Project Area and Idaho/Montana Airshed
Scenery		Project Area and Adjacent Surrounding Landscape

Methods of Analysis

This section details the process used for each phase of the analysis. The first step in the cumulative impact analysis is to determine what activities would be examined. The scoping process was used to determine those activities that were of concern to the public. Resource specialists provided input on what activities could potentially affect the environmental parameters of each resource concern. These activities were compiled and organized into the list in Table 2 above.

The second step is to establish the geographical boundaries or extent of the CEA areas of each resource concern. These CEA areas differ by resource concern and are discussed in Table 3 above.
The final step of this analysis is to determine and collect the pertinent data concerning each of the past activities and disclose the information relevant the study of cumulative effects for each resource. This data was collected from a variety of sources and is listed in Table B-4 below.

Some information for past timber harvest, road construction, and residential development was missing, incomplete, unavailable or never existed. Information for the timing and type of timber harvest, road construction, and development on Forest Service and other ownerships was estimated using past aerial photographs and personal observations by Forest Service personnel. Structure and composition in the harvested units was estimated from observable evidence in aerial photographs. Ground scars seen in the photographs were also used to determine harvest methods on private lands. For example, skid trail scars could be observed in the photographs to help determine if a particular area was tractor logged, and skyline corridors were observed to help determine that a unit might have been skyline logged.

Table B-4. Data sources for each past activity.

Activity	Data Source
Large Wildfires	District Fire Almanac
Fire Suppression; Small Wildfires	District Fire Reports 1940's to present
Brushfield Burning; Noxious Weed Treatments; Road Construction and Reconstruction/Drainage Improvements/Bridge Work; Road Decommission/Storage for Sediment Reduction/Griz Security; Aquatic Restoration Activities; Fish Improvement Structures;	District Accomplishment Reports
Snagging Operations; Blister Rust Control	Historic accounts on CCC and BRC operations
Timber Harvests - Private/Company - Slash Compliance	Idaho Department of Lands, aerial photo interpretation, and company foresters
Timber Harvests - FS Lands; Site Preparation (Slashing, Dozer Piling, Dozer Trampling, Rx Burning, Pile Burning); Tree Planting; TSI (Weed and Release, Pruning, Pre-commercial Thinning)	District Stand Records stored in TSMRS and FACTS database, aerial photo interpretation, historic tree planting records, and field verification using walk-thru stand exams in each stand
Historic Timber Harvests – FS Lands	District historic timber sale maps and

Activity	Data Source
	records and past aerial photographs
Insects/Disease - Blister Rust, Beetles, Root Rot - Current	Walk-thru stand exams in each stand
Noxious Weed Infestation - Associated with Other Projects	Botanical exams in treatment stands
Road Construction - Private/Company	Aerial photo interpretation
Road Construction - Past - Mining, Logging, Fire Access	Aerial photo interpretation and records stored in the Infra road management database
Mass Failures/Washouts	Local knowledge of district hydrologist
Non-native Fish Introductions; Woody Debris Removal in Streams	Stream survey records, historic accounts, and local knowledge of district fish biologist and hydrologist
Motor Vehicle, ATV, and Snowmobile use on Designated Routes and Areas; Recreational use on Trails/Camping/Rec. Sites; Road and Trail Maintenance - FS Lands	Local knowledge of district recreation manager
Motor Vehicle use off Designated Routes and Areas	Local knowledge of district personnel and walk-thru stand exams in each stand
Residential Development	Aerial photo interpretation and Bonner County Planning and Zoning office
Defensible Space Projects	BONFIRE
Firewood Gathering; Hunting; Fishing; County Rd. Maintenance; Special Forest Products (mushrooms, berries, Christmas trees, tree boughs, etc.); Road Maintenance - Private/Company	Local knowledge of district personnel
Mining	Historic land survey maps and walk-thru stand exams in each stand

Effects of Potentially Significant Past Activities

The level of effects of each type of past activity varied due to location and implementation standards that were in place at the time. This section describes the location, timing, scope, and potential effects of each potentially significant past activity. It is important to note, however, that these activities have not significantly affected all resources.

For those resources that may have been significantly affected only a brief examination of potential effects is disclosed here, but a detailed analysis is provided in the EIS, individual resource reports and the project files. Conversely, for those resources that have not been significantly affected, a brief, concise rationale explaining why a given activity has not had a significant effect and a detailed analysis is not necessary, is discussed here.

Because of the short duration or occurrence in the distant past none of the past activities have had a lasting effect on Air Quality and this resource concern is not addressed here.

Large Wildfires

Between 1890 and 2006, 26 large wildfires have occurred within at least one of the CEA areas (see table 5 below for acres of each fire by CEA area). Year and acres burned by CEA are detailed in Appendix A – Past Wildfire History.

Potential Significant Effects

- **Forest Vegetation/Insect and Disease:** Large wildfires played a major role in the establishment of current species composition and structure and subsequent insect and disease risk within the project area.
- **Soils:** Large wildfires created the initial conditions for existing soil respiration and decomposition rates, nutrient cycling, organic matter depth, and physical soil characteristics within treatment units.
- **Wildlife:** Large wildfires established the initial habitat conditions that current wildlife populations occupy.
- **Fire and Fuels:** Large wildfires have influenced existing fuel loading and arrangement and subsequent fire hazard to the extent that fires influenced vegetation development.
- **Rare or Sensitive Plants:** Large wildfires likely affected rare plant populations and may have at least temporarily reduced habitat suitability for several rare plant species.
- **Noxious Weeds:** Large wildfires created large areas of open ground which provided ideal areas for the establishment of noxious weeds.

Non Significant Effects

- **Aquatics (Hydrology and Fish):** Initially, these large wildfires caused an influx of nutrients, sediment, and woody debris into the streams which detrimentally impacted water quality and fish habitat. However, in a short time the water quality and fish habitat improved as the sediments flushed out, stream banks re-vegetated and woody debris provided cover. Today, the impacts of these fires are not significant to the aquatics resource because the resource has since recovered from the detrimental effects. Therefore, there will be no further effects discussion regarding the impacts of past wildfires on the aquatics resource.
- **Scenery:** These large wildfires created large open areas devoid of most forest vegetation with smaller treed areas scattered across the landscape. Over time, as re-growth was established and developed, these openings were converted into uniform forested stands. Today, the effects of these larger wildfires are unnoticeable to the casual forest visitor because the once large openings have blended with the residual vegetation. Therefore, there will be no further effects discussion regarding the impacts of past wildfires on scenery.

Fire Suppression

Fire suppression policy from the early 1900s until the late 1970s was that of total suppression. Only recently has fire policy been modified to recognize the importance of fire in balancing vegetation cycles within the temperate forest. The severe wildfire seasons in northern California and Oregon in 1987, in Yellowstone Park and the Northern Rocky Mountains in 1988, throughout most of the West in 1994, Florida and Texas in 1998, and the Northern Rocky Mountains in 2000 have made it clear that fire cannot be excluded from fire-dependent ecosystems. On the other hand, because of developed areas and commercial forests, fire cannot be fully restored to its historic character, except perhaps in a few of the largest wilderness areas.

As a result of fire suppression during the last century, natural fire regimes do not exist anywhere in north Idaho today (Smith and Fischer 1997, p. 27; PF-CE-07). Fire suppression efforts have largely eliminated low-intensity and small, variable-intensity fires from the system. Within the Priest Lake basin the historic disturbance mechanism of fire has been temporarily interrupted by fire suppression activities for the past 70 to 80 years. On the Priest Lake Ranger District, individual fire records exist from 1940 to present. Since 1940, 131 fires less than a ¼ acre in size have occurred within the project area. Twelve fires over a ¼ acre for a total of 16.8 acres have occurred within the project area since 1940. The only major fire to take place in the project area since 1926 occurred in 1968 and burned 40 acres.

Potential Significant Effects

- **Forest Vegetation/Insect and Disease:** In the absence of low and mixed-severity wildfires that had a thinning effect, young stands of shade-intolerant species are being lost to competition. The change in composition to shade-tolerant species has made stands more susceptible to root diseases, defoliating insects, bark beetles and stand-replacing wildfires.
- **Soils:** The absence of fire, has affected the initial conditions for existing soil respiration and decomposition rates, nutrient cycling, organic matter depth, and physical soil characteristics. Direct effects as a result of fire suppression efforts include trenching and mixing of the soil layers and aerial retardant may affect the short term soil nutrient status.
- **Wildlife:** The effects of fire suppression vary according to species. Species that tolerate or thrive in mid-to late succession forests have been favored as forest stands have been allowed to develop. Openings and snags created from fires that some species require have been lacking. Fire suppression activities may cause short term displacement of some animals.
- **Fire and Fuels:** The absence of disturbance from fires has influenced existing fuel loading and arrangement and subsequent fire hazard to the extent that suppression of wildfire has influenced vegetation development.
- **Rare or Sensitive Plants:** The absence of disturbance from fires may have influenced habitat suitability for some plant populations, especially those that occur in fire-adapted habitats. The increased risk of future widespread stand-replacing wildfire due to untreated fuel accumulations from past fire suppression is also a concern, because such fires could negatively impact rare plant populations and suitable rare plant habitat.
- **Noxious Weeds:** Fire suppression activities have likely affected noxious weed spread to some degree because of the use of roads, opening of impassable roads, and movements of firefighters. The increased risk of widespread stand-replacing wildfire due to untreated fuel accumulations from past fire suppression is also a concern, because such fires could create large areas of soil and/or vegetation disturbance conducive to weed introduction and spread.

Non Significant Effects

- **Aquatics (Hydrology and Fish):** In the absence of large wildfires as a result of fire suppression efforts, the influx of nutrients, sediment, and woody debris into the streams has not occurred. Fire suppression tactics utilizing aerial retardant near streams, temporary stream crossings, or streams as control barriers may have impacted water quality. However, these impacts tend to be localized, occur in short duration pulses, can no longer be detected and occur on an insignificant amount of land in relation to the larger watershed. Therefore, there will be no further effects discussion regarding the impacts of past fire suppression on the aquatics resource.
- **Scenery:** Fire suppression activities have not produced any physical changes on the landscape and subsequently have not had a significant effect on the scenic quality or character of the landscape. Therefore, there will be no further effects discussion regarding the impacts of fire suppression on scenery.

Brushfield Burning

The only recorded brushfield burning occurred on approximately 100 acres the south side of Lakeview Mountain in 2000. The purpose was to reduce fuel loadings and increase wildlife browse by killing decadent brush and provide favorable growing conditions to younger, more vigorous preferred species.

Potential Significant Effects

- **Noxious Weeds:** Although the acreage is small compared to the rest of the project area, noxious weeds increased after burning this brushfield and now provide a potential seed source to surrounding areas if disturbance occurs.
- **Rare or Sensitive Plants:** At the time of brushfield burning, there were no rare plants suspected to occur in the Kaniksu portion of the IPNF in these drier habitats. However, two currently addressed rare plants, clustered lady's slipper and pine broomrape, are known from such habitats; therefore, the effects of brushfield burning will be considered in the rare plants cumulative effects analysis.

Non Significant Effects

- **Forest Vegetation/Insect and Disease:** Because it occurred on such a small portion of the project area, this brushfield burning did not have a significant effect on the vegetation composition and structure of the project area. Therefore, there will be no further effects discussion regarding the impacts of brushfield burning on forest vegetation or insect and disease.
- **Soils:** This brushfield burning did not occur on any proposed treatment unit and did not occur with enough intensity or severity to detrimentally affect the physical, biological and chemical properties of the soil. Therefore, there will be no further effects discussion regarding the impacts of brushfield burning on the soils resource.
- **Wildlife:** Because it occurred on such a small portion of the project area, this brushfield burning did not have a significant effect on the quality or quantity of browse in the project area. Therefore, there will be no further effects discussion regarding the impacts of brushfield burning on wildlife.
- **Fire and Fuels:** Because it occurred on such a small portion of the project area, this brushfield burning did not have a significant effect on the vegetation composition and structure of the project area. Therefore, there will be no further effects discussion regarding the impacts of brushfield burning on fire and fuels.

- **Aquatics (Hydrology and Fish):** This brushfield burning did not occur with enough intensity or severity to create any sediment from runoff or significantly increase water yield. Therefore, there will be no further effects discussion regarding the impacts of brushfield burning on the aquatics resource.
- **Scenery:** Brushfield burning did not create a noticeable difference to the scenic quality or character of the landscape. Therefore, there will be no further effects discussion regarding the impacts of brushfield burning on scenery.

Snagging Operations

The stand replacing wildfire of 1926 burned through the southern third of the project area, killing most all trees except the larger larch and other scattered remnants. The fire resulted in a forest full of snags and downed timber, which created a fire hazard. After the fire, Civilian Conservation Corps (CCC) crews started snagging operations and felled the majority of dead and dying trees in order to remove "lightening rods" that could provide an ignition source for the next fire. The extent of snagging operations within the project area is not known. However, the south side of Lakeview Mountain and the Kalispell Creek drainage appear to have had the majority of work done. The north side of Lakeview Mountain appears to have had some snagging operations done, except that it is not clear whether this was from historic logging operations during the late teens and early twenties or from the CCCs. Many of the dead and dying larch that were felled as snags were used as firewood or sawn into lumber at the CCC sawmill.

Potential Significant Effects

- **Forest Vegetation/Insect and Disease:** Some structural diversity was lost due to snagging operations. However, snagging operations did not affect current levels of insect and disease activity.
- **Wildlife:** Because of the loss of large diameter snags, cavity nesting habitat is diminished from what was potentially available naturally. In addition, much of the felled material was consumed in some form so that habitat that could have been created from downed wood has also been diminished.
- **Soils:** Snagging and subsequent removal of felled material diminished the amount of downed wood recruitment for the affected sites. This may be the cause for a lack of course wood debris in some proposed treatment units today.
- **Aquatics (Hydrology and Fish):** Because felling was done by hand, the snagging operations were not a ground disturbing activity. Therefore, snagging did not affect hillslope hydrology or create any sediment that affected fish habitat. However, snagging operations did contribute somewhat to the lack of coarse wood debris recruitment into streams.

Non Significant Effects

- **Fire and Fuels:** The snagging operation did not influence the amount of fuel loading within the project area because snags do not contribute toward crown fire spread and any downed wood would have been incorporated into the soil by this time. Therefore, there will be no further effects discussion regarding the impacts of snagging operations on fire and fuels.
- **Rare or Sensitive Plants:** Because the snagging operations followed soon after the initial fires that created the snags, this activity did not contribute to a loss of rare or sensitive plant habitat beyond what had already occurred. Therefore, there will be no further effects discussion regarding the impacts of snagging operations on rare or sensitive plants.

- **Scenery:** Snagging operations did not affect vegetation characteristics enough to create a noticeable difference to the scenic quality or character of the landscape seen today. Therefore, there will be no further effects discussion regarding the impacts of snagging operations on scenery.
- **Noxious Weeds:** Snagging operations did not include ground disturbing activities beyond what had already occurred. Therefore, there will be no further effects discussion regarding the impacts of snagging operations on noxious weeds.

Timber Harvests on Private Lands

There are 4397 acres of private lands within the project area. Of this, the majority of currently available forest land has had limited timber harvest on and off since the early 1900's. Often timber harvest has coincided with residential development as some land owners have subdivided or cleared lots for building. Those lands have been converted and are not considered forest land any longer. In general, much of the larger tracts of private forest land are still managed as productive forests. Stimson Lumber Company is the only industrial landowner within the project area with 1486 acres. They have harvested all but one parcel within the last few decades and most recently on Lakeview Mountain in the late spring of 2007. They have relied on natural regeneration to reforest their lands. Another 26 acres of private non-industrial forest lands exist within the watershed analysis area and are currently in a forested condition. Stimson owns an additional 3105 acres within the watershed analysis area and has harvested these lands within the last few decades. Forest Capitol is a newer landowner in this area and holds 770 acres within the Granite Creek watershed that was harvested in decades past.

Potential Significant Effects

- **Forest Vegetation/Insect and Disease:** Harvests on private lands generally result in a trend toward shade-tolerant species compositions and structure. This has an effect on the overall species composition and structure and subsequent insect and disease risk within the project area.
- **Wildlife:** Harvests on private lands manipulate vegetation composition and structure thereby affecting some habitat requirements of various wildlife species.
- **Fire and Fuels:** Slash treatments following harvests on private lands vary by landowner and resulting fuel loading and arrangement and stand structure can have an effect on ignition risk and fire growth.
- **Aquatics (Hydrology and Fish):** Harvests on private land have the potential to affect hillslope hydrology and could result in sediment reaching streams. Although, industrial timberland owners have streamside management zone buffers, other private landowners do not and some streamside shade and coarse wood debris recruitment is lost in these areas.
- **Scenery:** Harvests on private land may have affected the existing scenic quality and character of the landscape.
- **Noxious Weeds:** Harvests on private lands are ground disturbing activities and can create sources for noxious weed establishment and dispersal.
- **Rare or Sensitive Plants:** Harvest on private lands have likely impacted rare plant populations and suitable rare plant habitat, since there are no requirements to provide for population or species viability of rare plants on private lands. In some cases, harvest on private lands may have also indirectly impacted rare plants or suitable rare plant habitat on adjacent NFS lands.

Non Significant Effects

- **Soils:** There have been no direct, indirect or cumulative effects to soil productivity within proposed treatment units as a result of harvest on private land. Therefore, there will be no further effects discussion regarding the impact of timber harvests on private land on the soils productivity.

Timber Harvests on National Forest System Lands

For reasons stated earlier, the implementation of watershed Best Management Practices, management direction under the Inland Native Fish Strategy, and changes in harvest practices and objectives, an individual analysis of past timber harvest projects would not further aide in assessing whether one form or another of the proposed activities would assist in meeting the project's purpose and need for action with minimal environmental harm. In addition, each resource area required past harvest information at different at different spatial and temporal scales. The vegetation analysis required the effects of these past harvests be aggregated by decade within the project area only in order to facilitate a more meaningful and effective analysis to take place because harvest methods and associated effects differ more significantly by decade than from year to year (See Appendix B – Past Harvest History). The hydrology analysis needed information on past timber harvests for the entire watershed analysis area but only harvest twenty five years old or less because in this area harvested lands older than that are considered hydrologically recovered. The fisheries analysis looked at all past timber harvests to determine the potential effects to streamside shade and coarse wood debris recruitment. The wildlife analysis examined several different cumulative effects areas for different species and evaluated changes in species habitat due to any past harvest within those areas (not analyzing each harvest separately but altogether at once) in order to predict the effects of proposed activities on each species habitat requirements.

An important point to note is that only a limited amount of information exists for timber sales that occurred before 1950. In general, only acres harvested, year and type of treatment are recorded for these sales. Beginning around 1950, additional information on logging systems and fuel treatments were recorded as well. Therefore, for sales occurring prior to 1950, only the effects on vegetation can be discussed. In addition, those activities recorded in stand exams prior to 1950 are not documented on historic timber sale maps or in historic records. This may be attributed to the fact that many of these activities were road side salvages or individual small sales from blowdown events that were not appropriate to record with larger timber sales. This indicates that these sales, because of their small size and limited scope individually and cumulatively, did not have a significant effect on other resources and this lack of information is probably not important.

Additionally, some stands had more than one harvest entry. Therefore, when two or more treatments where recorded for the same stand, data from the most significant treatment was used for this analysis. For example, if a stand had a thinning in 1960 and shelterwood seed cut in 1980, the shelterwood seed cut was used for the analysis because it is the more significant treatment in terms of changes in forest type and stand structure, impacts to soils, and influence on water yield and sediment delivery.

Potential Significant Effects

- **Forest Vegetation/Insect and Disease:** Past harvests have resulted in changes in species composition and structure. This has an effect on the overall species composition and structure and subsequent insect and disease risk within the project area.
- **Wildlife:** The amount of currently capable and suitable habitat for a given species has been affected to some degree by the past harvests that have occurred as these activities have changed some key habitat requirements.

- **Fire and Fuels:** Generally, slash treatments following harvests were effective at mitigating the fire risk. Although, some stands treated in the past have developed a fuel hazard from competition induced mortality or insect and disease activity, many stands still serve as effective fire breaks.
- **Aquatics (Hydrology and Fish):** Harvests can affect water yield, streamside shade and coarse wood debris recruitment.
- **Scenery:** Past harvests may have affected the existing scenic quality and character of the landscape.
- **Noxious Weeds:** Harvests are ground disturbing activities and can create sources for noxious weed establishment and dispersal. The effects of inadequate weed prevention and re-vegetation measures from past harvests are still evident in the project area.
- **Soils:** When proposed treatment units overlap past harvest units, there is a potential for detrimental cumulative effects (compaction, displacement, rutting, coarse wood deficiencies, etc.) to soil productivity.
- **Rare or Sensitive Plants:** Harvest on NFS lands may have directly impacted rare plant populations and/or suitable rare plant habitat. Few floristic surveys and rare plants effects analyses were conducted on NFS lands before 1990.

Historic Timber Harvests on National Forest System Lands

Historic Forest Service timber sale maps and records document timber harvest in the project area back to 1916. Typically, only the most valuable trees were removed, leaving the majority of the standing trees in the stand. White pine, spruce, cedar, and select larch that had survived previous fires were the main species being harvested. Following the selective logging, the slash was piled and burned or left to abate naturally. Cutting and skidding was done as soon as the ground was firm enough in late spring and continued until snow became too deep. Horses were used predominately to skid logs to chutes or straight to landings. Dalkena Lumber Company used sleighs and snow roads built in the winter to transport logs from landings to Priest Lake to await the spring time log drive. Diamond Match Company constructed a narrow gauge railroad up Kalispell Creek to transport logs to Kalispell Bay to wait for the log drives. The section of the existing 308 road proposed for obliteration was built on a portion of this railroad. The table in Appendix C details the recorded information for each historic sale from 1916 through 1939.

Potential Significant Effects

- **Forest Vegetation/Insect and Disease:** Historic timber harvests occurring before the 1926 fire may have removed seed sources from some areas, which may have affected the type and amount of regeneration that established after the fire. Along with harvests before the 1926 fire, those that occurred following the 1926 fire contributed to the overall existing species composition and structure in the project area, which may have affected the insect and disease risk within the project area.
- **Wildlife:** The amount of currently capable and suitable habitat for a given species has been affected to some degree by the past harvests that have occurred as these activities have changed some key habitat requirements.
- **Fire and Fuels:** Just as slash treatments following harvests were effective at mitigating the fire risk, the lack of slash disposal in some areas may have contributed to the 1926 fire. In addition, the effects these harvests had on subsequent regeneration and vegetation development has affected the existing fuel hazard.
- **Soils:** Because these harvests took place so long ago, the soils may have recovered from whatever detrimental effects that occurred. However, if the effects are still detectable, then there may be a

potential for detrimental cumulative effects (compaction, displacement, rutting, coarse wood deficiencies, etc.) to soil productivity.

- **Rare or Sensitive Plants:** Historic timber harvest very likely affected some rare plant populations and suitable rare plant habitat, especially where activities were concentrated near streams and in seasonally wet areas. Effects to rare plants and suitable rare plant habitat were not considered in the design of historic timber harvests.
- **Aquatics (Hydrology and Fish):** A common practice during these harvest operations was to remove stream course impairments including large logs, trees and debris jams to aid log transport. This has had a lasting adverse effect on sediment movement and native fish habitat in Kalispell, Reeder and Granite Creeks.
- **Noxious Weeds:** Historic timber harvest on NFS lands created areas of soil disturbance conducive to the introduction and spread of noxious weeds. Many noxious weeds were first introduced in Bonner County in the early 1900s, and at that time the effects of noxious weeds on other natural resources were not known.

Non Significant Effects

- **Scenery:** Because they occurred so long ago, the effects these harvests may have had in the past, have become subordinate to the scenic quality and character of the landscape today. Therefore, there will be no further effects discussion regarding the effects of historic timber harvests on the scenic resource.

Site Preparation Activities

These activities include slashing, dozer piling, dozer trampling, roller chopping, excavator piling, prescribed burning, and pile burning, which were used to treat fuels or prepare harvested sites for tree planting.

It is important to note, that some stands had more than one harvest entry and consequently more than one type of site preparation activity. Therefore, when two or more treatments where recorded for the same stand, data from the most significant treatment was used for this analysis. For example, if a stand had whole-tree yarding (no site preparation) in 1960 and dozer piling in 1980, the dozer piling was used for the analysis because it is the more significant treatment in terms of impacts to soils. See Appendix D – Past Site Preparation History for a description of these activities by decade.

Potential Significant Effects

- **Forest Vegetation/Insect and Disease:** Site preparation activities are most important for regeneration goals. The type of site preparation can, in part, determine the regeneration success. For example, if natural regeneration is the chosen method then seedlings will establish and grow much more successfully in an area that was prescribed burned than one that was whole tree yarded. In addition, some tree species are more dependent on mineral soil seed beds than others. If the goal is to regenerate larch naturally, then creating a mineral seed bed either by scarification or burning is the best method to increase regeneration success. Otherwise, shade-tolerant seedlings will be favored and will take over the site. Site preparation can be less important for areas that are to be planted unless competition by other forms of vegetation is likely to hinder growth.
- **Wildlife:** For species that are dependent on large course wood for habitat, method of site preparation will determine how much if any course wood is left on a given site.

- **Fire and Fuels:** The method of site preparation employed on a given site can determine the type and amount of subsequent regeneration and fuel loading. The type and amount of regeneration will affect how a given stand develops over time (i.e. density and arrangement of live fuels). An effective slash treatment will mitigate future fire risk just as the lack of slash disposal in some areas may contribute to the future fire risk.
- **Soils:** Besides the direct effects of mechanized harvest operations, the timing and type of follow up slash treatments can have detrimental effects to soil productivity, which may necessitate design requirements for proposed activities.
- **Rare or Sensitive Plants:** Some site preparation activities may have affected rare or sensitive plant populations or habitat.
- **Aquatics (Hydrology and Fish):** The type of site preparation activity can have an impact on sediment movement on a given site. Prescribed burns can cause some localized hydrophobic soil conditions leading to surface runoff and sediment movement into nearby creeks. Also, scarification and dozer piling can expose almost all mineral soil to erosion processes without leaving anything to impede sediment movement.
- **Scenery:** Site preparation or lack of can degrade the scenic quality of given site if treatments were not subordinate in context with the surrounding landscape (i.e. skid trails joining main roads or excessive slash left on site).
- **Noxious Weeds:** Site preparation that exposed mineral soil may have provided an area for noxious weeds to become established.

Tree Planting

Planting nursery grown trees has been a common reforestation practice that has occurred in many of the past harvest units and areas that burned in the 1926 fire within the project area. Over time, depending on availability of seed stock and accepted practices, the species planted has changed. From the late twenties to the sixties, a combination of western white pine, ponderosa pine and Engelmann spruce was planted predominately. Some Norway spruce was planted in the Zero Creek drainage in 1928, and eastern white pine was planted in many places in the thirties. Unfortunately today, plantations established during these time periods are experiencing high levels of mortality for a variety of reasons. During the twenties and thirties knowledge seed transfer zones did not exist so many trees were not genetically adapted to growing conditions in the Priest Lake basin. Seedlings were selected based on availability more than anything else. The planted ponderosa pine grew well for the first few decades but are now dying from root diseases and insect attacks that native ponderosa pine are adapted to persist through. In addition, the seed produced from this “off-site” ponderosa pine have much lower viability than native seed and therefore have poor reproductive success. The large majority of western and eastern white pine in these plantations are dying from blister rust. The first generation of resistant white pine stock was not available for planting in this area until the mid eighties. The planting of resistant stock in combination with pruning has decreased the mortality from blister rust somewhat. For the most part, the Engelmann spruce has done well in areas that can maintain moisture through most of the year. Douglas-fir was planted in higher and drier areas in the late sixties up to the mid nineties when extensive research revealed the relationship between this tree species and root disease. Because of its susceptibility to root disease, Interior Douglas-fir has historically been a short lived species and was only a minor component in mature stands in the Priest Lake basin. As a result, Douglas-fir planting was discontinued in this area. In the early eighties, western larch became more of a preferred species to plant due to recognition of its superior growth and availability of suitable seed stock. Today, due to the best available science and knowledge from past experience, western larch, western white pine and ponderosa pine from local, improved seed stock are the predominate planted species in this area.

Potential Significant Effects

- **Forest Vegetation/Insect and Disease:** The tree species planted has had a direct effect on the existing species composition, structure and insect and disease risk throughout the project area.
- **Wildlife:** The amount of currently capable and suitable habitat for a given species has been affected to some degree by the species planted in the past as existing forest vegetation type is a key habitat component.
- **Fire and Fuels:** The tree species planted has had an effect on the level of mortality incurred from insect and disease activity and consequently, the existing fuel loading and fuel hazard.

Non Significant Effects

- **Aquatics (Hydrology and Fish):** Although sites that were either burned or harvested and then planted may have reforested somewhat faster than sites that were not planted, the rate of recovery is not significant to the analysis of the aquatics resource. In the Priest Lake basin in general and the project area specifically, a given site has enough canopy cover re-growth after twenty-five years to be considered hydrologically recovered. During a twenty-five year time period the difference in growth between planted trees and naturally established trees is much closer. This is partly the reason why pre-commercial thinning is recommended between twenty and thirty years of age in planted stands because natural regeneration has caught up with planted trees and is effectively competing for growing space. It is more important for the aquatics resource as to the type and age of the disturbance rather than if the site was planted or naturally regenerated. Therefore, there will be no further discussion regarding the effects of tree planting on the aquatics resource.
- **Scenery:** Whether or not a site was reforested is more important to scenic quality than if that same site was planted or naturally regenerated. Therefore, there will be no further discussion regarding the effects of tree planting on the scenic resource.
- **Noxious Weeds:** Tree planting is not an activity that has significantly contributed to the spread of noxious weeds. Foot traffic along with movements of animals may have spread some seed within past treatment units but the magnitude of noxious weed dispersal has been far less from these activities than from ground based harvesting and vehicle traffic. Therefore, there will be no further effects discussion regarding the impacts of tree planting on noxious weeds.
- **Rare or Sensitive Plants:** Tree planting is a minor ground disturbing activity and in itself has not cumulatively impacted rare or sensitive populations or habitat. The activities associated with harvesting and site preparation, which precede tree planting, are the actions that may have impacted plant populations or habitat. These activities are discussed in the above sections. Therefore, there will be no further discussion regarding the impacts of tree planting on rare or sensitive plants.
- **Soils:** Different tree species have different nutrient requirements, which may affect the overall nutrient status of a given site. However, the areas that were planted have experienced enough growth from natural reforestation, that the effects to overall nutrient status of a site are more related to the numbers of trees rather than to species of tree. The two cannot be differentiated. Therefore, there will be no further discussion regarding the impacts of past tree planting on soils.

Timber Stand Improvements

Timber stand improvement (TSI) refers to activities such as weed and release, pruning, and pre-commercial thinning, which improve the growth and vigor of a stand by reducing inferior characteristics

and reallocating resources. These activities have been minor in terms of ground disturbance but have produced positive results in tree growth and disease resistance.

Potential Significant Effects

- **Forest Vegetation/Insect and Disease:** TSI activities or the lack of activities have contributed to the existing species composition, structure and insect and disease resistance or risk throughout the project area. For example, there is a marked difference in tree growth and vigor in stands that have had pre-commercial thinning and ones that have not.
- **Fire and Fuels:** TSI activities or the lack of activities have contributed to the existing species structure and level of mortality incurred from insect and disease activity and consequently, the existing fuel loading and fuel hazard.
- **Soils:** TSI activities do reallocate resources, which may have affected the nutrient status of a treated site.
- **Aquatics (Hydrology and Fish):** Past TSI activities have affected the aquatics resource in two ways, increased water yield and shortened time for vegetation to reduce in-stream temperatures. Pre-commercial thinning decreases the amount of canopy cover, which may have increased water yields in some areas. However, because the pre-commercial thinning has occurred over a limited number of acres this reduction in canopy cover is not significant. Pre-commercial thinning also reduces the numbers of trees, which increases growth response and shortens the time for young trees near streams to begin contributing to streamside shade.
- **Scenery:** TSI activities change the scenic character of areas harvested in the past by changing the structure from dense to more open.

Non Significant Effects

- **Noxious Weeds:** TSI activities are not ground disturbing and, therefore, have not significantly contributed to the spread of noxious weeds. Foot traffic along with movements of animals may have spread some seed within past treatment units but the magnitude of noxious weed dispersal has been far less from these activities that from ground based harvesting and vehicle traffic. Therefore, there will be no further effects discussion regarding the impacts of TSI activities on noxious weeds.
- **Rare or Sensitive Plants:** TSI activities are not ground disturbing and, therefore, have not cumulatively impacted rare or sensitive plant populations or habitat. The activities associated with harvesting and site preparation, which precede any TSI work, are the actions that may have impacted plant populations or habitat. These activities are discussed in the above sections. Therefore, there will be no further discussion regarding the impacts of TSI activities on rare or sensitive plants.
- **Wildlife:** The effect of these activities on the amount of currently capable and suitable habitat for a given species has been minor because these activities do not change the existing forest vegetation type, which is a major habitat requirement. Therefore, there will be no further discussion regarding the impacts of TSI activities on wildlife.

Insect and Disease Activity

A few specific insects and disease pathogens have had a profound effect on vegetation development within the project area. Blister rust (discussed in the section above) has significantly reduced the amount of mature trees that once existed and those that would have reached maturity today. Western white pine was once a dominate species in this area and has now been reduced to a minor component, with western

hemlock, western red cedar and grand fir taking over its niche. Several different root disease pathogens have affected stand development by reducing the amount of mature and immature Douglas-fir and grand fir trees within the project area. Fir engraver and Douglas-fir Beetles have reduced the amount of mature and immature grand fir and Douglas-fir within the project area. Indian paint fungus has infected a large percentage of western hemlock within the project area. Mountain and western pine beetles have reduce the amount of lodgepole and ponderosa pine within the project area.

Potential Significant Effects

- **Forest Vegetation/Insect and Disease:** Insects and disease pathogens have had profound shifts in the existing species composition, structure and insect and disease risk throughout the project area.
- **Wildlife:** The amount of currently capable and suitable habitat for a given species has been affected to some degree by the effects that insects and diseases have had on existing forest vegetation type, which is a key habitat component.
- **Fire and Fuels:** Insects and disease pathogens have had a sizeable effect on the level of mortality and consequently, the existing fuel loading and fuel hazard.
- **Soils:** Insect and disease activity has affected the amount of downed wood existing in stands today, which has an effect on the long-term nutrient status of a given site.
- **Scenery:** In some areas, the effects of insects and diseases has affected the scenic quality and even defined the character of the landscape today.

Non Significant Effects

- **Aquatics (Hydrology and Fish):** The mortality caused by insects and disease pathogens has not had a significant effect on riparian areas. These sites tend to be the most productive and though insect and disease activity is observable the percentage of mortality is low in comparison to the larger riparian stand. Therefore, there will be no further discussion regarding the effects of insects and diseases on the aquatics resource.
- **Noxious Weeds:** Insect and disease activity has not affected the dispersal of seed or created any ground disturbance that has provided for noxious weed establishment. Therefore, there will be no further effects discussion regarding the impacts of insects and disease on noxious weeds.
- **Rare or Sensitive Plants:** Insect and disease activity is not ground disturbing and no rare or sensitive plants are hosts to any species of insect or disease affecting forest vegetation. Therefore, there will be no further discussion regarding the impacts of insects and diseases on rare or sensitive plants.

Noxious Weed Treatments

Past noxious weed treatments within the project area have included herbicide application and release of biological control agents. These treatments have focused on road prisms, trails, developed sites, and a brushfield on Lakeview Mountain because these areas have the highest concentration noxious weeds, the most exposed soil from ground disturbance and the most activities that contribute to weed spread. Treatments have had positive results in reducing the amount of noxious weeds, especially in areas that have been treated multiple times, and have allowed native or desirable vegetation (mostly grasses) to out compete the noxious weeds.

Potential Significant Effects

- **Noxious Weeds:** Past noxious weed treatments, although not encompassing a large percentage of the project area, have had beneficial effects in the areas that have been treated. The effectiveness of past treatments, along with design criteria in Chapter 2, will be considered in the cumulative effects analysis for noxious weeds.

Non Significant Effects

- **Forest Vegetation/Insect and Disease:** Because the treatments have been limited to developed sites that are not part of the forest land base, noxious weed treatments have not had an effect on the existing species composition, structure and insect and disease risk within the project area. Therefore there will be no further effects discussion regarding the impacts of noxious weed treatments on forest vegetation/insect and disease.
- **Wildlife, Aquatics (Hydrology and Fish) and Rare or Sensitive Plants:** The effects of noxious weed treatments on these resources were addressed in the Priest Lake Noxious Weed Control Project FEIS (USDA 1997). Therefore there will be no further effects discussion regarding the impacts of noxious weed treatments on these resources.
- **Fire and Fuels:** Noxious weed treatments have not occurred in the general forest and have not had an effect on forest vegetation, fuel hazard or fire risk. Therefore there will be no further effects discussion regarding the impacts of noxious weed treatments on fire and fuels.
- **Soils:** Because past noxious weed treatments have not occurred within any proposed treatment unit but have been confined to the road or trail prism, there has been no effect to the existing condition of the soil resource. Therefore there will be no further effects discussion regarding the impacts of noxious weed treatments on soils.
- **Scenery:** In some areas, the effects of noxious weed treatments have been positive and improved the scenic quality. However, treatments have had no observable effect to the overall character of the landscape. Therefore, there will be no further effects discussion regarding the impacts of noxious weed treatments on the scenic resource.

Past Road Construction

Roads have been constructed in the past for a variety of reasons. The first wagon road from Reeder Bay to Nordman and the Nickelplate mines was in use around 1890. In the early 1900's logging companies built sleigh roads to transport logs in the winter. Many of these roads are evident on the landscape today. After 1910, as fire suppression efforts increased, roads were built to facilitate transporting crews and equipment to remote areas on the district. When logging trucks were put into use in the late twenties and early thirties better haul roads were constructed to transport logs out of the woods. As the demand for wood products increased in the fifties and sixties road building increased respectively as well. As harvest levels decreased in the late eighties through the nineties road building decreased also, and some roads were even being obliterated as resource values shifted. Development of private land has been the major contributing factor to increased road density within the project area. Development has concentrated along the lake shore, around the Reeder Bay, Reeder Creek, and lower Kalispell Creek county roads, and to the end of State Highway 57 just north of Nordman. This makes up the heart of the project area.

Potential Significant Effects

- **Forest Vegetation/Insect and Disease:** Road construction has taken land within the project area out of timber production, which is reflected in the amount of currently existing forest land.
- **Wildlife:** Roads have provided access for activities that have displaced some species.

- **Fire and Fuels:** Roads have provided access for more efficient and effective fire suppression activities.
- **Soils:** Land occupied by permanent roads has become part of the dedicated infrastructure and is no longer productive forest land.
- **Rare or Sensitive Plants:** Past road construction likely affected rare plant populations and/or suitable rare plants habitat. Effects to rare plants were generally not considered in proposed road construction before 1990.
- **Aquatics (Hydrology and Fish):** Of any other activity, roads have the greatest impact to the aquatics resource. If not properly designed, road cuts serve to reroute sediment and water flow, which can directly impact streams and fish habitat.
- **Scenery:** By creating artificial lines on the landscape, some road prisms have degraded the scenic quality of the project area.
- **Noxious Weeds:** Because road construction is a major ground disturbing activity, roads have provided an ideal area for noxious weeds to become established. In addition, weeds have been spread along road prisms and transported to other areas by vehicle traffic.

Past Trail Construction

Before roads, trails were the main transportation routes to get anywhere. Native Americans had well established trails in the Priest Lake basin long before the first white man came into the country. Some trails that exist today follow routes used by Native Americans. The old wagon road from Reeder Bay to Nordman was constructed on a trail route used by miners and settlers. Major trail building started when fire suppression efforts were ramped up after the 1910 fires. Forest guards and CCC crews built a vast network trails to access lookouts, guard cabins and recreational sites. In the thirties and especially after World War II, some of these trails became important for recreational users and were kept open, while others disappeared altogether. In more recent times trails have been constructed for recreational purposes almost exclusively and some are designed for a variety of traffic including horses and off-road vehicles.

Potential Significant Effects

- **Wildlife:** Trails that are high use non-motorized and motorized have provided access for activities that have displaced some species. Low use trails have had insignificant effects on wildlife species.
- **Fire and Fuels:** Trails have provided access for more efficient and effective fire suppression activities.
- **Soils:** Old trails that are inside of an activity area and are still compacted may have detrimental effects to the soils resource.
- **Noxious Weeds:** Because trail construction is a ground disturbing activity, trails have provided an area for noxious weeds to become established. In addition, weeds have been spread along some trails and transported to other areas by either by motorized and/or non-motorized traffic.
- **Rare or Sensitive Plants:** Past trail construction likely affected rare plant populations and/or suitable rare plant habitat. Effects to rare plants were generally not considered in proposed trail construction before 1990.

Non Significant Effects

- **Forest Vegetation/Insect and Disease:** Because trails are not very wide, 2 to 4 feet generally, they encompass only a very small percentage of the total forest land within the project area and

have not had a significant effect on forest vegetation or insect and disease activity. Therefore there will be no further effects discussion regarding the impacts of past trail construction on forest vegetation and insect and disease.

- **Aquatics (Hydrology and Fish):** Because trails are not very wide, must be built to fit the terrain and have natural or man-made drainage features, they do not reroute significant volumes of sediment or water flow and consequently do not impact streams or fish habitat. Therefore there will be no further effects discussion regarding the impacts of past trail construction on the aquatics resource.
- **Scenery:** Because trails are not very wide and must be built to fit the terrain, they do not create artificial lines on the landscape and cannot be seen from any sensitive viewing points. Therefore there will be no further effects discussion regarding the impacts of past trail construction on the scenic resource.

Past Road Decommissioning

Nearly 43 miles of roads have been decommissioned within the aquatics analysis area. These activities have taken place to reduce effects of roads to streams and to increase grizzly bear security.

Potential Significant Effects

- **Wildlife:** Road decommissioning has increased the amount of core habitat and decreased the amount of total road density in the Kalispell Granite and Lakeshore BMUs.
- **Aquatics (Hydrology and Fish):** Road decommissioning has reduced the amount of sediment delivery into nearby streams and improvement fish passages.
- **Noxious Weeds:** Road decommissioning activities are ground disturbing and have changed noxious weed populations along the road prisms the activities have taken place on. Generally, equipment is washed prior to beginning work and exposed soils are seeded with desirable mixes, which decreases plant populations. However, some areas have been re-invaded and treatment with herbicides is not an option now due to limited access.
- **Scenery:** Road decommissioning has restored the form, line, color and texture in areas where roads could be seen from sensitive viewing areas.
- **Rare or Sensitive Plants:** Road decommissioning has begun the process of recovery and may eventually restore rare or sensitive habitat impacted by past road construction, allowing plants to re-populate affected areas.

Non Significant Effects

- **Fire and Fuels:** Although, road decommissioning has limited fire suppression access into some areas, fire suppression efforts have been successful within the project area. In addition, road decommissioning activities have not significantly manipulated the fuel loading within the project area. Therefore, there will be no further effects discussion regarding the impacts of past road decommissioning on fire and fuels.
- **Forest Vegetation/Insect and Disease:** Although, road decommissioning has begun the process of recovery and has restored some productive land to the total forest land base, this has amounted to less than half a percent increase and is not a significant change to the forest composition and structure within the project area. Therefore, there will be no further effects discussion regarding the impacts of past road decommissioning on forest vegetation and insects and disease.

- **Soils:** Although, road decommissioning activities have begun the process of soil restoration of affected sites, these roads are outside the activity area for the proposed action. Therefore, there will be no further effects discussion regarding the impacts of past road decommissioning on soils.

Aquatic Restoration Activities

In June of 2002, an easement for the restoration of Bismark Meadows was finalized and in July 2004, the Bismark Wetlands Restoration Project (WRP) was implemented. The project included the removal of ditch structures to restore natural wetland hydrology within the meadows. Approximately 25,000 linear feet of ditches were filled, 75 (50 feet long compacted) ditch plugs were installed, 3 shallow water areas for wildlife were created and four log drop structures were installed in Reeder Creek. Previously surveyed rare or sensitive plant locations were avoided. All disturbed soil areas were herbicide sprayed in preparation for a dormant seeding of native plants in November of 2004. In summer of 2005, blue bird/swallow and bat houses were installed, one additional log drop structure was constructed in Reeder Creek, and weed control measures were applied on the newly seeded areas.

Along with the aquatic restoration activities, the Vital Ground Foundation has been actively trying to purchase the easement land and additional land around the meadow with the primary objective of protecting grizzly bear habitat. In April of 2005 they purchased an 18 acre property along Highway. 57. Nine acres of this property is in the WRP easement.

Potential Significant Effects

- **Aquatics (Hydrology and Fish):** These activities have improved fish habitat and hydrological conditions in Reeder Creek.
- **Wildlife:** With the purchase of the Bismark Meadows easement and additional land purchased by Vital Ground Foundation, grizzly bear security has increased.
- **Fire and Fuels:** With the conversion of this meadow from an active hay field to a functioning wetland meadow complex, the fuel composition and loading has changed, especially during the active fire season for this area.

Non Significant Effects

- **Soils:** This project is outside any potential treatment areas. Therefore, there will be no further discussion regarding the effects of aquatic restoration activities on the soils resource.
- **Forest Vegetation/Insect and Disease:** This project occurred in a grassland meadow and did not change the composition, structure or insect and disease risk to any forest stand. Therefore, there will be no further discussion regarding the effects of aquatic restoration activities on forest vegetation and insects and disease pathogens.
- **Scenery:** This project did not change vegetation type of this meadow; it is still a grassland meadow. Although the agricultural operations stopped, those operations could not be viewed from any sensitive view point so the scenic quality of the area did not change. Therefore, there will be no further discussion regarding the effects of aquatic restoration activities on the scenic resource.
- **Rare or Sensitive Plants:** This project avoided impacts to all surveyed rare or sensitive plant locations. In addition, restoring natural wetland hydrology to the meadows will likely have long-term benefits to rare plant populations Therefore, there will be no further discussion regarding the effects of aquatic restoration activities on rare or sensitive plants.

- **Noxious Weeds:** The restoration of natural vegetation and treatment of noxious weeds in the meadow has reduced some of the risk of weed spread to areas outside the meadow. However, the project has not had a significant effect on noxious weed spread in the overall project area because this area is not a major travel corridor and the spread of noxious weeds from the meadow is low to begin with. Therefore, there will be no further discussion regarding the effects of aquatic restoration activities on noxious weeds.

Woody Debris Removal in Streams

In association with historic harvesting practices that used streams to transport logs and stream cleaning practices of the 1970's and 1980's, much of the coarse wood component of Kalispell, Reeder and lower Granite Creeks was removed.

Potential Significant Effects

- **Aquatics (Hydrology and Fish):** Removal of the coarse wood components of these streams has affected the way sediment is deposited and has reduced fish habitat.

Non Significant Effects

- **Soils, Fire and Fuels, Forest Vegetation/Insect and Disease, Wildlife, Noxious Weeds, Scenery, and Rare or Sensitive Plants:** Removal of the coarse wood components of these streams has not affected any of these resources because this activity was focused within the actual stream channels and did not include ground or forest vegetation outside that. Therefore there will be no further effects discussion regarding the impacts of woody debris removal in streams on these resources.

Non-Native Fish Introductions

Around the 20s and 30s, settlers began stocking lakes and streams in the Priest Lake basin with non-native fish such as perch, bass, lake trout and brook trout. These non-native species have been able to successfully compete with native species and even dominate some systems.

Potential Significant Effects

- **Aquatics (Hydrology and Fish):** Non-native fish introductions have significantly impacted native fish habitat. Brook trout have taken over native cutthroat and bull trout habitat in many streams. Lake trout, perch, bass and other spiny ray species have out competed cutthroat and bull trout in Priest Lake.

Non Significant Effects

- **Soils, Fire and Fuels, Forest Vegetation/Insect and Disease, Wildlife, Noxious Weeds, Scenery, and Rare or Sensitive Plants:** Non-native fish introductions have not affected any of these resources because this activity was focused within the actual water bodies and did not include ground or forest vegetation outside that. Therefore there will be no further effects discussion regarding the impacts of non-native fish introductions on these resources.

Motor Vehicle, ATV, and Snowmobile use on Designated Routes and Areas

The majority of designated routes are multi-user roads that were originally built for land management purposes rather than recreation. However, a few trails have been specifically designated or built for motorized use in the summer and snowmobile use in the winter.

Potential Significant Effects

- **Aquatics (Hydrology and Fish):** Motor vehicle use on roads and trails has caused some sediment input in to streams, which has affected fish habitat.
- **Noxious Weeds:** Motor vehicle use on roads and trails is one of the primary mechanisms for spread of noxious weeds to new areas.
- **Wildlife:** Motorized vehicle use on designated roads and trails has affected wildlife populations to some degree by either causing displacement of animals or habituation to the disturbance. Each effect may have been positive or negative depending on the species and habitat requirements.

Non Significant Effects

- **Fire and Fuels:** Although, the activities that focus around roads and trails may have caused some human initiated fire starts, there has been no human caused fires large enough to significantly manipulate the fuel loading within the project area to date. Therefore there will be no further effects discussion regarding the impacts of past motorized vehicle use on these resources.
- **Soils, Forest Vegetation/Insect and Disease, Scenery, and Rare or Sensitive Plants:** Use of designated routes does not further affect these resources beyond what the original route construction did. Therefore there will be no further effects discussion regarding the impacts of past motorized vehicle use on these resources.

Motor Vehicle use off Designated Routes

Motorized vehicle use in the form of ATVs and motorcycles has occurred mainly on the 2516 road, north side of Nickelplate Mountain and south and east sides of Copper Mountain. Users have essentially developed trails systems in these areas that were not part of the designated route system.

Potential Significant Effects

- **Aquatics (Hydrology and Fish):** Motor vehicle use on user created trails has caused some sediment input in to streams, which has affected fish habitat.
- **Noxious Weeds:** Motor vehicle use off of designated trails is a major factor in the spread of noxious weeds to new areas.
- **Wildlife:** Motorized vehicle use on user created trails has added to the displacement of animals and has affected wildlife populations to some degree.
- **Soils:** Construction and continued use of user created trails within treatment units has created some detrimental compaction and slowed recovery.
- **Rare or Sensitive Plants:** Construction of user created trails may have impacted some rare or sensitive plant populations and habitat because this activity is not regulated
- **Scenery:** Motorized vehicle use off designated routes has not tended to follow natural slope contours creating artificial lines and noticeable scars in some areas. This has disrupted the scenic quality and character of the landscape.

Non Significant Effects

- **Fire and Fuels:** Although, the activities that focus around these user created trails may have caused some human initiated fire starts, there has been no human caused fires large enough to significantly manipulate the fuel loading within the project area to date. Therefore there will be

no further effects discussion regarding the impacts of past motorized vehicle use off designated routes on fire and fuels.

- **Forest Vegetation/Insect and Disease:** Because trails are not very wide, 2 to 4 feet generally, they encompass only a very small percentage of the total forest land within the project area and have not had a significant effect on forest vegetation or insect and disease activity. Therefore there will be no further effects discussion regarding the impacts of past motorized vehicle use off designated routes on forest vegetation and insect and disease risk.

Residential Development

Residential development in the project area began around 1890 and has continued sporadically since. Most growth has occurred historically in the Nordman, lower Granite Creek (Reeder Mountain to Priest Lake), and Reeder Bay areas within the project area with some rural home sites along county roads that follow Kalispell and Reeder Creeks.

Potential Significant Effects

- **Aquatics (Hydrology and Fish):** Residential development has changed the hydrology in some areas of all three sub-watersheds, which has had an effect on fish habitat.
- **Noxious Weeds:** Residential development has lead to the introduction and spread of some noxious weed species. Additionally, noxious weeds are not treated to the same degree as weeds on NFS lands, which may have exacerbated the problem.
- **Wildlife:** Residential development and activities associated with peoples style of living has added to the displacement of animals and may have caused habituation to some activities, which is a problem especially for grizzly bears.
- **Fire and Fuels:** The activities associated with development of lands within the project area has changed fuel conditions and increased the number of types of values at risk creating a complicated wildland-urban interface environment.
- **Forest Vegetation/Insect and Disease:** Residential development has changed the structure and composition of forest vegetation within the project area and decreased the amount of productive forest land.
- **Scenery:** Residential development has introduced unnatural form, line, color, and texture to the landscape, which has had an effect on the scenic quality and character of the area.
- **Rare or Sensitive Plants:** Residential development may have affected some rare or sensitive plant habitat due to the lack of protections.

Non Significant Effects

- **Soils:** Residential development has occurred outside any of the proposed treatment areas. Therefore, there will be no further discussion regarding the effects of residential development on the soils resource.

Hunting

Hunting is a poplar activity within the project area, especially in the spring and fall seasons. Seasons and take regulations are governed by the State Fish and Game office.

Potential Significant Effects

- **Wildlife:** Spring black bear season coincides with the post-den emergence period for grizzly bears. Some grizzly bear deaths have been attributed to hunters mis-identifying them as black bears.

Non Significant Effects

- **Soils:** Hunting is not a ground disturbing activity. Therefore, there will be no further discussion regarding the effects of hunting on the soils resource.
- **Rare or Sensitive Plants:** Because hunting is not a ground-disturbing activity, any effects of hunters on rare or sensitive plants would likely be incidental and could not be differentiated from the effects of other general forest users. Therefore, there will be no further discussion regarding the effects of hunting on rare or sensitive plants.
- **Noxious Weeds:** The effects of hunters on noxious weed spread cannot be differentiated from the effects of other general forest users. Therefore, cumulative effects discussion for noxious weeds will include hunters in a general discussion of other forest users.
- **Aquatics (Hydrology and Fish):** Hunting has not changed the hydrology of any of the sub-watersheds and is not an in-stream activity that may have affected fish habitat. Therefore, there will be no further discussion regarding the effects of hunting on the aquatics resource.
- **Fire and Fuels and Forest Vegetation/Insect and Disease:** Hunting does not change the vegetation structure and composition or fuel conditions within the project area. Therefore, there will be no further discussion regarding the effects of hunting on fire and fuels or forest vegetation and insect and disease risk.
- **Scenery:** Hunting does not change form, line, color, and texture of the landscape or the scenic quality and character of the area. Therefore, there will be no further discussion regarding the effects of hunting on scenery.

Effects of Non Significant Past, Ongoing and Reasonably Foreseeable Activities

This section describes the location, timing and scope of each non significant past activity with a brief, concise rationale explaining why each activity has not had a significant effect on any resource. Therefore, a more detailed cumulative effects analysis is not necessary.

Because of the short duration or occurrence in the distant past none of the past activities have had a lasting effect on Air Quality and this resource concern is not addressed here.

Mass Failures and Washouts

In the spring of 2002, a mass failure occurred on the 1347 road and in late winter or early spring of 2007 part of the abutment failed on the Beaver Creek Bridge. Sediment was deposited into Beaver Creek and a face drainage in Distillery Bay.

- **Soils, Fire and Fuels, Forest Vegetation/Insect and Disease, Noxious Weeds, Scenery, and Rare or Sensitive Plants, Aquatics (Hydrology and Fish):** These failures have occurred in areas outside of the cumulative effects area for these resources. Therefore there will be no further effects discussion regarding the impacts of mass failures and washouts on these resources.

- **Wildlife:** These failures have not impacted any vegetation characteristics or wildlife habitat of any species of concern. Therefore there will be no further effects discussion regarding the impacts of mass failures and washouts on wildlife.

Fish Improvement Structures

In 2006, zone fish biologists used chainsaw and hand winches to place large logs in Blacktail Creek in a few key locations. Chainsaws were used to fell trees and hand winches were used to elevate and place logs across the creek to create cover structure. This operation was limited in scope in that only eight areas were selected to place logs and only four to five logs were placed in each location. However, this project does serve as a building block for future habitat improvements in Blacktail Creek and as a model for future projects in other watersheds. At this time, there are no ongoing or reasonably foreseeable fish habitat improvement projects.

- **Forest Vegetation/Insect and Disease, Wildlife, Fire and Fuels, and Scenery:** Because of its limited scope, creating the fish habitat structures did not change the vegetative composition or structure in the stands this activity took place in and therefore, did not affect any resources dependent on these vegetative parameters.
- **Aquatics (Hydrology and Fish):** Because of its limited scope this project did not affect stream side shading, in-stream temperatures, sediment input, or water yield, and did not create a enough structure to significantly improve fish habitat within the Blacktail Creek drainage or larger Granite Creek watershed.
- **Noxious Weeds:** This activity caused only minor ground disturbance and did not involve the use of equipment that could transport noxious weed seed.
- **Soils and Rare or Sensitive Plants:** This activity occurred outside any of the proposed treatment areas and did not occur on any rare or sensitive plant locations.

Defensible Space Projects

BONFire is a program of the Bonner County Office of Emergency Management based on proactively managing for wild fire before it endangers a structure. It is funded by grants from state and federal government using National Fire Plan appropriations. Its purpose is to increase awareness of the risk of wildfire in the wildland urban interface areas of Bonner County and to educate individuals on the steps they can take to protect their homes and businesses from wildfires. This program provides a one-time service to qualified participants to reduce dangerous fuels from approximately 100 feet around structures creating a survivable or defensible space. Participants are also provided with information on the things they can do, in addition to fuel reduction, to protect their structures and property from wildfires now and in the future. Unfortunately, only a handful of homes and business within the project area have taken part in this program so far and participation is not expected to increase significantly to a point at which predicted effects would increase over currently observed effects discussed below.

- **Forest Vegetation/Insect and Disease and Wildlife:** Because of their limited scope and application (only a hundred feet around a handful of structures within the project area), these defensible space projects did not significantly change the vegetative composition or structure in the stands these activities took place in and therefore, did not affect any resources dependent on these vegetative parameters.
- **Aquatics (Hydrology and Fish):** Because of their limited scope and application and because these activities did not occur near streams, these projects did not affect stream side shading, in-stream temperatures, sediment input, water yield or fish habitat.

- **Fire and Fuels:** Although limited, these activities have increased the survivability of the individual structures they treated but these treatments would not affect the overall rate of spread or intensity of a large fire occurring within the project area.
- **Scenery:** These activities did change the appearance of forested areas around the homes they treated but did not affect the character or scenic quality of the landscape due the limited scope and application.
- **Noxious Weeds:** Although, these activities caused some ground disturbance from burning slash piles and exposing mineral soil they did not occur on a large enough scale and did not involve the use of equipment that could transport noxious weed seed to significantly affect noxious weed spread within the project area.
- **Soils and Rare or Sensitive Plants:** Although, these activities may have impacted some sensitive or rare plants and/or habitat, the scope of the activities was limited and would not contribute measurable cumulative effects.
- **Soils:** These activities occurred outside the cumulative effects area for the soils resource.

Blister Rust Control

Blister Rust Control (BRC) was an attempt made by the Forest Service to fight the spread of blister rust by eliminating the *Ribes* host plants through different cultural applications. The table below depicts the history of white pine blister rust control, especially as it pertains to Northern Idaho.

Table B-7. History of Blister Rust Control (FS-355, 1981; PF-CE-08).

Year	Activity
1898	Scattered sightings of blister rust on the east coast
1909	Blister rust discovered in New York state on young white pine from Germany, started the alarm of "Danger Ahead". Blister rust was introduced because the forests were rapidly disappearing in the US and there was a need for imported stock.
About 1916	Office of Blister Rust Control started
1921	Blister rust found near Vancouver, B.C. marking the beginning of the western devastation.
1923	Start of experimental *Ribes* eradication at the Northern Forest Experiment Station
1924	Expanded to Upper Priest River on the Kaniksu
1926	The experiment shifted to the Binarch and Lamb Creek drainage areas. Fire destroyed much of the pine in the control unit and the BRC personnel were fire fighters most of the summer.
1933-1941	Emergency Program Years, end of the Experimental Era. There was a big push in Northern Idaho, which made use of the CCC work force. 40 camps of 200 each were assigned to BRC but not all the camps were on the Kaniksu.
1941-1965	Post-Emergency Program. WWII slowed the program to a halt. 1941 was "wave year" for blister rust and infection spread long distances.
1967	Blister rust control in the Northern Rocky Mountains Region officially came to an end.

- **Forest Vegetation/Insect and Disease and Wildlife:** Control measures may have worked in some areas of the forest where pure white pine stands remain today. However, within the project area blister rust infection has spread seemingly unchecked. The efforts of the BRC crews did not significantly change the vegetative composition or structure in the stands these activities took place in and therefore, did not affect any resources dependent on these vegetative parameters.
- **Aquatics (Hydrology and Fish):** These activities included hand pulling of *Ribes* plants and some herbicide treatments. These activities did not remove vegetation that contributed to stream side shade, created sediment input, increased water yield or removed fish habitat.
- **Fire and Fuels:** These activities did not remove enough material from stands to have a lasting effect on fuel loading or fire spread and whatever vegetation was removed has recovered in the last 40 years.
- **Scenery:** These activities only removed the *Ribes* plants, which did not change the appearance of forested areas and did not affect the character or scenic quality of the landscape due the limited scope and application.
- **Noxious Weeds:** These activities did not cause any ground disturbance, did not expose mineral soil, and did not involve the use of equipment that could transport noxious weed seed.

- **Soils and Rare or Sensitive Plants:** These activities only removed the *Ribes* plants and did not involve ground disturbing activities.

Small Wildfires

Good fire record keeping began in 1940. Between 1940 and 2006 there were 131 small fires less than 0.25 acres (19.65 acres total) and 12 fires over 0.25 acres for a total of 16.80 acres. These fires were surface burning in nature and altogether make up less than a tenth of a percent of the project area. Because of the nature of these fires and the very small amount of area burned in comparison with the project area, these fires did not have a significant effect on any resource. They did not change the vegetative composition and structure within the project area and did not affect any resource dependent on these vegetative parameters; they did not affect streamside shading, water yield or sediment delivery; they did not create a significant change in fuel loading; their effects remain subordinate and unnoticeable on the landscape; they did not disturb a significant amount of ground to noticeably contribute to noxious weed spread; and these fires did not occur within any treatment unit or on any known sensitive or rare plant habitat. Future small fires are expected to have similar non-significant effects.

Mining

Historic mining began around 1890 within the project area, with the majority of activity occurring on Nickelplate and Copper Mountains and along the shoreline between Distillery Bay and Granite Creek. These projects were not large mining operations. Only a dozen mines consisting of a shaft and a waste rock pile less than quarter acre in size have been located today. Some shafts have caved in over time and most of the remaining open shafts have been secured with bat friendly closure devices. Because these mining operations were small, they have had no lasting effects on any resource. These mining areas have since re-vegetated, waste rock piles have stabilized and activities were not large enough disturbances to affect the long-term hydrologic function of any watershed or the overall vegetation composition and structure and fuel conditions within the project area. Although, some shafts do provide habitat for bats, this is not considered to be a significant amount of additional habitat due to the small number of open shafts. The mining activities have remained subordinate within the much of the landscape except for one area on Nickelplate Mountain, which can be seen when traveling north on Highway 57 around Bismark Meadows. This, however, is only a change in color amongst the rock outcrops from dark to light brown and in not noticeable to the casual forest visitor. No noxious weed infestations or sensitive or rare plants are known to occur in any of these mining sites. None of these mines occur within a proposed treatment unit and are therefore, outside the cumulative effects area for the soils resource.

Associated with the mining activity are multitudes of prospect pits that can be found throughout the project area. These prospect pits consist of shallow diggings not more than a few feet across and a few feet deep that prospectors used to determine what type of rock was in a particular area, which provided clues to what kinds of metals might be under the surface. These pits are even smaller than the mining sites and for the same reasons as with the mining activity these pits have had no lasting effects on any resource, even soils. Although, these pits can be considered as detrimental soil displacement, their small size and limited number per treatment unit constitute much less than one percent of a given treatment area. This is not significant.

There are no ongoing or reasonably foreseeable mining activities in the future.

County Road Maintenance and Forest Service Road and Trail Maintenance

Road maintenance activities include brushing, blading, spot surfacing and removal of blowdown. These activities are limited to the road right-of-way and do not, 1) manipulate forest vegetation or fuel conditions, 2) change the scenic character of the road, 3) impact soils outside the road prism, 4) impact rare or sensitive plant sites, 5) spread noxious weeds beyond existing infestations (equipment is washed

and inspected prior to beginning work), or 6) have a lasting effect on wildlife population movements because of the short duration of activity. These activities have occurred on each main Forest Service road at one time or another. Bonner County is responsible for maintenance of the lower portions of the Kalispell Creek road 308 and the Reeder Creek road 2231.

Road maintenance activities have generated some localized improvements to water quality, however, these effects are very minor and do not provide a significant reduction when added to other sediment reduction and road management activities. For example, the activities planned with this project for the Granite Creek drainage are expected to produce observable effects and would do so regardless if this road work had occurred or not. This project plans to repair the Fedar Creek crossing on the 1347 road, which is the major source of sediment input into Fedar Creek. The predicted sediment reduction from this activity would be the same regardless if the road maintenance activities had occurred or not because the past activities had such minor effects to begin with. In other words, the minor effects past activities are not cumulatively significant when added to the predicted effects of proposed activities.

Trail maintenance activities include bucking fallen trees off the trail, repairing trail tread, spot brushing, and drainage improvements. These activities are limited to the trail prism and do not 1) manipulate forest vegetation or fuel conditions, 2) change the scenic character of the trail, 3) impact soils outside the trail prism, 4) impact rare or sensitive plant sites, 5) spread noxious weeds beyond existing infestations, 6) have a lasting effect on wildlife population movements because of the short duration of activity, or 7) reroute significant volumes of sediment or water flow and consequently do not impact streams or fish habitat.

Fishing and Recreational Uses

With a limited amount of fishable water and sizeable fish to catch, fishing is a very minor activity within the project area, occurring in the late spring, summer and early fall seasons. Effects have not been observable. Seasons and take regulations are governed by State Fish and Game offices and harvesting any threatened or endangered fish is prohibited.

Campgrounds and dispersed recreational sites are popular places in every season, especially weekends during the summer, except winter. These activities, however, have not had observable effects to other resources because they are concentrated in dedicated areas that are not part of the productive forest land base. This is not expected to change. Activities that are many times associated with recreational use such as off-road vehicles or hunting are analyzed separately.

Special Forest Products

Special forest products include mushroom and berry picking and Christmas tree and firewood cutting. These activities are very small scale extractions and have had no observable effects on any other resource and are not expected to increase for any reason. For example, firewood cutting is generally concentrated near roads (within 100 feet) and only cuts dead trees. Trees in the general forest that provide snag habitat or shading for streams are not affected. Christmas tree cutting is a permitted practice with special restrictions protecting trees near streams that may provide future shade or trees that are of high quality form that may contribute good genetic traits to future seedlings. Mushroom and berry picking are highly dependent on crop production for each given year. When supply is plentiful, picking is high and when supply is scarce, picking is low. This relationship tends to balance competition with wildlife and maintains demand at relatively the same level.

Foreseeable Timber Stand Improvements

Timber stand improvement (TSI) refers to activities such as weed and release, pruning, and pre-commercial thinning, which improve the growth and vigor of a stand by reducing inferior characteristics and reallocating resources. These activities are minor in terms of ground disturbance but produce positive

results in tree growth and disease resistance. Currently, 96 acres are planned for pre-commercial thinning in the Distillery Bay area.

- **Wildlife:** Planned activities would treat only a very small percentage of the available habitat for any given species and any effect would not be observable. Therefore, there will be no further effects discussion regarding the impacts of TSI activities on wildlife.
- **Aquatics (Hydrology and Fish):** Planned activities would treat only a very small percentage of the drainage and any effect would not be observable. Therefore, there will be no further effects discussion regarding the impacts of TSI activities on aquatics.
- **Soils, Forest Vegetation/Insect and Disease and Fire and Fuels:** Planned activities would be outside the cumulative effects area for these resources. Therefore, there will be no further effects discussion regarding the impacts of TSI activities on these resources.
- **Scenery:** Planned activities would take place in areas that would not be seen from any sensitive view points. Therefore, there will be no further effects discussion regarding the impacts of TSI activities on scenery.
- **Noxious Weeds:** TSI activities are not activities that significantly contribute to the spread of noxious weeds. Foot traffic along with movements of animals may spread some seed within past treatment units but the magnitude of noxious weed dispersal is far less from these activities than from ground based harvesting and vehicle traffic. Therefore, there will be no further effects discussion regarding the impacts of TSI activities on noxious weeds.
- **Rare or Sensitive Plants:** TSI activities are not ground disturbing and, therefore, would not cumulatively impact rare or sensitive plant habitat. The activities associated with harvesting and site preparation, which come before any TSI work are the actions that may impact plant habitat. These activities are discussed in the above sections. Therefore, there will be no further discussion regarding the impacts of TSI activities on rare or sensitive plants.

Effects of Potentially Significant Ongoing and Reasonably Foreseeable Activities

This section describes the location, timing, scope, and potential effects of each potentially significant ongoing and reasonably foreseeable activity. It is important to note, however, that these activities may not significantly affect all resources.

For those resources that may be significantly affected only a brief examination of potential effects is disclosed here, but a detailed analysis is provided in the EIS, individual resource reports and the project files. Conversely, for those resources that will not be significantly affected, a brief, concise rationale explaining why a given activity will not have significant effects and a detailed analysis is not necessary, is discussed here.

Large Wildfire

Even with the implementation of the proposed action, large wildfires still have a chance of igniting in or burning across the project area. Treatments are proposed in only 13 percent of the project area and are aimed at reducing the risk to the foremost values. Potential effects would be less in treated areas than in untreated areas.

Potential Significant Effects

- **Forest Vegetation/Insect and Disease:** A large wildfire would reshape forest species composition and structure, which would affect future insect and disease risk.

- **Soils:** A large wildfire would change soil respiration and decomposition rates, nutrient cycling, organic matter depth, and physical soil characteristics.
- **Wildlife:** Wildlife populations would occupy different areas as habitat conditions would change.
- **Fire and Fuels:** Fuel loadings in the project area would decrease in burned areas while the arrangement of fuels within the project area would change.
- **Rare or Sensitive Plants:** A large wildfire could directly impact rare plant populations and/or reduce habitat suitability, at least temporarily.
- **Aquatics (Hydrology and Fish):** A large wildfire would create an influx of nutrients, sediment, and woody debris into the streams. Short-term effects can be detrimental but over the long-term fires can rejuvenate streams.
- **Scenery:** A large wildfire would create large open areas devoid of most forest vegetation with smaller treed areas and snags scattered across the landscape. Over time, as re-growth would establish and develop, these openings would be converted into uniform forested stands.
- **Noxious Weeds:** A large wildfire may significantly affect noxious weed populations because large areas of soil and/or vegetation disturbance would be conducive to weed introduction and spread.

Fire Suppression

Fire suppression policies are expected to continue as they have in recent years. For the project area, which is almost entirely within the wildland urban interface (WUI), that means total suppression of natural or human-caused fires.

Potential Significant Effects

- **Forest Vegetation/Insect and Disease:** In the absence of low and mixed-severity wildfires that have a thinning effect, young stands of shade-intolerant species would continue to be lost to competition. This change in composition to shade-tolerant species would make stands more susceptible to root diseases, defoliating insects, bark beetles and stand-replacing wildfires.
- **Soils:** The absence of fire, would affect soil respiration and decomposition rates, nutrient cycling, organic matter depth, and physical soil characteristics. Direct effects as a result of fire suppression efforts include trenching and mixing of the soil layers and aerial retardant may affect the short term soil nutrient status.
- **Wildlife:** The effects of fire suppression would vary according to species. Species that tolerate or thrive in mid-to late succession forests would be favored as forest stands develop. Openings and snags created from fires that some species require would continue to be lacking. Fire suppression activities may cause short term displacement of some animals.
- **Fire and Fuels:** The absence of disturbance from fires would influence existing fuel loading and arrangement and subsequent fire hazard to the extent that suppression of wildfire influences vegetation development.
- **Rare or Sensitive Plants:** The absence of disturbance from fires may indirectly impact suitable habitat for some rare plant species. Furthermore, continued fire suppression when combined with either No Action or an action alternative may have different indirect and cumulative effects on the potential for future large, stand-replacing fires that would affect rare plant populations and/or suitable habitat.

- **Noxious Weeds:** Fire suppression activities may affect noxious weed spread to some degree because of the use of roads, opening of impassable roads, and movements of firefighters. Furthermore, continued fire suppression when combined with either No Action or an action alternative may have different indirect and cumulative effects on the potential for future large, stand-replacing fires that would be conducive to weed introduction and spread.

Non Significant Effects

- **Aquatics (Hydrology and Fish):** In the absence of large wildfires as a result of fire suppression efforts, the influx of nutrients, sediment, and woody debris into the streams which detrimentally impact water quality and fish habitat for a short time would not occur. Fire suppression tactics utilizing aerial retardant near streams, temporary stream crossings, or streams as control barriers may impact water quality. However, these impacts tend to be localized, occur in short duration pulses, can no longer be detected after a short time. Therefore, there will be no further effects discussion regarding the impacts of fire suppression on the aquatics resource.
- **Scenery:** Fire suppression activities would not produce any physical changes on the landscape and subsequently would not have a significant effect on the scenic quality or character of the landscape. Therefore, there will be no further effects discussion regarding the impacts of fire suppression on scenery.

Timber Harvests on Private Lands

Stimson Lumber Company has logging planned in T61N R5W Sections 25 and 35 in 2008 (Warden Pers. Comm., 2007; PF-CE-09) within the project area. Stimson owns nearly 1,920 acres across three sections within the Kalispell Watershed. Of this, the company plans to harvest 961 acres between 2008 and 2012 (PF-CE-10). The type of cutting would be:

- 35% partial cut with 50% BA removal
- 0% selective cut with 60% BA removal
- 15% overstory removal with 70% BA removal
- 9% shelterwood cut with 85% BA removal
- 41% seedtree/clearcut with 95% BA removal

Potential Significant Effects

- **Forest Vegetation/Insect and Disease:** Harvests on private lands generally result in a trend toward shade-tolerant species compositions and structure. This would affect the overall species composition and structure and subsequent insect and disease risk within the project area.
- **Wildlife:** Harvests on private lands manipulate vegetation composition and structure would affect some habitat requirements of various wildlife species.
- **Fire and Fuels:** Slash treatments following harvests on private lands vary by landowner and resulting fuel loading and arrangement and stand structure may affect ignition risk and fire growth.
- **Aquatics (Hydrology and Fish):** Harvests on private land have the potential to affect hillslope hydrology and could result in sediment reaching streams.
- **Scenery:** Harvests on private land may affect the scenic quality and character of the landscape.

- **Noxious Weeds:** Harvests on private lands are ground disturbing activities and may create sources for noxious weed establishment and dispersal.
- **Rare or Sensitive Plants:** Harvests on private land may affect rare or sensitive plant habitat or populations due to lack of protections.

Non Significant Effects

- **Soils:** There would be no direct, indirect or cumulative effects to soil productivity within proposed treatment units as a result of harvest on private land. Therefore, there will be no further effects discussion regarding the impact of timber harvests on private land on the soils productivity.

Insect and Disease Activity

Blister rust (discussed previous sections) will continue to reduce the amount of western white pine in stands allowing more western hemlock, western red cedar and grand fir to dominate. Several different root disease pathogens along with fir engraver and Douglas-fir beetles will continue to reduce the amount of mature and immature grand fir and Douglas-fir within the project area. Mountain and western pine beetles will continue to reduce the amount of lodgepole and ponderosa pine within the project area.

Potential Significant Effects

- **Forest Vegetation/Insect and Disease:** Insects and disease pathogens will cause shifts in the existing species composition and structure throughout the project area.
- **Wildlife:** The amount of currently capable and suitable habitat for a given species will be affected to some degree by the effects that insects and diseases have on forest vegetation type, which is a key habitat component.
- **Fire and Fuels:** Insects and disease pathogens will affect the level of mortality and consequently, the existing fuel loading and fuel hazard.
- **Soils:** Insect and disease activity will affect the amount of downed wood in stands, which will affect the long-term nutrient status of a given site.
- **Scenery:** Larger insect and diseases outbreaks may affect the scenic quality and character of the landscape.

Non Significant Effects

- **Aquatics (Hydrology and Fish):** The mortality caused by insects and disease pathogens would not significantly affect riparian areas. These sites tend to be the most productive and though insect and disease activity would be observable the percentage of mortality would be low in comparison to the larger riparian stand. Therefore, there will be no further discussion regarding the effects of insects and diseases on the aquatics resource.
- **Noxious Weeds:** Insect and disease activity would not affect the dispersal of seed or create any ground disturbance that would provide for noxious weed establishment. Therefore, there will be no further effects discussion regarding the impacts of insects and disease on noxious weeds.
- **Rare or Sensitive Plants:** Insect and disease activity is not ground disturbing and no rare or sensitive plants are hosts to any species of insect or disease affecting forest vegetation. Therefore, there will be no further discussion regarding the impacts of insects and diseases on rare or sensitive plants.

Noxious Weed Treatments

Ongoing and foreseeable noxious weed treatments not associated with the project would include herbicide application and release of biological control agents. Specifically, treatments would focus on the 1347 Media and 1340 Fedar Creek roads; roads in Kalispell, Indian, and Athol Creek Drainages (308 and 1362); spot treatment on the 1341 road; Lakeshore and Lakeview Mountain trailheads; 1355 Hazard Creek road on the loop to the administrative site and old ski run; 302 road to Pass Creek Pass; 313 Bismark road and Bismark Gravel Pit; Priest Lake Ranger District residences; 638 Tango Creek road; the airstrip; 2512 road; Hanna Flats road; 502 New Hazard road; Kalispell Bay road; Old Kalispell sewage lagoon and white pine tree improvement plantation and associated roads; 365 trail; and the 2245 Copper Mountain road. Past treatments have had positive results in reducing the amount of noxious weeds, especially in areas that have been treated multiple times, and have allowed native or desirable vegetation (mostly grasses) to out compete the noxious weeds.

Potential Significant Effects

- **Noxious Weeds:** Noxious weed treatments, although not encompassing a large percentage of the project area, would have beneficial effects in the areas that have been treated. Future weed treatment activities may be influenced by the activities proposed in this project.

Non Significant Effects

- **Forest Vegetation/Insect and Disease:** Because the treatments would be limited to developed sites that are not part of the forest land base, noxious weed treatments would not have an affect on the existing species composition, structure and insect and disease risk within the project area. Therefore there will be no further effects discussion regarding the impacts of noxious weed treatments on forest vegetation/insect and disease.
- **Fire and Fuels:** Noxious weed treatments would not occur in the general forest and would not affect forest vegetation, fuel hazard or fire risk. Therefore there will be no further effects discussion regarding the impacts of noxious weed treatments on fire and fuels.
- **Soils:** Because noxious weed treatments would not occur within any proposed treatment unit but are confined to the road or trail prism, there would be no effect to the existing condition of the soil resource. Therefore there will be no further effects discussion regarding the impacts of noxious weed treatments on soils.
- **Scenery:** In some areas, the effects of noxious weed treatments would be positive and improve the scenic quality. However, treatments would have no observable effect to the overall character of the landscape. Therefore there will be no further effects discussion regarding the impacts of noxious weed treatments on the scenic resource.
- **Wildlife, Aquatics (Hydrology and Fish) and Rare or Sensitive Plants:** The effects of noxious weed treatment were analyzed in the Priest Lake Noxious Weed Control Project FEIS (USDA 1997). Therefore, there will be no further effects discussion regarding the impacts of noxious weed treatments on these resources.

Road Repair and Bridge Reconstruction

A washout on the 1347 Media Creek road is planned for repair in 2008 and the Beaver Creek Bridge is planned for reconstruction in 2008.

Although, planning and preliminary design work has not been completed for the Granite Creek Bridge replacement, the project is on the IPNF Capitol Improvement Program for 2010 if funding permits. Work would most likely involve the superstructure only and include new decking, rail system and running

plank. However, if footing scour is discovered, some in-stream work would occur including replacing posts and armoring on the mid-span pier.

Potential Significant Effects

- **Wildlife:** These activities may displace some species for a short period of time.
- **Noxious Weeds:** These activities are ground disturbing and may affect noxious weed establishment.
- **Aquatics (Hydrology and Fish) and Soils:** The 1347 road repair and the Beaver Creek Bridge reconstruction occur outside the cumulative effects area for these resources. Therefore, there will be no further effects discussion regarding the impacts of these activities. However, work on the mid-span pier on the Granite Creek Bridge may disturb some sediment and have a short-term affect on water quality and fish habitat in that part of Granite Creek. Work on the Granite Creek Bridge is outside the cumulative effects area for soils and will not be discussed any further regarding this resource.

Non Significant Effects

- **Forest Vegetation/Insect and Disease and Fire and Fuels:** These activities will not affect forest vegetation and therefore will not affect insect and disease or fire and fuels. There will be no further effects discussion regarding the impacts of road repair and bridge reconstruction on these resources.
- **Rare or Sensitive Plants:** These activities will not occur on any rare or sensitive plant populations or habitat. Therefore, there will be no further effects discussion regarding the impacts of road repair and bridge reconstruction on rare or sensitive plant populations or habitat.
- **Scenery:** These activities are repairing what is already a part of the landscape will not change the scenic quality or character of the landscape. Therefore, there will be no further effects discussion regarding the impacts of road repair and bridge reconstruction on scenery.

Road Decommissioning

Road decommissioning not associated with this project is planned for the Hungry Creek road 2119 and Deerhorn Meadows road 2120. These activities aim to reduce effects of roads to streams and to increase grizzly bear security.

Potential Significant Effects

- **Wildlife:** Road decommissioning would increase the amount of core habitat and decreased the amount of total road density in the Kalispell Granite BMU.
- **Aquatics (Hydrology and Fish):** Road decommissioning would reduce the amount of sediment delivery to nearby streams and remove fish passage barriers.
- **Soils:** Road decommissioning activities would begin the process of soil restoration and eventual recovery.
- **Noxious Weeds:** Road decommissioning activities are ground disturbing and may change noxious weed populations along the road prisms the activities would take place on. Weeds would be pretreated along road prisms, equipment would be washed prior to beginning work and exposed soils would be seeded with desirable mixes, which would decrease plant populations. However, some areas may be re-invaded and treatment with herbicides would not an option later due to limited access.

- **Scenery:** Road decommissioning would restore the form, line, color and texture in areas where roads can be seen from sensitive viewing areas.
- **Rare or Sensitive Plants:** Road decommissioning would begin the process of recovery and may eventually restore rare or sensitive habitat impacted by past road construction, allowing plants to re-populate affected areas.

Non Significant Effects

- **Fire and Fuels:** Although, road decommissioning would limit fire suppression access into some areas, fire suppression would probably remain successful within the project area. In addition, road decommissioning activities would not significantly manipulate the fuel loading within the project area. Therefore, there will be no further effects discussion regarding the impacts of past road decommissioning on fire and fuels.
- **Forest Vegetation/Insect and Disease:** Although, road decommissioning would begin the process of recovery and would restore some productive land to the total forest land base, this would amount to less than a quarter percent increase and would not be a significant change to the forest composition and structure within the project area. Therefore, there will be no further effects discussion regarding the impacts of past road decommissioning on forest vegetation and insects and disease.

Motor Vehicle, ATV, and Snowmobile use on Designated Routes and Areas

The majority of designated routes are multi-user roads that were originally built for land management purposes rather than recreation. However, a few trails have been specifically designated or built for motorized use in the summer and snowmobile use in the winter.

Potential Significant Effects

- **Aquatics (Hydrology and Fish):** Motor vehicle use on roads and trails would continue to cause some sediment input in to streams, which may affect fish habitat.
- **Noxious Weeds:** Motor vehicle use on roads and trails is one of the primary mechanisms for spread of noxious weeds to new areas.
- **Wildlife:** Motorized vehicle use on designated roads and trails may affect wildlife populations to some degree by either causing displacement of animals or habituation to the disturbance. Each effect may have been positive or negative depending on the species and habitat requirements.

Non Significant Effects

- **Fire and Fuels:** Although, the activities that focus around roads and trails may cause some human initiated fire starts, there is a very low probability that these fires would grow large enough to significantly manipulate the fuel loading within the project area. Therefore there will be no further effects discussion regarding the impacts of past motorized vehicle use on these resources.
- **Soils, Forest Vegetation/Insect and Disease, Scenery, and Rare or Sensitive Plants:** Use of designated routes would not further affect these resources beyond what the original route construction did. Therefore there will be no further effects discussion regarding the impacts of past motorized vehicle use on these resources.

Motor Vehicle use off Designated Routes

Motorized vehicle use in the form of ATVs and motorcycles may continue to occur mainly on the 2516 road, north side of Nickelplate Mountain and south and east sides of Copper Mountain. Users have essentially developed trails systems in these areas that were not part of the designated route system.

Potential Significant Effects

- **Aquatics (Hydrology and Fish):** Motor vehicle use on user created trails may cause some sediment input in to streams, which may affect fish habitat.
- **Noxious Weeds:** Motor vehicle use off of designated trails is a major factor in the spread of noxious weeds to new areas.
- **Wildlife:** Motorized vehicle use on user created trails would likely continue to displace animals and affect wildlife populations to some degree.
- **Soils:** Construction and continued use of user created trails within treatment units would create some additional detrimental compaction and slowed recovery.
- **Rare or Sensitive Plants:** Construction of user created trails may impact some rare or sensitive plant populations because this activity has no requirements to do otherwise.
- **Scenery:** Motorized vehicle use off designated routes most likely would not follow natural slope contours creating artificial lines and noticeable scars. This would disrupt the scenic quality and character of the landscape.

Non Significant Effects

- **Fire and Fuels:** Although, the activities that focus around these user created trails may have caused some human initiated fire starts, there is a very low probability that these fires would grow large enough to significantly manipulate the fuel loading within the project area. Therefore there will be no further effects discussion regarding the impacts of past motorized vehicle use off designated routes on fire and fuels.
- **Forest Vegetation/Insect and Disease:** Because trails are not very wide, 2 to 4 feet generally, they would encompass only a very small percentage of the total forest land within the project area and would not have a significant effect on forest vegetation or insect and disease activity. Therefore there will be no further effects discussion regarding the impacts of past motorized vehicle use off designated routes on forest vegetation and insect and disease risk.

Residential Development

The draft 2007 Bonner County Zoning District Map has the Reeder Bay area in recreation zoning, much of the Nordman and lower Granite Creek areas in Rural 5 acre or Rural 10 acre parcel sizes, and the rest of the private land within the project area as agriculture and forestry 10 to 20 acre parcel sizes (PF-CE-10). Projections for private lands within the project area show a steady population increase, although slower than the 2004 to 2006 period. Currently, only two subdivision applications have been filed for Reeder Bay area.

Potential Significant Effects

- **Aquatics (Hydrology and Fish):** Residential development would likely decrease infiltration rates and increase water yield, which could affect fish habitat.

- **Noxious Weeds:** Residential development would likely continue to introduce and spread some noxious weed species. Additionally, noxious weeds are not treated to the same degree as weeds on NFS lands, which may exacerbate the problem.
- **Wildlife:** Residential development and activities associated with peoples style of living may add to the displacement of animals and may cause habituation to some activities.
- **Rare or Sensitive Plants:** Residential development is not regulated in terms of preserving plant populations and their habitat and may impact some rare or sensitive plant populations within the project area.
- **Fire and Fuels:** The activities associated with development of lands within the project area would likely change fuel conditions and increase the number of types of values at risk adding to an already complicated wildland-urban interface environment.
- **Forest Vegetation/Insect and Disease:** Projected residential development is expected to make minor changes to the structure and composition of forest vegetation within the project area and decrease the amount of productive forest land.
- **Scenery:** Residential development would continue to introduce unnatural form, line, color, and texture to the landscape, which would affect the scenic quality and character of the area.

Non Significant Effects

- **Soils:** Residential development would occur outside any of the proposed treatment areas. Therefore, there will be no further discussion regarding the effects of residential development on the soils resource.

Hunting

Potential Significant Effects

- **Wildlife:** Spring black bear season coincides with the post-den emergence period for grizzly bears, which increases risk to grizzly bears.

Non Significant Effects

- **Soils:** Hunting is not a ground disturbing activity. Therefore, there will be no further discussion regarding the effects of hunting on the soils resource.
- **Rare or Sensitive Plants:** Because hunting is not a ground-disturbing activity, any effects of hunters on rare or sensitive plants would likely be incidental and could not be differentiated from the effects of other general forest users. Therefore, there will be no further discussion regarding the effects of hunting on rare or sensitive plants.
- **Noxious Weeds:** The effects of hunters on noxious weed spread cannot be differentiated from the effects of other general forest users. Therefore, cumulative effects discussion for noxious weeds will include hunters in a general discussion of other forest users.
- **Aquatics (Hydrology and Fish):** Hunting would not change the hydrology of any of the sub-watersheds and is not an in-stream activity that would affect fish habitat. Therefore, there will be no further discussion regarding the effects of hunting on the aquatics resource.
- **Fire and Fuels and Forest Vegetation/Insect and Disease:** Hunting would not change the vegetation structure and composition or fuel conditions within the project area. Therefore, there

will be no further discussion regarding the effects of hunting on fire and fuels or forest vegetation and insect and disease risk.

- **Scenery:** Hunting would not change form, line, color, and texture of the landscape or the scenic quality and character of the area. Therefore, there will be no further discussion regarding the effects of hunting on scenery.

Land Sale/Exchanges - (Granite Reeder Sanitary Sewer System)

In 1995, the Idaho State Legislature adopted a Lake Management Plan to protect the water quality of Priest Lake. The plan recognized that existing sewage treatment facilities in the Granite Reeder Creek community are sub-standard, and that development of a new sewage treatment plant is needed to maintain the water quality of Priest Lake in a pristine condition. The Granite Reeder Water and Sewer District (Sewer District) approved a local improvement district to finance the system, and under the direction of the Idaho Department of Environmental Quality (IDEQ) prepared an Environmental Assessment (EA). The Environmental Protection Agency (EPA) was the lead federal agency in the analysis and preparation of the EA; the Forest Service was involved as a cooperating agency.

The EA prepared by Welch Comer and Associates, Inc. was published in June 2002 and updated in June 2003. The EA analyzed the effects of installation and operation of on-site grinder pump collection units, a community pressure collection system, two lagoons and land application treatment facilities on 80 acres of National Forest System (NFS) lands. Because the Forest Service is the only agency that may authorize activities on or conveyance of NFS lands, additional analysis by the Forest Service was required before issuing a decision on the proposed activities and land conveyance. This additional analysis was attached as an appendix with the EA.

DEQ published a Finding of No Significant Impact (FONSI) in October of 2003 and the EPA issued a FONSI in August of 2006. Those documents state the agencies' determination that the proposed activities would not have an adverse or significant impact on the quality of the human environment. The FONSIs also allow the Sewer District to receive EPA grant funds for the construction of the sewage treatment facilities. In December 2007, the Forest Service issued a decision notice and FONSI which selected and approved the implementation of Alternative 1, the Proposed Action. This decision allowed the Forest Service to sell 80 acres of National Forest System (NFS) land and granted a special use permit for the development of a community sewer system.

Potential Significant Effects

- **Scenery:** Vegetation removals would occur along portions of roadways and may create some changes in the form, line, color, and texture of the landscape or the scenic quality and character of the area.
- **Noxious Weeds:** These activities would be ground disturbing and may have the potential to spread noxious weeds or facilitate noxious weed establishment.

Non Significant Effects

- **Wildlife:** The proposed land conveyance would reduce the availability of currently occupied spring grizzly bear habitat by 80 acres. However, because the conveyance would not result in increased levels of bear attractants (improperly managed food, garbage or fruit trees and compost, all of which are associated with residential developments), grizzly bear mortality risk would not be measurably increased. No effects to grizzly bear are expected from installation of the collection system on NFS lands because most of the disturbance would occur in existing road rights-of-way. Therefore, it was determined that, although this activity may affect grizzly bears through the loss of habitat, it is not likely to adversely affect grizzly bears. Approximately 34

acres of mature forest within the project area are considered suitable habitat for blacked-back woodpeckers. Development of the proposed sewage treatment facility would likely result in some impact to suitable habitat either through development or through snag removal for safety purposes. The remaining 46 acres that are considered capable habitat would likely not develop into suitable habitat for similar reasons. The proposed land conveyance would potentially reduce the availability of suitable habitat in the form of snag habitat mature timber. However, ample suitable habitat for this species is available throughout the Granite and Reeder Creek drainages and allows black-backed woodpeckers to maintain populations at low endemic levels. No impacts are expected from installation of the collection system on NFS lands because most of the disturbance would occur in existing road rights-of-way. Consequently, the proposed action may impact individual black-backed woodpeckers or habitat, but would not likely contribute to a trend toward federal listing or cause a loss of viability to the population or species. Approximately 34 acres of currently suitable northern goshawk nesting habitat would be impacted by this proposal. However, no known nesting territories would be impacted. Goshawk foraging habitat would likely be maintained on a portion of the land area. No impacts from installation of the collection system on NFS lands are expected to occur because most of the disturbance would occur in existing road rights-of-way. Consequently, the proposed action may impact individual northern goshawks or habitat, but would not likely contribute to a trend toward federal listing or cause a loss of viability to the population or species. The land conveyance and subsequent development would likely result in 34 acres of currently suitable fisher habitat being negatively impacted. The development of the proposed sewage lagoon and associated other structures would result in the permanent loss of capable habitat. However, ample suitable habitat for this species is available throughout the Granite and Reeder Creek drainages and allows fishers to maintain populations. No impacts to fishers or suitable habitat are anticipated from installation of the collection system on NFS lands because most of the disturbance would occur in existing road rights-of-way. Consequently, the proposed action may impact individual fishers or habitat, but would not likely contribute to a trend toward federal listing or cause a loss of viability to the population or species. Because no western toad breeding habitat occurs in the proposed land conveyance area, no impact to western toad breeding habitat would occur. As western toads are often found outside of breeding habitat, impacts to toads may occur during the development of the proposed sewage treatment facility on the conveyed parcel, and during installation of the collection system on NFS lands, although these impacts are anticipated to be minor. Although implementation may impact individual western toads or habitat, it would not contribute to a trend toward federal listing or cause a reduction of viability to the population or species. There would be no reduction of pileated woodpecker nesting habitat and no impacts to old growth habitat. The proposed activities would not be likely to cause a local or regional change in habitat quality or population status of pileated woodpecker. Implementation of the proposed action would not reduce priority forest land bird habitats. Therefore, the proposed activities would not contribute to measurable declines in forest land bird populations.

- **Soils:** This land exchange would occur outside the cumulative effects area for the soils resource. Therefore, there will be no further discussion regarding the effects of this land exchange on the soils resource.
- **Rare or Sensitive Plants:** No endangered plant species are suspected to occur in the IPNF, and no threatened plant species are suspected to occur in Bonner County (USDI 2007a). There would be no direct, indirect or cumulative effects to any federally listed plant species. Habitat suitability was determined to be low for most rare plant species. There would be no direct, indirect or cumulative impacts to any documented rare plant species or suitable rare plant habitat since these habitat guilds do not occur in the project area. In addition, potential for occurrence of moist forest species other than moonworts was determined to be low; there would be no direct, indirect or cumulative impacts to moist forest species other than rare moonworts. Undetected individual

moonwort species may be impacted if disturbance occurs in the portion of the parcel that contains marginally suitable habitat for these species. However, this portion of the parcel proposed for conveyance is not part of the area proposed for eventual construction of the lagoons and land application treatment facility. Other areas include the proposed collection line to be placed within the right-of-way on Forest Road 1339 and connections to that line from recreation residences on NFS lands. No rare plant occurrences are documented along this road or near any recreation residences and cursory observations by the project botanist indicate low potential for their occurrence. Based on this observation it is unlikely that any rare plants would be directly or indirectly impacted by this disturbance. Therefore, cumulative impacts to rare moonworts would be low (individuals or habitat not likely affected) to moderate (individuals or habitat may be affected but no trend to federal listing or loss of population or species viability would occur). Therefore, there will be no further discussion regarding the effects of this land exchange on rare or sensitive plants.

- **Fire and Fuels and Forest Vegetation/Insect and Disease:** 80 acres of currently suitable forest land could be removed from the productive forest land base. This represents less than third of a percent of the total forest land within the project area and would not substantially add to other ongoing and future foreseeable activities. No old growth stands currently exist within this parcel. The vegetation removals and spray field operations would not change the structure and composition to create a higher risk condition. Slash would be treated from any harvest removal to clear land for lagoons and collection systems. Therefore, there will be no further discussion regarding the effects of this land exchange on these resources.
- **Aquatics (Hydrology and Fish):** Once the federal parcel is conveyed to the Granite Reeder Sewer District, there would be no direct or indirect effects to federal water resources from the construction of the lagoons. Once the lagoons are constructed and are operational, the risk of lagoon failure is very low. Application of site-specific BMPs would prevent adverse direct or indirect impacts during the digging of the trenches for the installation of collection system within the ROW of Forest Road 1399 and on other NFS lands. Aerial application including both sprinklers and drip irrigation would begin in the springtime, with the arrival of warmer weather. The application rates would not exceed the site's transpiration rates. Whatever the vegetation would not take up, natural evaporation would then take over. No land application would take place when vegetative uptake would be reduced or infiltration would be exceeded (e.g. when the plants weren't actively growing, or when the ground was puddled, or when it was raining). All effluent that would be applied to the land would be treated through disinfection and then aeration. Therefore, the concentrations of coliform bacteria that are land applied would be significantly lower than what is permitted in swimable waters. With the highly sandy soil substrate, it is more probable that the soil microbes would more successfully be able to breakdown any residual e-coli that is applied to the land. There would be no direct or indirect effects to federal water resources from the properly functioning sprinklers or drip irrigation systems. The risk of failure for this type of system is extremely low. The implementation of project design features and proper BMPs during the installation of sewer line across intermittent and perennial streams would render contamination of surface waters unlikely and would have no direct or indirect effects to any intermittent streams and Granite and Reeder Creeks. With no direct/indirect effects there would be no cumulative effects unless a failure occurs. With the proposed BMPs identified in the Storm water Pollution Controls report (Welch Comer) as well as the BMPs proposed by the Forest Service, there should be no delivery of sediment to any water body from development or operation of the sewage treatment facility and collection system. With proper BMPs the risk of nutrient enrichment to the water resources should also be reduced. Currently, there are three monitoring wells on the subject 80-acre parcel to detect any leakage from the proposed sewage lagoons. If a failure did occur, with the rate of groundwater movement in the area at 2.0 ft/day, it would take 250 days for the wells 500 feet away to be affected. This scenario would not be likely,

given the existing monitoring wells. If the lines crossing either of the larger streams failed, then untreated effluent could be delivered to the shoreline of Priest Lake within minutes of the failure. However, the risk of failure of either buried or aerial sewer lines is relatively low. The existing sewer facilities within the Granite Reeder Sewer District do not meet state standards. Therefore, implementation of the project would enable the Granite Reeder Sewer District to bring the sewer treatment up to State of Idaho Standards, which would result in a net improvement in protecting overall water quality. It is unlikely that cumulatively there would be any adverse impacts from the combined actions of the Granite Reeder Sewer District project and the Lakeview Reeder Fuel Project.

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Past Wildfire History

Fire Year	Acres Burned
1889	102 acres in the Kalispell Granite BMU, 20 acres in the Granite Creek Watershed, 82 acres in the Kalispell Creek Watershed
1890	19309 acres in the project area, 19049 acres in the Kalispell Granite BMU, 9352 acres in the Lakeshore BMU, 15744 acres in the Granite Creek Watershed, 6202 acres in the Kalispell Creek Watershed, 8539 acres in the Reeder Creek Watershed
1900	2195 acres in the Kalispell Granite BMU, 1808 acres in the Granite Creek Watershed, 208 acres in the Kalispell Creek Watershed
1905	1321 acres in the Kalispell Granite BMU, 375 acres in the Kalispell Creek Watershed, 946 acres in the Granite Creek Watershed
1906	616 acres in the Kalispell Granite BMU, 616 acres in the Granite Creek Watershed
1909	9139 acres in the Kalispell Granite BMU, 1871 acres in the Granite Creek Watershed
1910	142 acres in the Granite Creek Watershed
1917	989 acres in the project area, 16 acres in the Kalispell BMU, 229 acres in the Lakeshore BMU, 535 acres in the Granite Creek Watershed, 454 acres in the Reeder Creek Watershed
1918	1145 acres in the project area, 1807 acres in the Kalispell Granite BMU, 107 acres in the Granite Creek Watershed, 1700 acres in the Kalispell Creek Watershed, 19 acres in the Reeder Creek Watershed
1919	1035 acres in the Kalispell Granite BMU, 140 acres in the Granite Creek Watershed
1920	301 acres in the Kalispell Granite BMU, 301 acres in the Kalispell Creek Watershed
1922	230 acres in the Kalispell Granite BMU, 230 acres in the Kalispell Creek Watershed
1924	95 acres in the Kalispell Granite BMU, 95 acres in the Granite Creek Watershed
1925	891 acres in the project area, 5246 acres in the Kalispell Granite BMU, 1061 acres in the Lakeshore BMU, 5636 acres in the Granite Creek Watershed, 162 acres in the Kalispell Creek Watershed
1926	9657 acres within the project area, 45597 acres in the Kalispell Granite BMU, 416 acres in the Lakeshore BMU, 37960 acres in the Granite Creek Watershed, 13530

	in the Kalispell Creek Watershed, 5165 in the Reeder Creek Watershed
1929	257 acres in the Kalispell Granite BMU, 175 acres in the Kalispell Creek Watershed, 166 acres in the Granite Creek Watershed
1939	8730 acres in the Kalispell Granite BMU, 8711 acres in the Kalispell Creek Watershed
1960	44 acres in the Kalispell Granite BMU, 44 acres in the Kalispell Creek Watershed
1968	40 acres in the project area, 40 acres in the Lakeshore BMU, 40 acres in the Granite Creek Watershed
1970	35 acres in the Kalispell Granite BMU
1974	37 acres in the Kalispell Granite BMU
1978	42 acres in the Kalispell Granite BMU
1991	156 acres in the Kalispell Granite BMU, 156 acres in the Granite Creek Watershed
1994	62 acres in the Granite Creek Watershed
2001	20 acres in the Kalispell Granite BMU, 20 acres in the Granite Creek Watershed
2006	31 acres in the Kalispell Granite BMU

Past Harvest History

Harvest Type	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	Grand Total
Clearcut					171	1192	691	536	243	2	2835
Clearcut with Reserves									44		44
Group Selection Cut										7	7
Improvement Cut								4			4
Liberation Cutting								13	290	3	306
Permanent Land Clearing						85			1		86
Salvage			12								12
Sanitation/Salvage	335	338		170	539	66	549	295	590	256	3138
Seed Tree Final Cut with Reserves									18		18
Seed Tree Seed Cut							1	40	23		64
Shelterwood Final Cut									17		17
Shelterwood Final Cut with Reserves									33		33
Shelterwood Preparatory Cut										217	217
Shelterwood Seed Cut							32	443	135	185	795
Shelterwood Seed Cut with Reserves									10	17	27
Single Tree Selection							18		16		34
Special Cut									147	4	151
Thinning						170	1703	1881	192	3	3949
Grand Total	335	338	12	170	710	1513	2994	3212	1759	694	11737

Historic Timber Sales

Sale Number	Purchaser	Location	Size (acres)	Date Sold	Date Closed	Notes
26	Dalkena Lumber Co.	T60N, R5W, Sec. 1,2, 11-12	1580	8/171916 After 1890 burn	2/12/1924 Before 1926 burn	S. side of Lakeview Mtn.
60	Dalkena Lumber Co.	T60N, R5W Sec 11-12	40	3/11/1922 After 1890 burn	1/25/1924 Before 1926 burn	S. side of Lakeview Mtn.
31	Dalkena Lumber Co.	T61N, R5W, Sec. 14, 15, 22-26	225	1/20/1917 After 1890 burn	1/26/1920 Before 1926 burn	S. side of Nickelplate Mtn. and N. side of Lakeview Mtn.
54	Dalkena Lumber Co.	Sale # 31 reopened		1/02/1920 After 1890 burn	4/05/1923 Before 1926 burn	S. side of Nickelplate Mtn. and N. side of Lakeview Mtn.
73	Dalkena Lumber Co.	T61N, R5W, Sec.14, 15, 22-24, 26	345	1/02/1923 After 1890 burn	11/09/1928 After 1926 burn	S. side of Nickelplate Mtn. and N. side of Lakeview Mtn.
30	J. C. Lilje	T61N, R5W, Sec. 24	20	1/10/1916 After 1890 burn	6/10/1916 Before 1926 burn	N. side of Lakeview Mtn
29	J. C. Lilje	T61N, R5W, Sec. 14, 23, 24	140	1/11/1916 After 1890 burn	5/31/1917 Before 1926 burn	S. side of Nickelplate Mtn. and N. side of Lakeview Mtn.
34	Dalkena Lumber Co.	T61N, R5W, Sec 14, 23, 24	192	6/02/1917 After 1890 burn	12/05/1921 Before 1926 burn	S. side of Nickelplate Mtn. and N. side of Lakeview

Sale Number	Purchaser	Location	Size (acres)	Date Sold	Date Closed	Notes
						Mtn.
109	Diamond Match Co.	T61N R5W and T36N, R 45 & 46E	4300	10/26/1926 After 1926 burn	2/1931	Kalispell Cr.
168	Unknown	Wash. and T61N, R5W, Sec. 28	Unknown	7/12/1935 After 1926 burn	Unknown	Kalispell Cr.; cut cedar only
124	Dalkena Lumber Co.	T61N, R4W, Sec 8, 17; T61N, R5W, Sec. 12	538	4/22/1929 After 1890 burn	8/20/1932	Mouth of Reeder Cr. and Granite Cr.
125	R. McGrath	T61N, R5W, Sec. 23, 26, 27, 34	Unknown	6/08/1929 After 1926 burn	7/5/1930	N. and W. sides of Lakeview Mtn.; cut cedar poles only
122	Albert Kerr	T61N, R5W, Sec. 11, 12	12	11/24/1928 After 1890 burn	6/12/1929	Kerr Lake
134	Dalkena Lumber Co.	T61N, R5W, Sec. 1; T61N, R4W, Sec. 6; T62N, R4W, Sec. 31	50	6/13/1930 After 1890 burn	6/29/1930	Watson Mtn.
76	Kaniksu Cedar Co.	T62N, R4W, Sec.29	180	3/24/1923 After 1890 burn	12/20/1926	Distillery Bay
77	Kaniksu Cedar Co.	T62N, R4W, Sec. 30, 31	40	4/14/1923 After 1890 burn	Did not Close	Distillery Bay
93	Dalkena Lumber Co.	T61N, R5W, Sec	1440	10/13/1925 After 1890	12/31/1926	Watson Mtn.

Sale Number	Purchaser	Location	Size (acres)	Date Sold	Date Closed	Notes
		1, 2		burn		
94	Dalkena Lumber Co.	Same as #93		11/14/1925 After 1890 burn	2/17/1930	Watson Mtn.
190	M. E. Griffith	T61N, R5W, Sec. 21	Unknown	12/01/1938	1/04/1939	W. side of Bismark Meadows; cut WP saw logs only

Past Site Preparation History

Fuels Treatment	1930	1950	1960	1970	1980	1990	2000	Grand Total
Broadcast Burn		3	61	14	42	23		143
Burn Dozer Piles			1	9	108	6		124
Burn Excavator Piles					5	25	21	51
Burn Hand Piles				3	32	25	1	61
Burn Landings					21	46	34	101
Burning for Range Improvement				1				1
Burning for Site Prep for Natural Regeneration				2	9	2		13
Burning for Site Prep for Planting	1	3	57	10	39	26		136
Dozer Piling			2	31	88	41	10	172
Ecosystem Burning						3	1	4
Excavator Piling					12	46	27	85
Fireline Construction					24	26	3	53
Fuelbreak				1	1			2
Hand Piling				20	29	22	1	72
Indirect Treatment					24	11		35
Interim Protection					35	76	45	156
Jackpot Burn			1					1
Lopping				2	14	3		19
Manual for Natural Regeneration						1		1
Manual Site Prep for Planting					1	2		3
Mechanical Site Prep for Direct Seeding						1		1
Mechanical Site Prep for Natural Regeneration			1	1	29	2		33
Mechanical Site Prep for Planting			1	13	46	17	5	82
Natural Abatement					2	1		3
Trampling				4	1			5
Understory Burn					13	7	2	22
Yarding					6	20	6	32
YUM				1	12	45	11	69
Grand Total	1	6	124	112	593	477	167	1480

Past Noxious Weed Treatments

FY2005-2007 Weed Treatment Accomplishments in Lakeview-Reeder Fuel Project (Priest Lake RD)								
11/7/2007			**NFVW WEEDS**		**CWKV WEEDS**		**RAC - PSRS**	
Date	**Location**	**New Invader(s)**	**Treat. Acres**	**Herb. Acres**	**Treat. Acres**	**Herb. Acres**	**Treat. Acres**	**Herb. Acres**
5/6/2005	**Lakeview Mtn Biocontrol Releases (MEJA)**	**DT**					**25**	**0**
6/13/2005	Bismark Gravel Pit	DT,YT					21	1.3
6/13/2005	Bismark Gravel Pit	DT,YT					0.86	0.86
6/14/2005	Loop around sewage lagoon from PLRS to Kalispell Cr Rd		6.8	1.5				
6/15/2005	Rd 313 (Bismark)	DT					1.9	1.8
6/15/2005	Rd 313 (Bismark)		23.8	3.46				
6/29/2005	Rd 2245 (Copper Mtn)	DT					5.8	0.16
6/29/2005	Rd 502, 1355 (Hazard Cr)	DT					5.8	0.16
6/29/2005	Priest Lake Airstrip	DT					0.5	0.5
6/29/2005	PLRS Compound (D.Butler)		0.3	0.2				
6/30/2005	Hazard Creek Trail 365	DT					1.7	0.9
7/5/2005	Jct Rd 302/638 (Tango) to MP 2.6 on Rd 302, Tango Cr Rd Gravel Pit, Dispersed Camp on 638 (Granite Cr.)	DT (not on 302)					7.5	4
7/13/2005	PLRS Compound	DT	28	1				
7/13/2005	Priest Lake Airstrip (see 6/29/2005)						0	0.33
7/13/2005	Lakeview/Hazard Cr Trail	DT					0.42	0.42
7/25/2005	Old Kalispell Bay Sewage Lagoon		1.7	2.17				
7/25/2005	Non-system roads behind PLRS		4.9	0				

8/2/2005	Rd 302 (MP 2 to end of pavement)	DT					1.45	0.66
8/2/2005	Rd 638 (Tango), Rd 1347 (Media Cr), Rd 1340 & spurs (Fedar Cr, Fedar TS)	DT			13.2	5.8	13.27	5.8
8/9/2005	Priest Lake Airstrip (see 6/29 & 7/13)						0	11.6
8/22/2005	Rd 1340 (Fedar) & spurs (Fedar TS)				3.1	3.1		
FY2005-2007 Weed Treatment Accomplishments in Lakeview-Reeder Fuel Project (Priest Lake RD)								
11/7/2007			**NFVW WEEDS**		**CWKV WEEDS**		**RAC - PSRS**	
Date	**Location**	**New Invader(s)**	**Treat. Acres**	**Herb. Acres**	**Treat. Acres**	**Herb. Acres**	**Treat. Acres**	**Herb. Acres**
5/12/2006	Kalispell Sewage Lagoon & WP TI Plantation		6.7	6.7				
6/1/2006	Bismark gravel pit	DT, YT					18.6	2
6/5/2006	Bismark gravel pit	DT, YT					18.6	2
6/7/2006	Priest Lake Airstrip	DT					1.2	0.8
6/21/2006	**Lakeview Mtn Biocontrol Releases (Crysolina)**		**20**					
7/13/2006	Reeder Bay Rd & West Lakeshore (DT)	DT					5	0.6
7/14/2006	Hazard Cr 1355	DT					5	0.15
7/15/2006	Priest Lake Airstrip	DT, YT					5	2.4
7/17/2006	Nordman-Metalline 302 to Pass Cr Pass (east side rd)	Tansy Rag.					26	18
7/24/2006	Bismark 313 (part)	DT, RS	8.3	8.3				
7/24/2006	Meadow by Kalispell Cr, behind PLRS		5	3.4				
7/17/2006	Nordman-Metalline 302 to Pass Cr Pass (west side rd)	Tansy Rag.					31	17
7/28/2006	Bismark 313 (part)		7.8	7.6				
4/30/2007	Bismark Gravel Pit (Raven Ranch Road)	YT, DT					1.25	1.25
7/7/2007	PLRD Station and Residence's		28	4				
7/9/2007	638-Tango Creek		9.1	9.1				

7/14/2007	PLRD Airstrip	DT					19	16
7/17/2007	2512-Reeder/Lakeshore (part)	DT					7	1
7/18/2007	Kalispell Bay Road	DT					5.8	1
7/31/2007	Hanna Flats Rd - Bismark	RS					10.1	10.1
8/6/2007	2512-Reeder/Lakeshore (part)	DT					7	1
8/7/2007	1355-Hazard Creek	DT					5.2	1
8/16/2007	1347-Media Creek						6.98	3.25
8/17/2007	PLRD-Palfrey Residence		1.0	1.0				
			151.4	48.4	16.3	8.9	257.9	106